COLLEGE OF INTENSIVE CARE MEDICINE
SECOND PART PAEDIATRIC EXAMINATION REPORT

AUGUST / OCTOBER 2014

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. Candidates should discuss the report with their tutors so that they may prepare appropriately for future examinations.

The Examination included two 2.5 hour written papers, each composed of 15 ten-minute short answer questions. Candidates were required to score at least 50% in the written paper to be eligible to sit the oral component of the Examination. The oral component comprised 8 interactive vivas and two clinical hot cases.

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

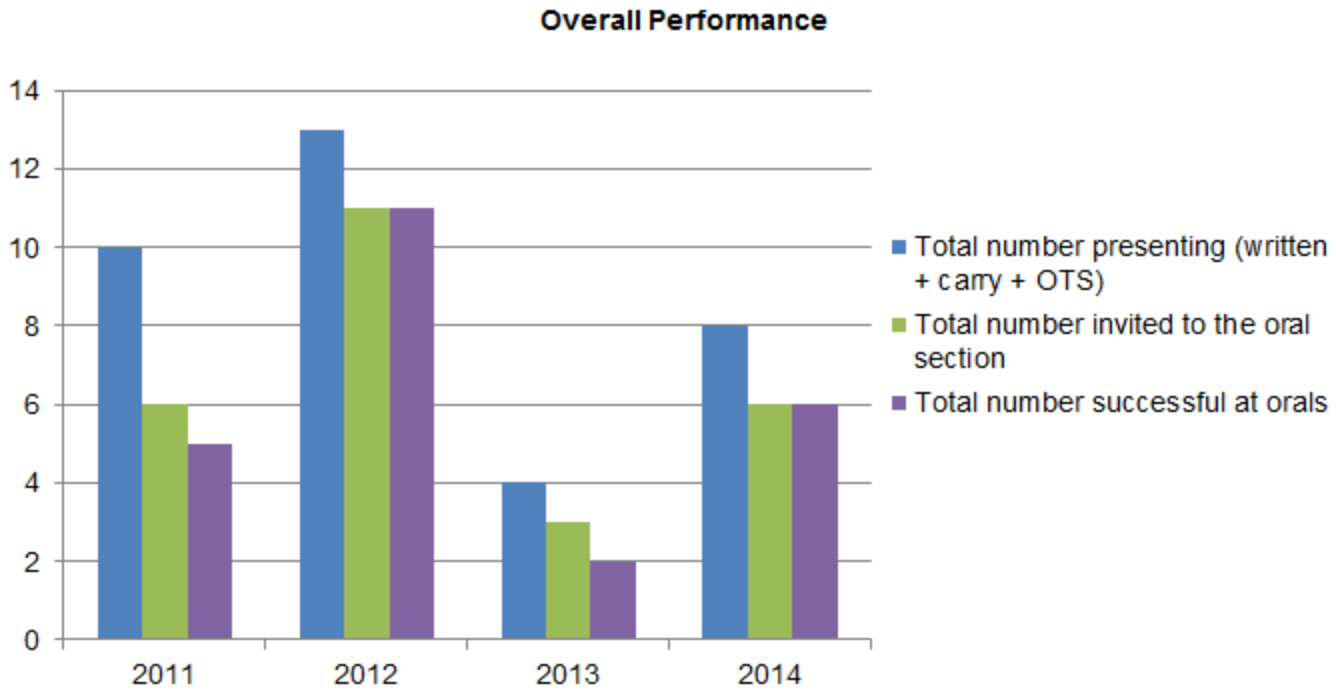
The written section of the Examination was held in Brisbane, Hobart, Melbourne, Perth and Sydney. The clinical and viva sections of the examination were held in Auckland, New Zealand at the Starship Children's Health Hospital.

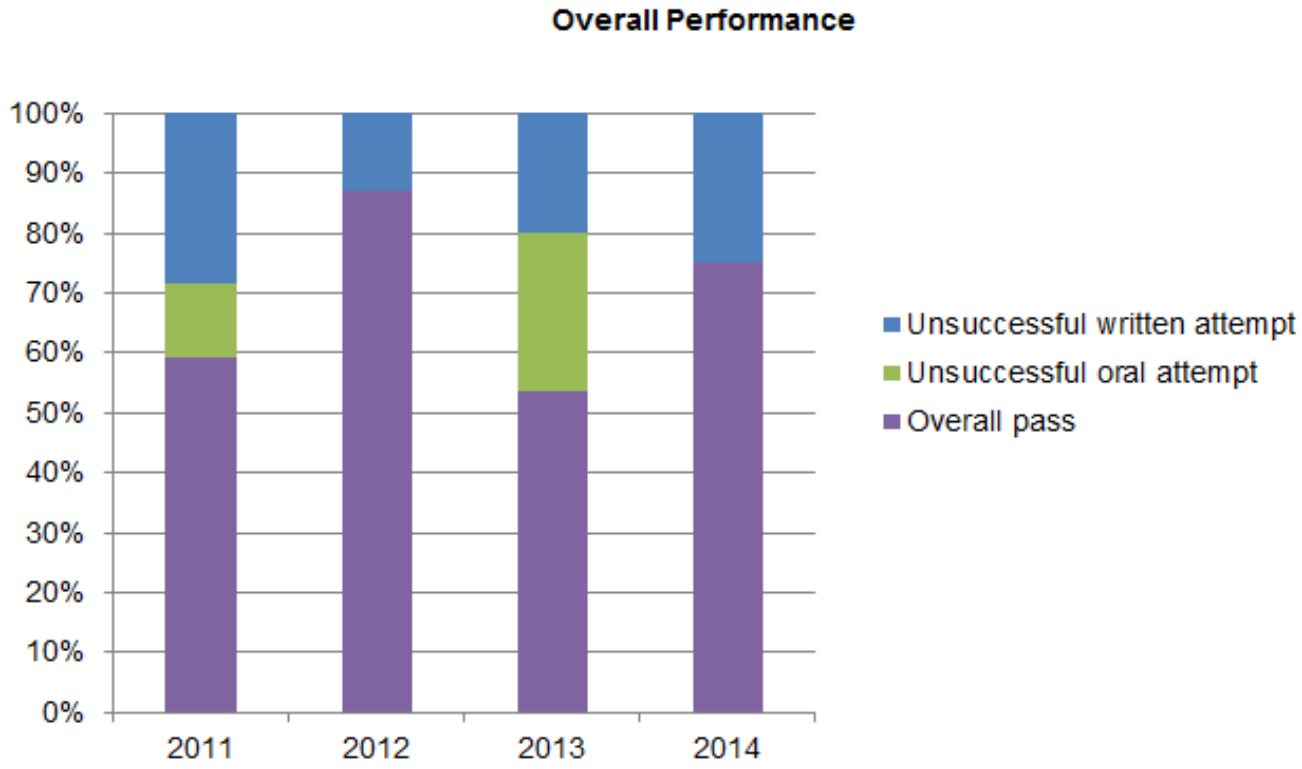
STATISTICAL REPORT

Overall Pass Rate	**2011**	**2012**	**2013**	**2014**
Total number presenting (written + carry + OTS)	10	13	4	8
Total number invited to the oral section	6	11	3	6
Total number successful at orals	5	11	2	6
	83%	100%	67%	100%
Overall pass rate	5/10	11/13	2/4	6/8
	50%	**85%**	**50%**	**75%**

Clinical Pass Rates	2011		2012		2013		2014	
	Pass rate	Highest individual mark	Pass rate	Highest individual mark	Pass rate	Highest individual mark	Pass rate	Highest individual mark
Hot Case 1	83%	90%	100%	83%	67%	63%	83%	90%
Hot Case 2	50%	67%	100%	87%	67%	67%	83%	80%
Total number successful in the Hot Case section	5/6		11/11		2/3		5/6	
Overall Hot Case pass rate	83%		100%		67%		83%	

Vivas Pass Rates	2011		2012		2013		2014	
	Pass rate	Highest individual mark	Pass rate	Highest individual mark	Pass rate	Highest individual mark	Pass rate	Highest individual mark
Viva 1	83%	75%	100%	90%	67%	63%	100%	80%
Viva 2 – Procedure Station	100%	68%	82%	80%	100%	70%	67%	88%
Viva 3	100%	95%	82%	80%	33%	70%	100%	85%
Viva 4 – Radiology Station	33%	65%	100%	90%	67%	85%	50%	54%
Viva 5	33%	88%	82%	100%	100%	85%	67%	70%
Viva 6	67%	72%	91%	90%	33%	68%	83%	73%
Viva 7 – Communication Station	17%	50%	100%	90%	33%	80%	100%	90%
Viva 8	33%	80%	64%	63%	67%	53%	100%	85%
Total number successful in the Viva section	5/6		11/11		2/3		6/6	
Overall Viva pass rate	83%		100%		67%		100%	


Overall Performance
14
12
10
8
6
4
2
0
2011
2012
2013
2014
Total number presenting (written + carry + OTS)
Total number invited to the oral section
Total number successful at orals


Overall Performance
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2011
2012
2013
2014
Unsuccessful written attempt
Unsuccessful oral attempt
Overall pass

EXAMINERS' COMMENTS

Written Paper

Eight of the thirty short answer questions had a pass rate of less than 50%. Topics covered in these questions included the interpretation of meta-analyses, the use of sildenafil, infection in burns, Tetralogy of Fallot and absent pulmonary valve syndrome, non-accidental injury, investigation of myocardial ischaemia, study design and perioperative corticosteroids in cardiac surgery.

The most common reasons for candidates to fail questions were:

- Insufficient knowledge of the topic
- Insufficient detail or depth of the answer
- Failure to answer the question asked
- Poorly structured answer

Candidates are reminded to read the questions carefully and thoroughly, to include in their answer only information that is relevant to the question and to write legibly. The allocation of marks in multipart questions is shown to allow candidates to organise their answers appropriately. The glossary of terms is provided to help candidates to understand the type of information and structure required in the answer.

Hot Cases

The overall pass rate was comparable to previous examinations. Comments noted by the examiners when candidates failed cases included:

- Too slow with initial assessment
- Spent too long at bedside
- Missed clinical signs / important abnormalities
- Unfocussed / hesitant examination
- Lack of clarity and depth in discussion

Candidates are advised that they should not sit the Fellowship Examination until they can confidently examine patients, present the relevant clinical findings and discuss management issues at the appropriate level (senior fellow/junior consultant). This aspect of the examination requires specific and frequent practice.

Vivas

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.

WRITTEN EXAMINATION REPORT

Notes

Where laboratory values are provided, abnormal values are marked with an asterisk (*).

Images from the SAQ papers are not shown in this report.

Instructions to Candidates

a) Write your answers in the blue books provided.

b) Start each answer on a new page and indicate the question number. It is not necessary to rewrite the question in your answer book.

c) You should aim to answer each question in ten minutes.

d) The questions are worth equal marks.

e) Record you candidate number and each question number on the cover of each book and hand in all books.

Glossary of Terms

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 (e.g. in table form).
Management:	Generic term that implies overall plan. Where appropriate, may include diagnosis as well as treatment.
Discuss:	Explain the underlying key principles. Where appropriate, this may include controversies and/or pros and cons.

Question 1

A 5 year old boy has been in PICU for 3 weeks following pneumococcal pneumonia with acute respiratory distress syndrome and multi-organ dysfunction syndrome. He required 1 week of high frequency oscillation for severe hypoxia and has subsequently been commenced on steroids to facilitate lung healing as per the Meduri protocol. He is currently on 2 mg/kg/day methylprednisolone.

His renal function is recovering and he is enterally fed via a nasogastric tube. He is afebrile and no longer on antibiotics.

Attempts to decrease his level of respiratory support have resulted in arterial desaturation, tachypnea, and tachycardia.

His current ventilator settings are:

- SIMV/Pressure Control/Pressure Support
- FiO_2 0.35; PIP 24 cmH_2O; PEEP 5 cmH_2O; Rate 18 breaths per minute; PS 15 cmH_2O

His most recent investigations are shown below:

Parameter	Patient Value	Reference Range
pH	7.47*	7.35 – 7.45
$PaCO_2$	48 mmHg (6.3 kPa)*	35 – 45 mmHg (4.6 – 6 kPa)
PaO_2	89 mmHg (11.7 kPa)	80 – 105 mmHg (10.5 – 13.8 kPa)
Base Excess	5.6*	-5.0 to +5.0
Bicarbonate	32 mmol/L*	20 – 26 mmol/L
Chloride	93 mmol/L*	98 – 110 mmol/L
Sodium	138 mmol/L	135 – 146 mmol/L
Potassium	4.2 mmol/L	3.5 – 5.0 mmol/L
Urea	8.7 mmol/L*	2.1 – 6.5 mmol/L
Creatinine	72 µmol/L	30 – 80 µmol/L
Phosphate	0.7 mmol/L*	1.1 – 1.8 mmol/L
Magnesium	0.9 mmol/L	0.7 – 1.2 mmol/L
Haemoglobin	92 g/L*	115 – 155 g/L
White Blood Cells	15.3×10^9/L*	$4.0 – 11.0 \times 10^9$/L
Platelets	95×10^9/L*	$150 – 400 \times 10^9$/L

a) List the potential causes of failure to wean in this patient. (5 marks)

b) What criteria will you use to decide when he is ready for extubation? (5 marks)

Comments

86% of candidates passed this question.

This is a straightforward question about failure to wean from ventilation in a long-stay PICU patient. As expected, it was generally answered well. Candidates with a systematic approach scored highly.

Question 2

a) Outline your PICU admission criteria for acute asthma. (2 marks)

b) Outline your criteria for intubation in acute asthma. (2 marks)

c) Discuss your approach to intubation and ventilation in acute asthma. (6 marks)

Comments

86% of candidates passed this question.

This question asks for specific details about the assessment and treatment of asthma. Some answers were poorly structured and lacked the required detail.

References

OH's Intensive Care Manual, 7th Edition, 2014, Chapter 35.

Question 3

a) Discuss the risks and benefits of red blood cell transfusion in the anaemic critically ill child.

(4 marks)

b) Discuss blood conservation strategies to reduce the need for red blood cell transfusion in critically ill children.

(6 marks)

Comments

86% of candidates passed this question.

A straightforward question that was generally answered very well.

References

Tinmouth AT, McIntyre LA, Fowler RA. Blood conservation strategies. CMAJ 2008; 178(1):49-57.

Question 4

4.1

Two forest plots are shown on page 4 from different meta-analyses (MA 1 and MA 2).

a) What information do forest plots give about meta-analysis? (2 marks)

b) Compare and contrast the forest plots for MA 1 and MA 2. (3 marks)

4.2

Two funnel plots are shown on page 5 from different meta-analyses (MA 3 and MA 4). They show the risk ratio (RR) for mortality with treatment versus placebo for different conditions (higher RR means higher risk of mortality with treatment).

a) What information do funnel plots give about meta-analysis? (2 marks)

b) Compare and contrast the forest plots of MA 3 and MA 4. (3 marks)

Comments

29% of candidates passed this question.

This question revealed inadequate understanding of the interpretation of meta-analyses on the part of many candidates. This is an important aspect of literature evaluation. Some candidates did not attempt to interpret the plots, even though labelling and information given was sufficient.

Question 5

5.1

The diagram below shows an arterial line pressure waveform with a synchronous ECG recording.

Using the numerically labelled phases and points of the waveform:

a) Describe which part of the tracing represents systole.

b) Describe which part of the tracing represents diastole.

c) What is point 4 and what causes it (3 marks)

5.2

Match the following arterial waveform characteristics with the associated pathology (or pathologies) listed.

a) Pulsus paradoxus
b) Pulsus alternans
c) Pulse deficit
d) Slow upstroke
e) Wide pulse pressure
f) Narrow pulse pressure
g) Loss of point 4 on the above waveform tracing

(7 marks)

Pathologies:

- Pericardial effusion
- Aortic regurgitation
- Bronchospasm
- High systemic vascular resistance
- Severe LV failure
- Ventricular ectopy
- Tamponade
- Severe aortic stenosis
- Atrial fibrillation
- Low systemic vascular resistance

Comments

100% of candidates passed this question.

A straightforward question that was well answered.

Question 6

Discuss the use of sildenafil in critically ill infants. (10 marks)

Comments

29% of candidates passed this question.

This question required candidates to demonstrate knowledge and perspective. See the Glossary of Terms for what is expected when a SAQ asks the candidate to 'Discuss'. As well as simple pharmacology and actions of sildenafil, answers were expected to provide insight into the variety of indications and uses with mention of controversies. This was answered poorly, with insufficient detail and a surprising lack of knowledge about a relatively common drug.

Reference

PCCM 2014; 15(4):362-368

Question 7

You are called to provide advice and to organise retrieval of a 14 month old female (12 kg) with facial burns. She has had a pot of boiling spaghetti poured over her head in the kitchen when she crawled under her mother's feet as she was transferring the pot for draining. She has presented to the emergency department of a local tertiary adult hospital with a small paediatric service.

Her burns extend from the head, side of face to eyelids, ear, lips and shoulders to 25% of her torso front and back. There are several areas of blistering and skin loss.

- SpO_2 100% in air
- Heart rate 160 beats per minute
- Blood Pressure 120/70 mmHg
- Respiratory rate 30 breaths per minute

The child is screaming in the background despite having received 2 mg morphine and 5 mg ketamine (both intravenously).

They are 45 minutes away by road and it is 2100 hours. Two of your registrars are absent due to illness. This includes the rostered retrieval fellow so a junior registrar (no anaesthetic experience) is available. There are two unstable patients in the unit so assume that you should not go yourself.

What are the key clinical and logistic considerations in the management and transport of this patient?

(10 marks)

Comments

100% of candidates passed this question.

Most answers were adequate, although some candidates could have scored more highly by paying equal attention to both clinical and logistic parts of the question. Candidates are reminded to read the question carefully.

References

Lancet, Volume 383, Issue 9923, 29 March–4 April 2014, Pages 1168-1178.

Question 8

A 5 year old boy is admitted from MRI following an acute ischaemic cerebral event. There is a background of sickle cell disease and a new diagnosis of moyamoya syndrome. He has been extubated and has a Glasgow coma score of 14. The MRI demonstrates new left sided parietal and right sided frontal infarcts, with adequate CSF spaces and no apparent bleed.

a) The haematologist requests an exchange transfusion in PICU; describe how you will proceed. (4 marks)

b) How will you manage this patient to optimize neurological outcome? (4 marks)

c) What is moyamoya syndrome? (2 marks)

Comments

71% of candidates passed this question.

This question covered two main areas: the practicalities of exchange transfusion and clinical neurointensive care. Allowance was made for differences in protocols/approach, in particular to the former. Candidates who scored poorly did not address both aspects of the question equally, or provided answers that were too narrow in scope. The specific question about the diagnosis was not attempted by several candidates.

Reference

NEJM 2009 360:122-6.

Question 9

a) Outline the preconditions for early extubation following cardiac surgery. (5 marks)

b) Tabulate the benefits and risks of early extubation following cardiac surgery. (5 marks)

Comments

71% of candidates passed this question.

This was a straightforward question, with clear guidance for how to structure the answer. Candidates are reminded to answer in the format requested (in this case 'tabulate').

Reference

Early extubation after Pediatric Cardiac Surgery: Systematic Review, Meta-analysis, and evidence-Based Recommendations. A.A.Alghamadi, J Card Surg 2010; 25:586-595.

Question 10

In table form, compare and contrast propofol, thiopentone and ketamine as induction agents for anaesthesia, with specific reference to:

- mechanism of action
- onset
- duration of effect
- elimination
- adverse effects
- advantages
- dose (10 marks)

Comments

100% of candidates passed this question.

This question was well-answered, with candidates displaying a good understanding of the relevant drugs.

Question 11

A 7 month old patient is admitted from the ward with increased work of breathing. He has 22q deletion and unrepaired Tetralogy of Fallot with absent pulmonary valve syndrome (APVS). He has been in hospital for two months. His ward management is 8 cmH_2O of CPAP via a nasal mask in room air. He has had repeated readmissions to the PICU because of problems with management of mask ventilation on the ward.

A Chest X-ray was shown.

a) Describe the abnormalities evident on this X-ray. (3 marks)

b) What are the pathophysiological features of Tetralogy of Fallot with APVS? (3 marks)

c) Outline your approach to getting this child discharged on home ventilation. (4 marks)

Comments

43% of candidates passed this question.

This was a demanding question addressing three distinct aspects of one disease. Candidates failed because of poor understanding of the disease and an insufficiently comprehensive approach to home ventilation.

Question 12

A three year old child has been ventilated in PICU for six days following 50% deep burns to face, trunk and arms from a camp fire. She has had two burn debridements and received one dose of cephalothin intravenously upon anaesthetic induction at each operation. She was initially afebrile. At 24 hours she developed a persistent fever to 38^oC. Yesterday her temperature rose to 39.5^oC for several hours. A second episode of high fever has occurred today.

Her current observations are:

- Temperature 39.2^oC
- Heart rate 190 beats per minute
- Blood pressure 82/42 mmHg
- SpO_2 94%, FiO_2 0.45
- Capillary refill upper thigh (dressings obscure trunk) 3 seconds

- Urine output 0.6 mL/kg/hr

Laboratory investigations reveal the following:

Parameter	Patient Value	Reference Range
White Blood Cell count	19.2 $x10^9$/L*	5.5 – 15.5 $x10^9$/L
Neutrophils	18.6 $x10^9$/L*	1.5 – 8.5 $x10^9$/L
C-Reactive Protein	178 mg/L*	<8 mg/L

Outline your management of possible infection in this child. (10 marks)

Comments

43% of candidates passed this question.

Answers to this question needed to cover haemodynamic instability with sepsis, a discussion of potential sources of infection and likely organisms, as well as specific investigations and treatments with reference to consensus guidelines. Few candidates were able to provide an organised and comprehensive answer.

Reference

J Burn Care Res. Nov-Dec 2007; 28(6):776-90.

Question 13

A 10 day old boy presents to the Emergency Department with reported symptoms of sleepiness, poor feeding, and fever.

On examination he is lethargic with poor perfusion and gasping respirations. He is jaundiced and has hepatomegaly.

Initial laboratory investigations are shown below:

Parameter	Patient Value	Reference Range
International Normalised Ratio (INR)	5.8*	<1.3
Activated Partial Thromboplastin Time (APTT)	122 seconds*	22 - 39 seconds
PT	56.4 seconds*	9.0 – 14.0 seconds
Fibrinogen	0.9 g/L*	1.9 - 5.0 g/L
pH	6.90*	7.34 - 7.43
$PaCO_2$	79* mmHg (10.4 kPa)*	32 - 45 mmHg (4.2 – 5.9 kPa)
PaO_2	100 mmHg (13.2 kPa)	80 – 100 mmHg (11 – 13.2 kPa)
Bicarbonate	12 mmol/L*	18 – 25 mmol/L
Lactate	4.5 mmol/L*	1.0 – 1.8 mmol/L
Sodium	148 mmol/L*	135 – 145 mmol/L
Potassium	5.8 mmol/L*	3.5 – 5.0 mmol/L
Chloride	106 mmol/L	98 – 110 mmol/L
Urea	12 mmol/L*	2.1 – 6.5 mmol/L

Creatinine	100 µmol/L*	10 – 60 µmol/L
Glucose	1.9 mmol/L*	3.6 – 5.4 mmol/L
Bilirubin conjugated	446 µmol/L* 58 µmol/L*	< 10 µmol/L < 5 µmol/L
Alkaline phosphatase (ALP)	568 IU*	100 - 350 IU
Alanine aminotransferase (ALT)	61 IU/L*	0 - 35 IU/L

a) List your differential diagnoses in order of likelihood. (2 marks)

b) Outline your approach to diagnosis and management. (8 marks)

Comments

86% of candidates passed this question.

This question was generally well-answered. Most candidates recognised the likelihood of metabolic disease, although few were able to suggest more specific diagnoses. A surprising number of candidates did not address management of hyperbilirubinaemia.

Question 14

For each of the following toxins:

a) List the specific antidote(s) and

b) Describe the mechanism of action of each antidote.

i. Digoxin

ii. Organophosphates

iii. Ethylene glycol

iv. Iron

v. Benzodiazepines

(10 marks)

Comments

86% of candidates passed this question.

Candidates were able to pass this this question with relatively basic knowledge of clinical toxicology.

Question 15

A 10 year old boy weighing 120 kg is admitted to your PICU with respiratory failure.

a) List potential pathophysiological problems which arise from childhood obesity. (5 marks)

b) List specific problems you are likely to encounter with this child, and measures you will take to manage these for:

i. airway and ventilation (2 marks)

ii. line insertion (1 mark)

iii. nursing care (1 mark)

iv. drug metabolism and pharmacokinetics (1 mark)

Comments

100% of candidates passed this question.

This question addressed an important emerging problem in PICU and most candidates answered well. Some candidates failed to organise the second part of the question adequately, with a problem and its management.

Reference

Obese Children - Challenges in the ICU
http://www.sccm.org/Communications/Critical-Connections/Archives/Pages/Obese-Children---Challenges-in-the-ICU.aspx

Question 16

In table form, outline the causes of patient – ventilator dyssynchrony and strategies to address each of these. (10 marks)

Comments

57% of candidates passed this question.

Answers to this question were generally disappointing. Few were able to display a systematic approach to what is a common problem. Candidates are reminded that there is no point in repeating one piece of information several times in an answer.

Reference

CCNurse 2009 29:41.

Question 17

You are asked to assist in the management of a 4 year old who has presented to the Emergency Department with a history of seizures for the past 20 minutes.

Discuss your approach to management of seizures, specifically addressing escalation of treatment for refractory seizures.

(10 marks)

Comments

86% of candidates passed this question.

This question was answered well by most. Candidates failed to score highly if they did not adequately describe the sequence of therapies that they would use (the 'escalation' referred to in the question) or did not include drug dosing and administration information.

Question 18

A previously well 9 month old girl presents with out of hospital cardiac arrest (initial rhythm recorded by ambulance was ventricular fibrillation). Her parents report that she appeared to stop breathing and then become cyanosed on the change table. Sinus rhythm was established after 30 minutes of appropriate CPR. She is admitted to the PICU.

A Chest X-ray was shown.

a) List the abnormalities on this X-ray. (2 marks)

b) What is the likely mechanism of the arrest? (2 marks)

c) List further investigations. (2 marks)

d) Discuss the role of therapeutic hypothermia in this case. (4 marks)

Comments

29% of candidates passed this question.

The X-ray showed rib fractures, which were identified by a minority of candidates. Those who scored highly answered the question with non-accidental injury as the most likely diagnosis.

Question 19

A six month old girl was injured after her capsule was ejected from a car in a motor vehicle crash. The car was being driven by her father, who is in intensive care in an adult hospital. The parents are separated, with the mother having custody in an informal arrangement.

This girl has been ventilated in PICU for one week with a complete spinal cord injury at C1-C2, but is fully conscious. The neurologist believes that the MRI shows unrecoverable complete transection of the spinal cord. The neurosurgeon is more optimistic and wants to give three weeks of corticosteroids and review. The mother says that she wants “everything done” and is willing to accept her alive in any condition.

Outline the important communication, ethical and legal issues to consider in your approach to this case.

(10 marks)

Comments

57% of candidates passed this question.

Candidates who scored poorly did not address the three aspects of this problem clearly stated in the question. This was a difficult question, requiring a broad view of a complex situation, rather than the practicalities of PICU management.

Question 20

A 10 year old boy has been in PICU for three weeks with severe Staphylococcal sepsis and acute respiratory distress syndrome. He required high frequency ventilation then veno-venous ECMO for ten days and is now on conventional mechanical ventilation. He initially required high doses of morphine and midazolam for analgesia and sedation which were supplemented with ketamine and clonidine.

His sedation has been stopped for two days as he has been slow to wake up. He has become agitated, tachycardic and hypertensive.

a) What is your differential diagnosis? (2 marks)

b) Outline your approach to monitoring for drug withdrawal. (4 marks)

c) Discuss management of drug withdrawal. (4 marks)

Comments

86% of candidates passed this question.

A relatively easy question. Some candidates gave incomplete or superficial answers.

Question 21

Critically evaluate the use of tight glycaemic control in PICU. (10 marks)

Comments

71% of candidates passed this question.

Most candidates were aware of the relevant literature in this area and to score well needed more detailed knowledge of the CHiP study. Some candidates made little attempt to interpret or draw conclusions from the literature.

Reference

Macrae D, Grieve R, Allen E, et al. A randomized trial of hyperglycemic control in pediatric intensive care. N Engl J Med 2014; 370:107-18.

Question 22

A 4 month old girl with single ventricle physiology (hypoplastic left ventricle, double-outlet right ventricle, sub-pulmonary stenosis) is recovering following an atrial septectomy and central shunt (aorta-main pulmonary artery). In theatre she had severe myocardial dysfunction and was unable to come off cardiopulmonary bypass. She was supported with four days of central veno-arterial ECMO, with apparent recovery and was subsequently decannulated in PICU.

Immediately after decannulation she becomes hypotensive requiring rapid institution and escalation of inotropes (adrenaline and noradrenaline).

A 12 lead ECG was shown

a) Comment on the ECG. (2 marks)

b) List your differential diagnosis. (2 marks)

c) Outline further investigations and the associated risks and benefits of each. (6 marks)

Comments

43% of candidates passed this question.

Answers to this question were generally disappointing. ECG interpretation was superficial and investigation of myocardial ischaemia in a patient on ECMO (and the associated difficulties) poorly addressed.

Question 23

a) In table form compare and contrast suxamethonium and rocuronium under the following sub-headings: onset, duration of action, mechanism of action, side effects, and contraindications. (6 marks)

b) List <u>eight</u> features on physical assessment that suggest a potentially difficult intubation. (4 marks)

Comments

100% of candidates passed this question.

A straightforward question that was answered well by the majority of candidates.

Question 24

A Chest X-ray was shown.

a) Describe the abnormalities seen on this X-ray. (5 marks)

b) Describe and draw a 3 bottle suction system for chest drainage. (5 marks)

Comments

71% of candidates passed this question.

The X-ray interpretation was generally done well, allowing some candidates to pass despite limited knowledge of the relevant suction system.

Question 25

A four year old boy was a passenger on a quad bike being driven by an adult. He struck a rope at neck level and has been transferred by air ambulance to intensive care. The night registrar phones you and tells you that the patient has spinal shock.

a) List five clinical signs of cervical spinal injury. (2.5 marks)

b) List the anatomic differences between adults and children which have an influence on cervical injury. (2.5 marks)

c) Define SCIWORA. (1 mark)

d) Define spinal shock. Briefly outline the natural history of spinal shock. (2 marks)

e) Briefly outline your management of this patient for the first 24 hours after a high cervical injury. (2 marks)

Comments

83% of candidates passed this question.

Although most candidates passed this question some answers were surprisingly shallow with respect to the relevant differences between paediatric and adult anatomy, spinal cord injury and management.

Question 26

You are planning a study to look at risk factors for poor long-term outcomes in PICU survivors (dead or severely disabled 5 years after PICU discharge).

Compare the strengths and weakness of the following three study designs to address this type of question:

- Cohort
- Case control
- Cross-sectional studies

(10 marks)

Comments

29% of candidates passed this question.

To pass, candidates needed to apply their understanding of the limitations of various methodologies when applied to a specific research question. Unfortunately most candidates did not convey a clear understanding of the relevant study designs and therefore scored poorly.

Question 27

A 2 year old boy is intubated for severe upper airway obstruction due to croup. He is conscious on arrival at hospital and has copious frothy pink secretions coming up his endotracheal tube.

a) What determines microvascular fluid exchange in the normal lung and what causes pulmonary oedema? (3.5 marks)

b) What complication has this boy suffered? (1 mark)

c) Outline the pathophysiology of this complication. (3 marks)

d) What is the treatment for this complication? (1.5 marks)

e) What is the natural history of this complication? (1 mark)

Comments

71% of candidates passed this question.

Most candidates provided reasonable answers to this question; however others displayed particularly poor knowledge of the required physiology and pathophysiology.

Question 28

Critically evaluate the use of perioperative corticosteroids in paediatric cardiac surgery.

(10 marks)

Comments

0% of candidates passed this question.

There was a lack of knowledge of the literature in this area. Discussion of suggested mechanism, timing etc. was also inadequate. Candidates often simply described local practice.

References

Scrascia G, Rotunno C, Guida P, et al: Perioperative Steroids Administration in Pediatric Cardiac Surgery: A Meta-Analysis of Randomized Controlled Trials. *Pediatr Crit Care Med* 2014; 15:435–442

Pasquali SK, Hall M, Li JS, et al: Corticosteroids and outcome in children undergoing congenital heart surgery: Analysis of the Pediatric Health Information Systems database. *Circulation* 2010; 122:2123–2130

Pasquali SK, Li JS, He X, et al: Perioperative methylprednisolone and outcome in neonates undergoing heart surgery. *Pediatrics* 2012; 129:e385–e391

Robertson-Malt S, Afrane B, Elbarbary M: Prophylactic steroids for pediatric open heart surgery. *Cochrane Database Syst Rev* 2007; 4:CD005550

Question 29

You are the consultant in charge of PICU. A senior fellow has been struggling with clinical and administrative duties and with preparation for the Fellowship examination. He has not turned up for a rostered nightshift and is not answering his mobile or landline.

a) Outline your approach to this problem. (4 marks)

The fellow turns up two hours later having simply overslept. During discussion he expresses concern about passing the exam and is critical of your unit's teaching programme.

b) What are the essential features of a robust PICU educational programme? (6 marks)

Comments

86% of candidates passed this question.

A question with two distinct sections addressing different aspects of management. The first was general well answered. The second part, dealing with education, was poorly structured in some cases.

Question 30

Discuss the following statement:

"Fluid balance has an important influence on outcome in children with acute lung injury."

(10 marks)

Comments

57% of candidates passed this question.

Candidates are reminded to read the glossary of terms provided with the SAQ paper. To score highly candidates needed to display knowledge of pathophysiology, assess the plausibility of the statement and acknowledge relevant literature.

References

Crit Care Med. 2012 Oct;40(10):2883-9.

N Engl J Med 2006; 354:2564-2575.

ORAL SECTION

Clinical Section

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

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

Candidates should listen carefully to the introduction given by the examiners and direct their examination accordingly. Cases are usually presented as problem solving exercises. For maximal marks, candidates should demonstrate a systematic approach to examination, clinical signs should be demonstrated, and a reasonable discussion regarding their findings should follow.

Some candidates waste valuable time at the start of the case by spending more than a couple of minutes around the bedside before actually examining the patient. Exposing the patient should be limited to those areas that are necessary for that component of the examination. Candidates must show appropriate courtesy and respect to patients and their families if present during the examination.

The twenty minutes available for each case provides ample opportunity to discuss investigations and plans of management. Candidates are reminded that a large proportion of the marks are allocated to coherent presentation and synthesis, discussion and reasoning. Candidates should approach the case discussion in a consultant-like manner.

Cases encountered in the clinical component of the examination included:

- An infant recovering from an arterial switch operation performed the previous day
- An infant with upper airway obstruction due to a large face and neck haemangioendothelioma
- A 19 month old boy with Noonan's syndrome, tracheostomy, HOCM and recent

resection of left ventricular outflow tract

- An 8 year old girl with sepsis and large joint arthritis
- A 3 month old boy with dilated cardiomyopathy and parainfluenza infection.

Viva Section

There are 8 stations of ten minutes each for structured vivas. Two minutes are provided to read an introductory scenario (which includes the initial question) outside each viva room. This same information is also provided inside the viva room.

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

Viva 1

A 6 year old boy with a past history of asthma and mild autism spectrum, presents with a 2 week history of polydipsia, and polyuria. This morning his father found him sleeping in bed with "hard breathing". He gave him salbutamol with no effect and brought him to the local hospital. On arrival he is drowsy, moving all 4 limbs, pupils 3 and reactive, palpable pulses and has obvious Kussmaul breathing.

Initial capillary blood tests are shown below:

Parameter	Patient Value	Reference Range
pH	6.86	7.35 – 7.45
PCO2	8 mmHg (1.1 kPA)	35 – 45 mmHg (4.5 – 6.5 kPa)
HCO3	2 mmol/L	18 – 23 mmol/L
Na	137 mmol/L	135 – 145 mmol/L
K	2.5 mmol/L	3.5 – 4.5 mmol/L
Glucose	45 mmol/L	4 – 8 mmol/L
Urea	10 mmol/L	3 – 7 mmol/L
Creatinine	130 µmol/L	30 – 60 µmol/l

What is your interpretation of these laboratory tests?

Viva 2 – Procedure Station

You are the PICU fellow and are called to provide assistance to the emergency department. The paediatric emergency specialist is in the process of intubating a 12 month old boy with acute respiratory distress of presumed acute viral origin on the background of a chromosomal translocation.

Viva 3

A 7 year old girl with a past history of a repaired ventricular septal defect has been placed on V-A ECMO for cardiogenic shock. The working diagnosis is viral myocarditis.

What does this Chest X-ray demonstrate?

Viva 4 – Radiology Station

You are reviewing the morning X-rays for the cardiac patients in PICU. You will be shown and asked to interpret a series of chest X-rays.

Viva 5

A 14 year old girl weighing 50Kg is admitted to the ICU following surgical ligation of a fronto-parietal AVM (diagnosed following 12 month history of headache). She has no other relevant past medical history, apart from long-standing mild asthma (not on regular medication). Surgery was uneventful and she was left intubated to facilitate blood pressure control over the first 48 hours. On the morning of surgery she complained of a sore throat, but she was afebrile and had no abnormal findings on examination.

She is transferred to the ICU with a cuffed oral 5.5 endotracheal tube. She is ventilated using time-cycled, pressure limited ventilation with the following settings:

> Peak inspiratory pressure 27 cm H2O; Peak end expiratory pressure 7 cm H2O;
> Rate 20 per minute, Inspiratory time 1 second; FiO2 0.55

She has 2 peripheral 20g intravenous lines and is receiving an intravenous morphine infusion at 3mg per hour.

Monitoring shows:

> Temperature 36.9°C
> End tidal CO_2 42; SpO_2 97%
> Heart rate 98 beats per minute
> Blood pressure 110/74 mmHg, mean 95 mmHg

Briefly outline your approach to initial assessment and investigation.

Viva 6

A 5 year old develops meningococcal sepsis and requires significant fluid resuscitation, inotropes, intubation and ventilation. He has been on the ICU for 20 hours. He weighs 20 kg and has received 120 mL/kg fluid resuscitation since admission.

He is ventilated with tidal volumes of 6 mL/kg at a rate of 30 with a PEEP of 10cm H_2O and FiO_2 of 0.7. Peak Pressure is 30 cm H_2O

He is on Noradrenaline at 0.4 mcgm/kg/min, Vasopressin at 0.04 u/kg/min and dobutamine of 7.5 mcgm/kg/min he has a blood pressure of 65/35 mmHg and a CVP of 12 cm H_2O. He has been anuric for 12 hours.

The following blood tests are obtained:

Parameter	Patient Value	Reference Range
pH	7.12	7.35 – 7.45
$PaCO_2$	55 mmHg (7.33 kPa)	35 – 45 (4.7 – 6.0 kPa)
Pa O_2	85 mmHg (11.33 kPa)	70 – 100 (9.33 – 13.33 kPa)
HCO_3	14 mmol/L	20 – 25 mmol/L
BE	-13.5	-3.0 to +3.0
Lactate	4.5 mmol/L	< 2.0 mmol/L
Hb	87 g/L	120 – 145 g/L
Na	134 mmol/L	135 – 145 mmol/L
K	6.2 mmol/L	3.5 – 4.5 mmol/L
Cl	114 mmol/L	95 – 105 mmol/L
Urea	14 mmol/L	2.5 – 8 mmol/L
Creatinine	160 µmol/L	50 – 100 µmol/L

The decision is made to start renal replacement therapy. What issues do you need to assess and address before commencing renal replacement therapy?

Viva 7 – Communication Station

A 10 year old boy was riding a bicycle home from school on a main road when he was hit by a car travelling at 80 km/h and suffered an isolated head injury. He was not wearing a helmet. GCS at the scene was 5 with a motor score of 3. CT confirms diffuse cerebral oedema but no significant haemorrhage. An ICP monitor has just been placed with an opening pressure of 28, and he has been given one bolus of hypertonic saline. He has just returned to the ICU from theatre.

You are meeting the parents for the first time to discuss this boy's condition, outline your plan of management and what you consider to be his likely prognosis.

Viva 8

A 7 month old aboriginal girl presents with acute history of high fevers, reduced conscious state, poor feeding and vomiting.

On examination she is not fixing or following. She withdraws to painful stimuli.

Other observations:

Temperature 38.9°
Pulse 160/min
Blood pressure 70/40 mmHg
Respiratory rate 40/minute, mild respiratory distress

What is your differential diagnosis?