



COLLEGE OF INTENSIVE CARE MEDICINE PAEDIATRIC FELLOWSHIP EXAMINATION REPORT

AUGUST / NOVEMBER 2013

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 and Supervisors of Training so that they may prepare appropriately for future examinations.

The Examination included two 2.5 hour written papers, each comprised 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 of two clinical hot cases and 8 interactive vivas.

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.

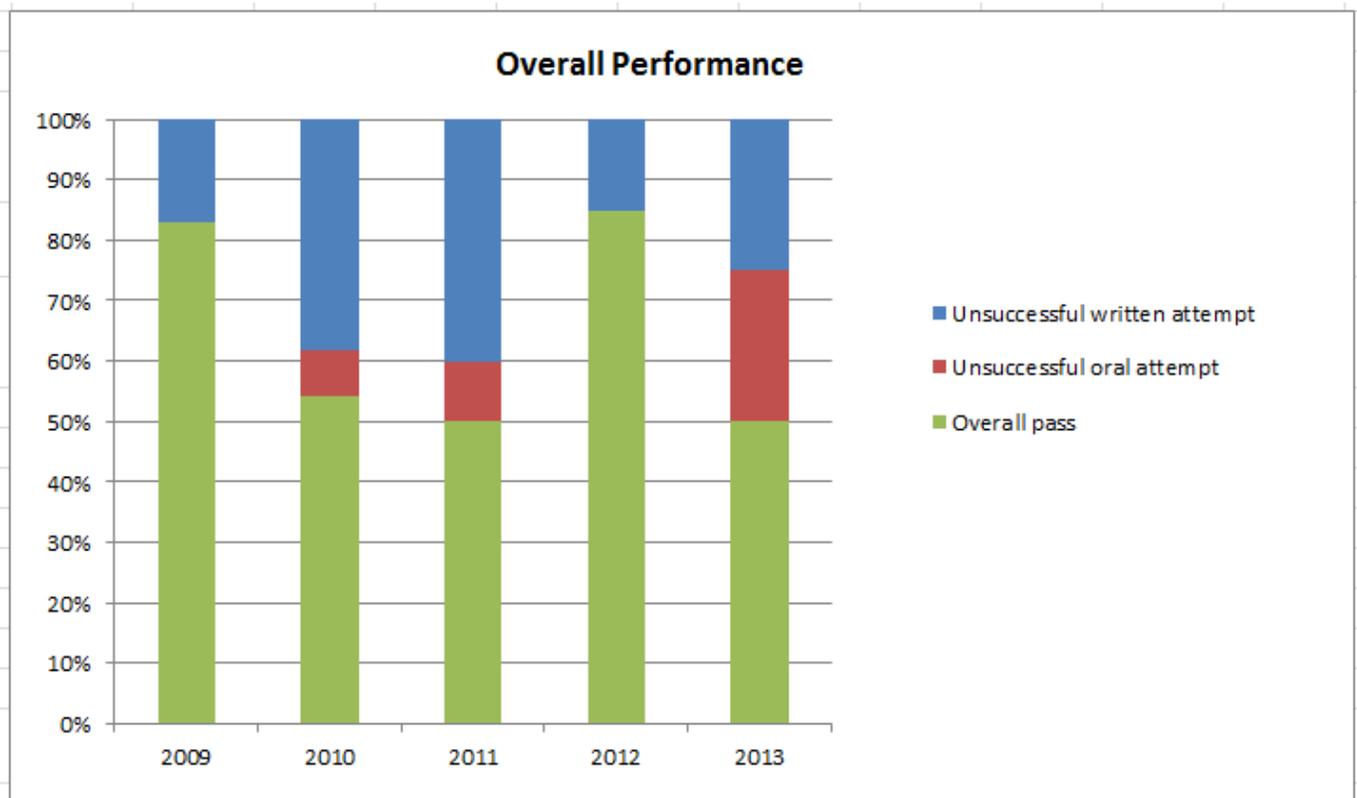
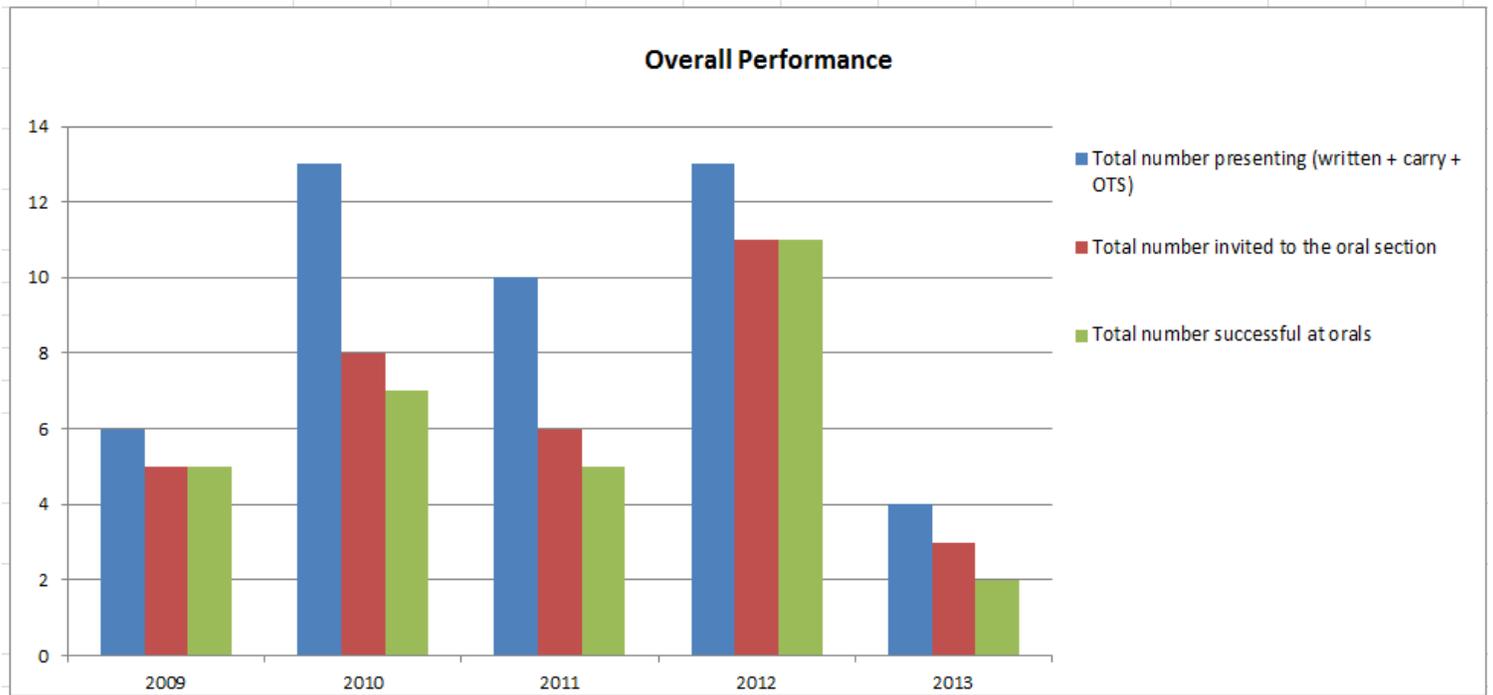
The Written section of the Examination was held in Brisbane and Sydney. The Clinical and Viva sections of the examination were held in Sydney at the Children's Hospital at Westmead.

STATISTICAL REPORT

Overall Pass Rates	2009	2010	2011	2012	2013
Total number presenting (written + carry + OTS)	6	13	10	13	4
Total number invited to the oral section	5	8	6	11	3
Total number successful at orals	5	7	5	11	2
	100%	88%	83%	100%	67%
Overall pass rate	5/6	7/13	5/10	11/13	2/4
	83%	54%	50%	85%	50%

Clinical Pass Rates	2010		2011		2012		2013	
	Pass rate	Highest individual mark						
Hot Case 1	75%	77%	83%	90%	100%	83%	67%	63%
Hot Case 2	75%	87%	50%	67%	100%	87%	67%	67%
Total number successful in the Hot Case section	6/8		5/6		11/11		2/3	
Overall Hot Case pass rate	75%		83%		100%		67%	

Vivas Pass Rates	2010		2011		2012		2013	
	Pass rate	Highest individual mark						
Viva 1	63%	90%	83%	75%	100%	90%	67%	63%
Viva 2 – Procedure Station	88%	90%	100%	68%	82%	80%	100%	70%
Viva 3	63%	75%	100%	95%	82%	80%	33%	70%
Viva 4 – Radiology Station	88%	90%	33%	65%	100%	90%	67%	85%
Viva 5	100%	90%	33%	88%	82%	100%	100%	85%
Viva 6	100%	100%	67%	72%	91%	90%	33%	68%
Viva 7 – Communication Station	88%	100%	17%	50%	100%	90%	33%	80%
Viva 8	100%	90%	33%	80%	64%	63%	67%	53%
Total number successful in the Viva section	8/8		5/6		11/11		2/3	
Overall Viva pass rate	100%		83%		100%		67%	



EXAMINERS' COMMENTS

Written Paper

Seven of the 30 short answer questions had a pass rate of less than 50%. Topics covered in these questions included insulin overdose, the use of neuromuscular blockade, management of hyponatraemia, ECG interpretation, recognition and management of microangiopathic haemolytic anaemia, sources of bias in clinical studies and mechanisms and management of tetanus.

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 as 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.

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.

Three of the 8 vivas had a pass rate of less than 50%. Examiners commented that the general viva questions revealed significant knowledge gaps in several candidates. Performance in the communication station was generally poor and candidates are reminded that this viva is one that requires practice and a structured approach.

WRITTEN EXAMINATION REPORT

Note

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 your 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 3 month old girl with known Trisomy 21 and an atrioventricular septal defect is admitted to your PICU from the emergency department. She has had increasing difficulty feeding and rapid breathing over the last week. There is no history of fever or coryzal symptoms and other family members are well.

On examination she is afebrile, pale, tachypnoeic and grunting. She has prolonged capillary refill, a systolic murmur and hepatomegaly.

A full blood examination is normal apart from haemoglobin 85g/L (normal 95 – 125). Urea, creatinine, electrolytes, capillary acid base and liver function tests are all normal.

A chest X-ray demonstrates an enlarged heart with plethoric lung fields. Echocardiography reveals reduced systolic ventricular function, moderate left AV valve regurgitation and an estimated pulmonary artery pressure $\frac{3}{4}$ systemic.

Outline your approach to the ICU management of this infant's cardiac failure.

Comments

50% of candidates passed this question.

This is a basic question about management of cardiac failure in an infant with a left to right shunt. An ideal answer required a comprehensive approach to provision of respiratory support, fluid and electrolyte management, drug therapy, transfusion and timing of surgery. Candidates who did poorly omitted major aspects of management.

References

South and Isaacs *Practical Paediatrics* 7th Edition.

Barry and Morris *Paediatric Intensive Care Oxford Specialist Handbooks in Paediatrics*.

Nichols et al Chapter 67 A and B in *Rogers Textbook of Paediatric Intensive Care* 4th Edition.

Question 2

A 4 week old term baby presents to the Emergency Department with apnoea and desaturation. The entire family has had a prolonged coughing illness. A nasopharyngeal aspirate is positive for *Bordetella pertussis* on PCR testing.

- a) Outline your initial management of this patient.
- b) What are the useful prognostic indicators in this disease?
- c) Critically evaluate the role of leucoreduction in this condition.

Comments

75% of candidates passed this question.

This is a common problem and as expected most candidates answered the management aspects well. In general, there was a lack of clarity regarding prognostic indicators. The marks available for discussion of leucoreduction were available to those who were aware of the limited literature in this area.

References

Berger JT et al PCCM 2013 14(4) 356-365.

Question 3

You are the on-service PICU consultant when a Code Brown (External Emergency) is announced. You are informed by your hospital executive that two bombs have exploded at a nearby Primary School. There are reports of up to 50 casualties, 20 of them "critical". Five ventilated patients are in transit to your hospital and more will follow.

Outline your approach to immediate management and planning for the next 24 hours.

Comments

75% of candidates passed this question.

All tertiary hospitals are expected to have detailed plans for these emergencies and to run mock exercises regularly. ICU plays an important role during such events. Candidates were expected to be able to describe an approach to communication, increasing PICU capacity, mobilisation of human and material resources in PICU and associated areas and to identify potential problems within the hospital that would impact on the ability to cope. Most answers were adequate, but not comprehensive enough to score highly.

References

Rogers Textbook of Pediatric Intensive Care 4th Edition:Ch 30.

Crit Care Med 2011; 39 (11): 2534-9.

Intensive Care Med 2010; 36 (1 Supplement) Recommendations and standard operating procedures for intensive care unit and hospital preparations for an influenza epidemic or mass disaster.

Question 4

An eight-year-old boy has been admitted after being struck by car travelling at 50km/hr. Glasgow coma score was 5/15 at the scene and 3/15 in the Emergency Department. The initial cerebral CT scan reveals a right-sided acute subdural haematoma and diffuse cerebral swelling. The CT chest and abdomen reveals an extensive right-sided pulmonary contusion and hepatic contusion He is admitted to your ICU from the operating theatre following evacuation of intracranial haematoma and placement of a Codman pressure monitor.

The patient is intubated and on SIMV with a mean airway pressure of 14mmHg and FiO₂ 0.55. Heart rate is 109 beats per minute and blood pressure is 86/43, mean 57 mmHg. The intracranial pressure is 18 mmHg. He is receiving morphine by infusion at 30 micrograms/kg/hour. Blood tests are shown below.

Arterial blood gas:

Parameter	Value	Reference Range
pH	7.29*	7.35 – 7.45
PaCO ₂	52 mmHg (6.8 kPa)*	35 – 45 mmHg (4.6 – 6 kPa)
PaO ₂	67 mmHg (8.8 kPa)*	80 – 105mmHg (10.5 – 13.8 kPa)
O ₂ Saturation	92%*	
Bicarbonate	26 mmol/L	20 – 26
Lactate	2 mmol/L*	1 – 1.8

Coagulation:

Parameter	Value	Reference Range
INR	1.6*	0.8 – 1.2
APTT	55 seconds*	27 – 45
Fibrinogen	3.6 g/L	1.5 – 4.3

Briefly outline your approach to management over the next 24 hours.

In table form, compare the benefits and risks of the following ‘Tier 2’ therapies for intracranial hypertension: high-dose barbiturate coma, decompressive craniectomy and induced hypothermia.

Comments

100% of candidates passed this question.

This is a basic question about management of traumatic brain injury, where further marks were available for consideration of the implications of pulmonary and liver contusions on management. In general, this question was answered well.

References

Ped Crit Care Med 2012; 13 (supplement 1).

Question 5

A 13 year old girl is admitted to your PICU 4 hours following a deliberate self-injection of 500 units of Novorapid (short acting) insulin. She has an implanted insulin pump providing 14 units per day (12 units bolus and 2 units basal each 24 hours). She has had three previous admissions for insulin overdose and is known to Adolescent Psychiatry. She lives at home with her mother and 18 year old brother. Her parents are separated. Her blood sugar level on arrival is 1.6 mmol/L. She is alert and co-operative.

Discuss your management.

Comments

25% of candidates passed this question.

This question required an answer that addressed management of insulin overdose in detail, along with a general response to adolescent deliberate overdose. A discussion of investigation, monitoring and potential complications was expected. Many of the answers to this question were superficial, lacked detail and omitted major parts of management.

Question 6

A 20kg 12 year old boy is being considered for scoliosis surgery. You are asked to talk to his family from a PICU perspective about the pros and cons of such a procedure. His chest X-ray is shown below:

- a) Outline what further information you require to hold this discussion.
- b) Outline the issues to discuss, with emphasis on likely clinical course/risks involved.
- c) What outcomes from this discussion would make you happy to advise the family to proceed?

Comments

50% of candidates passed this question.

This question required understanding of the potential risks and benefits of scoliosis surgery in an undergrown child with severe deformity and lung disease. Candidates were also expected to describe a clear approach to communication with the family. Poor responses were lacking in detail and did not adequately describe the risks involved.

Question 7

A 1 week old baby presents with shock. He was born at term after an uneventful antenatal course and was discharged home on day 2 with no concerns. The day prior to presentation he had been grizzly and feeding poorly.

Examination findings are:

Heart rate 170 beats per minute, regular
BP 58/32 mmHg
Respiratory rate 56 breaths per minute
Temperature 36.7°C
SpO₂ 98%
Pale
Capillary refill 4 seconds
Increased work of breathing
Thready peripheral pulses with absent femoral pulses

Initial blood results are shown below:

Parameter	Value	Normal range
Hb	178 g/L	125 – 205
WBC	13.3 x 10 ⁹ /L	5 – 19.5
Plts	237 x 10 ⁹ /L	150 – 400
Urea	7.2 mmol/L*	1.3 – 5.7
Creat	98 micromol/L*	10 – 30
Lactate	4.8 mmol/L*	1 – 1.8

Chest X-ray shows cardiomegaly and pulmonary plethora.

Cardiac echo reveals a type B interrupted aortic arch.

- a) Briefly list your immediate management priorities.
- b) What are the important non-cardiac associations with this lesion?
- c) How might these affect PICU management?
- d) What factors influence the timing of corrective cardiac surgery?
- e) How would you provide nutrition for this infant?
- f) List the classification of interrupted aortic arch.

Comments

50% of candidates passed this question.

This question addressed the management of a newborn with interrupted aortic arch, with specific detail required about 22q deletion and clinical manifestations. Candidates who failed provided insufficient information about 22q deletion, but there was also a poor understanding of the cardiac lesion and its management.

References

Pediatric Cardiac Intensive Care Ed. Chang et al, 1998.
Medicine 2011; 90 (1):1-18.

Question 8

A 3 month old girl is admitted to PICU from the Emergency Department after presenting with a decreased level of consciousness. She was born at 30 weeks gestation and spent 8 weeks in NICU due to low birth weight where she required CPAP for 3 weeks.

Cranial USS and neurologic examination were normal at discharge.

The history from the mother is that the baby rolled off a change table and landed on the floor.

On Examination:

Heart rate 165 beats per minute
BP 75/37 mmHg
Respiratory rate 32 breaths per minute
Temperature 36.7°C
Modified Glasgow Coma Scale 12 (V 3, E 4, M 5)

There is boggy scalp swelling posteriorly and bruising around the neck and face.

The Emergency Department physician suspects non-accidental injury but has not mentioned this to the mother.

- a) Outline your immediate medical management.
- b) What investigations/further management are required specific to the suspected non-accidental injury?

Comments

100% of candidates passed this question.

This straightforward question covered head injury in an infant and the management of suspected non-accidental injury. It was well answered by all candidates.

Question 9

A 12 year old girl is transferred to PICU from the oncology ward with increasing respiratory failure. She was initially diagnosed with high risk acute lymphoblastic leukaemia 2 years ago. She relapsed after 18 months of chemotherapy and underwent a matched unrelated bone marrow transplant two weeks ago. She has not yet shown signs of engraftment and has been dependent on platelet and red blood cell transfusions.

Two days ago she developed a fever and was commenced on broad spectrum antibiotics. She has developed increased work of breathing and an oxygen requirement over the past 24 hours.

Her observations on admission to PICU are:

Heart rate 125 beats per minute
Respiratory rate 37 breaths per minute
BP 95/52 mmHg
Temperature 38.2°C
SpO₂ 92% on oxygen 6L/min via facemask

Her latest lab results are:

Parameter	Value	Normal Range
Haemoglobin	87*	115 – 155 g/L
Platelets	34*	150 – 400 x 10 ⁹ /L
WBC	0.4*	4 – 11 x 10 ⁹ /L
pH	7.27*	7.35 – 7.45
PaCO ₂	54mmHg (7.1kPa)*	35-45mmHg (4.6-6 kPa)
PaO ₂	65mmHg (8.5kPa)*	80 – 105mmHg (10.5 – 13.8kPa)

- List potential non-infectious causes of this girl's respiratory failure.
- List further investigations you might perform to confirm a non-infectious diagnosis.
- Outline a treatment plan for her respiratory failure.

Comments

50% of candidates passed this question.

The question addressed non-infectious causes of respiratory failure in a complex, immunocompromised patient. An ideal answer required a structured and organised approach to investigation and management. Unfortunately some candidates spent unrewarding time discussing infectious causes, despite the clearly stated focus of the question. Answers were too narrow in approach without a structured approach.

Question 10

- Critically evaluate the use of neuromuscular paralyzing agents in PICU.
- In table form compare and contrast the pharmacological properties of rocuronium, cisatracurium and succinyl choline.

Comments

0% of candidates passed this question.

Candidates were expected to display clinical perspective about the pros and cons of neuromuscular blocking agents in PICU as well as the factual knowledge to use these drugs appropriately and safely. Disadvantages and complications of NMB use were not addressed and there was a disappointing lack of factual knowledge displayed about the specific drugs in part b.

Reference

Crit Care Med 2013; 41(5): 1332-44.

Question 11

A 12 year old girl is readmitted to PICU emergently 7 days post liver transplant, following a prolonged tonic clonic seizure. Prior to the seizure her initial postoperative course was uncomplicated, her liver function laboratory tests were improving, her nutrition was enteral, and she had been mobilising. Her recorded vital signs in the previous 24 hours have been normal apart from a temperature of 37.7°C and several BP measurements where the systolic BP was > 130 mmHg. She has not had seizures in the past.

Her current medications are tacrolimus, prednisolone, azathioprine, frusemide, esomeprazole, valganciclovir (prophylaxis dosing), captopril and nifedipine.

In table form list the relevant possible causes of the seizure, the reason that this child is at risk for that cause and investigation findings which will confirm that cause.

Below is an example of how to set out your answer.

Cause	Why at risk?	Investigation
Hypoglycaemia	Deterioration in liver graft function due to complication	Low BSL on bedside glucose test, ABG or formal lab test

Comments

75% of candidates passed this question.

This question required candidates to think widely and rationally about the potential causes for seizures in a complex patient and to provide some details about investigation. The question was generally well answered, with marks generally being lost for not considering a sufficient number of potential causes.

Question 12

A normal time-based capnogram trace in a mechanically ventilated patient is shown below:

- Clearly label inspiration and expiration on the x axis.
- Describe what is happening in phases I, II and III of the trace.
- What is indicated by the arrow?
- What changes to the capnogram are likely to be seen in a ventilated patient with bronchospasm?
- Where do cardiac oscillations typically appear on the capnogram? Why at this point?
- How does intracardiac right to left shunting affect the end tidal to arterial CO₂ difference?

Comments

100% of candidates passed this question.

A basic question designed to show understanding of the capnogram and its interpretation in PICU. This question was answered well.

Reference

British Journal of Anaesthesia 2001; 86 (3): 349-353.

Question 13

- a) Describe the physiological and metabolic derangements in that occur following brain death.
- b) Outline management of these derangements in the potential organ donor.

Comments

75% of candidates passed this question.

This is a straightforward question that most candidates answered well. However some marks were lost for lack of detail in the discussion of management of the potential organ donor.

Reference

The ANZICS Statement on Death and Organ Donation Edition 3.2, 2013; pp44-46.

Question 14

In table form, compare and contrast milrinone, levosimendan and dobutamine for treatment of cardiac failure associated with idiopathic dilated cardiomyopathy.

Comments

75% of candidates passed this question.

Candidates were expected to display a combination of theoretical and clinical knowledge about these commonly used heart failure treatments. Parameters such as mechanism of action, dose, half-life and adverse effects were required. Although this question was generally answered adequately, few candidates scored highly due to lack of sufficient detail.

Question 15

You are called to see a 5 year old boy on the oncology ward because of altered consciousness. He had been admitted the previous evening for prehydration in preparation for chemotherapy, including cyclophosphamide. He has been receiving intravenous 5% dextrose 0.45% NaCl at a rate of 200 mL/hour for 12 hours. His Glasgow Coma Scale score is 3, his pupils are normal, his respiratory rate is 10 breaths per minute, his SpO₂ in oxygen is 100%, his heart rate is 55 beats per minute, blood pressure 140/85 mmHg and his temperature is 36.0°C. As you arrive, the oncology fellow tells you that his plasma sodium is 123 mmol/L.

- a) Outline your immediate management plan.
- b) Outline the pathophysiology behind the problem and your suggested interventions.

Comments

25% of candidates passed this question.

This was partly a simple clinical question about management of a patient with hyponatraemia. However candidates were asked to display more detailed knowledge of the pathophysiology of sodium haemostasis and the consequences of hyponatraemia, along with how treatments such as hypertonic saline exert their effects. The question was answered poorly. Management plans were generally too narrow or lacked detail and discussion of the pathophysiology was superficial.

Question 16

A 2 month old boy is admitted to ICU following an uncomplicated repair of a complete AVSD. After 6 hours he has good gas exchange, is adequately sedated with morphine at 40mcg/kg/hour and is on 7mcg/kg/minute of dobutamine.

Temperature 37.1 C
CVP 9 mmHg
BP 64/33, mean 44 mmHg
Mixed venous saturation 65%
Lactate 3.1mmol/L

An atrial ECG is done because of tachycardia:

- a) What does the atrial ECG show?
- b) List three (3) differential diagnoses (different rhythms).

Blood pressure has fallen in the last 30 minutes and the nurse has noted a change in rhythm on the monitor. Another atrial ECG is performed:

- c) What rhythm is demonstrated now?
- d) What mode of pacing will you use? Justify your answer.

Comments

0% of candidates passed this question.

A series of post-operative atrial ECGs showing first and second degree heart block was provided for interpretation. Candidates failed to recognise these correctly and offer plausible differential diagnoses. Candidates were keen to diagnose JET and discuss its management.

Question 17

- a) Describe the clinical and laboratory features of the propofol infusion syndrome (PRIS).
- b) What are the risk factors for development of PRIS?
- c) Describe how Propofol might be used in PICU whilst minimising the risk of PRIS.

Comments

75% of candidates passed this question.

Candidates were expected to display detailed knowledge of PRIS and make rational and justifiable recommendations for use in PICU. Most candidates answered these parts reasonably well, but knowledge of risk factors was poor.

References

Minerva Anesthesiol 2009; 75: 339-44.

Pediatric Critical Care, Fuhrmann & Zimmerman p1670-1672.

Contin Educ Anaesth Crit Care Pain 2013 doi: 10.1093/bjaceaccp/mkt007 Propofol Infusion Syndrome, Loh NHW & Nair P.

Question 18

A 14 year old girl is brought to the emergency department. She has been vaguely unwell for the last 24 hours with mild abdominal pain and nausea, but has developed headache, blurred vision and confusion over the last few hours. She has no past medical history of note and has been well until the onset of this illness.

On examination she has a temperature of 38.5°C and no rash. She is drowsy with a Glasgow Coma Scale score of 9 and is protecting her airway adequately.

Heart rate 100 beats per minute

Blood pressure 120/75 (mean 90) mmHg

Respiratory rate 12 breaths per minute, chest clear to auscultation.

Abdomen soft and non-tender. No organomegaly.

No focal neurologic deficit. No papilloedema.

Initial laboratory results are shown below:

Parameter	Value	Normal Range
Chloride	107 mmol/L	98 – 110
Na+	138 mmol/L	135 – 145
K+	4.9 mmol/L	3.5 – 5
Glucose	5.3 mmol/L	3.6 – 5.4
Lactate	1.6 mmol/L	1.0 – 1.8
Urea	12 mmol/L*	2.1 – 6.5 mmol/L
Creatinine	136 µmol/L*	30 – 80 µmol/L
Albumin	38g/L	33 – 47 g/L
ALT	26 IU/L	10 – 30 IU/L
ALP	123 IU/L	100 – 350 IU/L
GGT	29 IU/L	0 – 40 IU/L
Unconj Bilirubin	59 µmol/L*	0 – 10 µmol/L

Haemoglobin	81g/L*	115 – 155
MCV	75 fL*	77-95
Platelets	31 X10 ⁹ /L*	150-400
WCC	15.1 X10 ⁹ /L*	4.5-13.5
Neutrophils	7.6 X10 ⁹ /L	1.5-8
Film comment	Numerous fragmented red cells seen No band forms No blasts	

- What is the likely diagnosis? Give reasons for your answer.
- What is the underlying mechanism of the haematologic abnormality?
- What further laboratory tests will you perform?
- What is the definitive treatment for this disease?

Comments

25% of candidates passed this question.

The question describes a teenage girl with a microangiopathic, haemolytic anaemia and thrombocytopenia and predominantly neurologic symptoms. Candidates were expected to recognise that this was likely to be TTP, rather than straightforward HUS, and could only score highly if they did so.

References

Current Opinion in Pediatrics 2013; 25 (2): 216-224.
Chapter 98 in *Pediatric Critical Care* 4th Edition, Eds Fuhrman & Zimmerman.

Question 19

An 11 year old boy weighing 40kg suffered 60% burns to his face, arms, and trunk after throwing accelerant onto a campfire. He did not lose consciousness and his GCS at hospital presentation was 15. On day 4 in PICU he remains intubated and ventilated, requiring PEEP of 10 cm H₂O and FiO₂ 0.5 for lungs affected by inhalational injury and fluid overload. He has had all burns debrided and the first of 4 planned grafting operations. He is tolerating enteral feeds.

His current analgesia and sedation therapy is:

Morphine 60 micrograms / kilogram / hour
Midazolam 120 micrograms / kilogram / hour
Ketamine 4 micrograms / kilogram / minute.

He has episodes of marked agitation when he appears to wake suddenly, with open eyes, dilated pupils, appears frightened and thrashes around in the bed. The bedside nurse thinks he is in pain.

Outline ten (10) priority interventions including pharmacological and non-pharmacological to improve this boy's comfort. For each management justify your suggestion.

Below is an example of how to set out your answer:

Suggestion	Justification
E.g.: Change from morphine infusion to fentanyl infusion	Opioid rotation may be efficacious due to differential opioid receptor affinities

Comments

100% of candidates passed this question.

This question asked candidates to think broadly about the problems of ongoing sedation and analgesia in a patient with severe burns. The question was generally answered well, although discussion of non-pharmacological interventions was notably poor, and few candidates mentioned pain and sedation scoring.

Question 20

In list or table form, classify and list the causes of lactic acidosis.

Comments

50% of candidates passed this question.

This basic knowledge question could be answered using a recognised classification (Cohen and Woods) or a rational alternative. Candidates offering poorly-structured answers found it difficult to produce a comprehensive list of causes and did not score well.

Reference

Oh's Intensive Care Medicine, 6th Edition. Ch 15 pp145-151.

Question 21

A 16 year old boy is admitted after taking 33g of paracetamol, 20g of carbamazepine, 20mg of warfarin, 10 mg of temazepam and 5g of enteric coated valproate. The time of ingestion was approximately 8 to 12 hours before presentation. A suicide note was found at the scene. In the Emergency Department he has a Glasgow Coma Scale score of 3 and a temperature of 35°C. Kussmaul respirations are observed at 16 breaths per minute and he is tolerating an oropharyngeal airway. SpO₂ is 100% in high flow oxygen. Blood pressure is 110/55 mmHg and heart rate is 85 beats per minute.

His ECG is normal and INR is 1.5.

Serum drug levels are shown below:

Drug	Level	Therapeutic level
Paracetamol	1017 micromol/L	
Carbamazepine	260 micromol/L	20 – 50
Valproate	1153 micromol/L	300 – 600

Outline your management plan, prioritized according to the above information.

Comments

50% of candidates passed this question.

Candidates were asked to prioritize their management according to the clinical state of the patient and the expected consequences of the individual drug ingestions. Candidates who scored poorly failed to do this, offering a poorly-structured answer or an undifferentiated list of interventions.

Reference

Oh's Intensive Care Medicine, 7th Edition. Ch 112 pp1148-1157.

Question 22

Your PICU receives an emergency phone call from a rural hospital emergency department requesting retrieval of a 3 year old boy with respiratory distress. His temperature is 37.9°C, heart rate is 180 beats per minute and respiratory rate is 50 breaths per minute. He has soft stridor with marked sternal retraction, and is maintaining himself in an upright sitting position on his mother's lap, refusing to be placed on the examination bed. His oxygen saturations are 91% in room air, and he is distressed by attempts to administer mask oxygen. His mother cannot provide any further history. The doctor wonders if the chest X-ray shows a widened upper mediastinum. The hospital is located 300 km away from your hospital.

Your PICU colleague is providing immediate emergency advice via telemedicine. You are responsible for decision-making regarding tasking the retrieval team and transport vehicle to retrieve this child.

List the factors that you need to consider in this decision.

Comments

75% of candidates passed this question.

Candidates were expected to consider all aspects of this referral and retrieval: patient, local hospital environment, transport logistics, team composition and communication. Although most candidates passed, few considered the question this widely, with some limiting their answer to patient management.

Question 23

A randomised, controlled trial of early parenteral nutrition (begun within 24 hours of admission) in ventilated PICU patients with severe burns was conducted. Patients were randomly allocated using sealed envelopes in blocks of four. The primary outcome was severe sepsis defined by the presence of markers of SIRS plus evidence of ventilator-associated pneumonia, blood stream infection, urinary tract infection or wound infection in the first 28 days.

Analyses were conducted by assigned group and per protocol. The primary outcome was the odds ratio for sepsis occurring by day 28 adjusted for the presence of smoke inhalation. A secondary outcome was any in-hospital infection requiring at least 5 days of antibiotics.

The results are summarised below:

Primary outcome:

Control group 32.4%

TPN group 27.2%

Adjusted odds ratio 1.28

95% confidence interval 1.00 – 1.64

$p = 0.05$

Secondary outcome (per protocol analysis):

Control group 37.2%

TPN group 31%

$p = 0.02$

The authors concluded that early TPN was beneficial.

List the potential sources of bias in this study.

Comments

0% of candidates passed this question.

This is a question asking candidates to demonstrate their capacity to read studies critically. Candidates failed to come up with more than a few potential sources of bias. Expected

responses included potential problems with concealment of allocation, predictability of block randomisation, blinding, cointerventions, ascertainment, failure to analyse by intention to treat etc.

Reference

Practical Statistics for Medical Research, Altman DG. Ch15.

Question 24

A 5 year old unimmunised child is admitted to your PICU with a diagnosis of tetanus.

- Which organism causes tetanus and by what mechanism does it produce the clinical effects?
- List six (6) clinical signs of tetanus.
- How do you eliminate the toxin and ameliorate its effects?

Comments

25% of candidates passed this question.

This is a question about an uncommon condition in our region. Candidates were expected to know the basic mechanisms of disease, the clinical effects and an approach to treatment. Most candidates answered poorly and did not display even basic knowledge of the disease.

Reference

Anaesth 2001; 87: 477-87.

Question 25

A term infant is intubated at birth after normal delivery and has saturations of 50% on pressure control ventilation of 25/5, in a FiO_2 of 1.0. The initial chest X-ray is shown below:

- List four (4) abnormalities shown in this X-ray.
- What does the following arterial blood gas show?

Parameter	Value	Reference Range
pH	7.13*	
pCO ₂	70mmHg (9.3 kPa)*	35 – 45 mmHg (4.6 – 6 kPa)
pO ₂	30 mmHg (4.0 kPa)*	80 – 105mmHg (10.5 – 13.8 kPa)
O ₂ Saturation	60%*	
Bicarbonate	17 mmol/L*	
Anion Gap	11.3*	
Lactate	3.1 mmol/L*	1 – 1.8

- c) What is the most important urgent treatment needed for this child?
- d) List principles of ventilation which will be important in managing this child.
- e) What is the role of ECMO in this clinical setting?

Comments

75% of candidates passed this question.

This question expected candidates to identify X-Ray abnormalities and make a diagnosis of CDH with contralateral pneumothorax. The role of urgent decompression of a pneumothorax in the "good" lung followed by a period of "gentle ventilation" to minimise VLI and allow for resolution of the associated pulmonary hypertension was required. Many candidates handled these sections well. The difficulties of prognostication and what measures would be used to guide the decision to offer ECMO were handled superficially or omitted.

Question 26

A thirteen year old is admitted following a high speed car crash. The child was a back seat passenger wearing a lap seat belt. Selected abdominal CT scan images are shown below:

- a) List four (4) significant findings on the CT scan.
- b) What other injuries are associated with a lap belt injury?
- c) What are the indications for laparotomy?

Comments

75% of candidates passed this question.

This was a straightforward abdominal trauma question with significant CT scan abnormalities. The nature of the impact should have enabled candidates to describe associated injuries and structured answers scored well. The indications for laparotomy in this setting are clear and opportunities for marks were missed by some.

Reference

J Trauma. 1990; 30 (9):1133-8.

Question 27

An eight month old infant presents with refractory seizures. The following results are obtained:

Parameter	Value	Reference Range
pH	7.33	7.36 – 7.44
pCO ₂	38 mmHg (5.1 kPa)	35 – 45 mmHg (4.6 – 6.0 kPa)
Base Excess	- 5 mmol/L	- 5 to + 5
Bicarbonate	20 mmol/L	18 – 23
Sodium	134 mmol/L	134 – 148
Potassium	4.7 mmol/L	4.5 – 6.0
Calcium (ionised)	0.76 mmol/L*	1.10 – 1.45
Lactate	4.9 mmol/L*	0.5 – 2.2
Haemoglobin	147 g/L	100 – 180
Urea	8 mmol/L*	1 – 4
Creatinine	90 umol/L*	10 – 30
Phosphate	2.50 mmol/L	1.00 – 2.50
Magnesium	0.76 mol/L	0.70 – 1.00
Calcium	0.5 mmol/L*	2.1 – 2.8
Alkaline phosphatase	927 U/L*	80 – 350
Albumin	39 g/L	36 – 50
Vitamin D (25 Hydroxy)	< 10 mmol/L*	50 – 150
Chloride	110 mmol/L	90 – 114
Glucose	5.0 mmol/L	3.5 – 5.4

- Describe the abnormalities demonstrated in these results.
- What is the likely underlying diagnosis?
- List three (3) possible causes.
- What further investigations are required?
- How will you treat the metabolic abnormality?

Comments

50% of candidates passed this question.

This is a question about vitamin D deficiency causing hypocalcaemia and seizures. The opportunity to describe the obvious metabolic abnormalities and to list differential diagnoses and investigations enabled candidates to score easy marks. Superficial responses or failure to identify the low vitamin D as relevant to the hypocalcaemia were disappointing.

Reference

Rogers' textbook of Pediatric Intensive Care, 4th Edition. Ch 94.

Question 28

You are managing a 2 month old infant with suspected non-accidental injury. This includes significant intra-cerebral injury. The infant is intubated, ventilated and sedated with morphine and midazolam. There are regular tonic clonic movements associated with

tachycardia and hypertension. The infant has been loaded with intravenous phenobarbitone 30 mg/kg with minimal seizure reduction.

In table form compare and contrast the mechanism of action, adverse effect profile, effectiveness and safety of levetiracetam, topiramate and phenytoin in this situation.

Comments

50% of candidates passed this question.

Status epilepsy is core CICM curriculum. Candidates are expected to have a good knowledge of first and second line agents used to terminate seizures. Limitations in our current knowledge of how certain agents work is knowledge in itself. This "contrast" question limited the number of comparisons for the candidate. Despite this some candidates wasted time with detailed dosage and pharmacokinetic differences that scored no marks. Some answers were superficial and specific areas were omitted. Candidates are reminded to read the question carefully.

References

Seizures and Status Epilepticus in the ICU. *Seminars in Neurology* 2008; 28: 668-681.
Anticonvulsant medications in the pediatric emergency room and intensive care unit. *Pediatr Emerg Care* 2008; 24 (10):705-718.

Question 29

- a) Briefly outline an approach to Quality Improvement that is applicable to healthcare.
- b) Using this framework describe an intervention that would improve your ICU's hand hygiene compliance.
- c) List the five (5) moments of hand hygiene.

Comments

75% of candidates passed this question.

This question covers two important topics: the quality improvement cycle and hand hygiene. Candidates were expected to describe a quality improvement programme that covered gathering of information, planning, implementation, evaluation and acting on results. Although most candidates passed, this was not well done. Knowledge of the 5 moments of hand hygiene was particularly disappointing.

References

http://www.cicm.org.au/cms_files/IC-8_Quality_Improvement.pdf
Med J Aust 2009; 191(8): 420-421.

Question 30

A 15 month old boy presents with 2 weeks of earache, fever, vomiting and increasing lethargy four months after returning from a family visit to Vietnam. He has been given amoxicillin by his local doctor.

Observations are as follows:

Temperature 37 °C

Heart rate 94 beats per minute

Blood pressure 94/69 mmHg

Respiratory rate 36 breaths per minute

His Glasgow Coma Scale score is 9 (E 2, V 2, M 5)

An image from a CT brain scan is shown below:

His initial management was by neurosurgery. An external ventricular drain was inserted, with an opening pressure of > 30 cmH₂O. He was commenced on acyclovir and cefotaxime.

Results of CSF examination and a peripheral blood count are shown below:

Parameter	Result	Normal Range
CSF protein (g/L)	0.26	0.15 – 0.4
CSF glucose	3.2 mmol/L	2.2 – 5.5
CSF cell count	10 x10 ⁶ /L	0 – 4
	8% neutrophils 83% lymphocytes 8% monocytes	

Parameter	Result	Normal Range
Blood WBC	10.10 x10 ⁹ /L	6.0 – 12.0
Blood Neutrophils	6.77 x10 ⁹ /L	1.5 – 5.0

- List three (3) plausible infectious causes and identify the most likely one.
- List the additional information you would seek from the history.
- List the further investigations you would request.
- List the empirical treatment you would commence.
- List the potential complications.
- List the infection control measures needed (if any).

Comments

50% of candidates passed this question.

This question expected candidates to recognize that the patient was at risk of and had investigations consistent with TB meningitis. Some candidates answered this well, but

others did not score highly because of poor recognition of or lack of knowledge about the underlying disease.

Reference

Critical Care 2013; 17: 240.

ORAL SECTION

Clinical Section

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

Candidates who approach the clinical examination of the patient and presentation of findings in an organized manner will impress the examiners. 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 8 month old boy with a past history of prune belly syndrome and vesicostomy. Acute renal failure secondary to presumed abdominal sepsis. On CVVH. Fungaemia.
- A 4 month old boy with hypoplastic left heart syndrome. Multiple cardiac and non-cardiac complications. Post stage 1 surgery. Ventilator dependent.
- A 10 month old girl with trisomy 21. Still ventilated 2 weeks following repair of an AVSD. Complications including infection, lung disease, pulmonary hypertension.

Viva Section

There are eight stations of 10 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

You are asked to urgently review a 17 year-old boy with acute respiratory distress and desaturation to 86% despite 50 litres per minute high-flow oxygen. He has no intravenous access as he was about to be discharged to the ward.

He was admitted 6 weeks previously with severe influenza A pneumonia and his tracheostomy was removed 18 hours ago. He has autism.

His Chest X-ray is shown below.

What is your immediate management?

Viva 2 – Procedure Station

You are the PICU consultant and are about to insert a femoral venous line. The parents have given informed consent for the procedure; the child is stable, ventilated and adequately sedated with infusions of morphine at 40 mcg/kg/hr and midazolam at 40 cg/kg/hr.

With the assistance of a PICU nurse you will be expected to appropriately position the child for the procedure and prepare for line insertion up to the point of venepuncture.

Viva 3

A five-month old boy returns to the ICU following uncomplicated repair of Tetralogy of Fallot. Pre-operative saturations were in the high 80s with occasional cyanotic spells.

Repair was done using a transannular patch, requiring 130 minutes of CPB and 100 minutes of cross-clamp. There was no bleeding and the chest was closed.

On admission to ICU he is sedated and ventilated, is on milrinone 0.5 mcg/kg/min and noradrenaline 0.03mcg/kg/min.

The initial chest X-ray, arterial and venous blood gases are shown below.

Viva 4 – Radiology station

A 5-month old child is admitted with respiratory distress and a distended abdomen.

Respiratory rate 80 breaths per minute

Heart rate 180 beats per minute

Blood pressure 50/30 mmHg.

What abnormalities are evident on this admission chest X-ray and what action is required?

Viva 5

A previously well 3 year old boy presents with several weeks of increasing dyspnoea to your hospital's Emergency Department. The ED physician notes increased work of breathing and an expiratory wheeze, but the patient is well oxygenated. While having blood drawn he desaturates to the 60s but recovers with 30 seconds of bag mask ventilation in 100% oxygen.

The Chest X-ray below is obtained.

Please comment on the X-ray.

Viva 6

A 3 year old boy presents to your hospital's Emergency Department with a one day history of drowsiness and lethargy. In the Emergency Department he is noted to have a generalised tonic clonic seizure and decerebrate/extensor posturing.

The patient becomes apnoeic after two intravenous doses of midazolam (0.1mg/kg). He is intubated and taken for an emergency non-contrast cerebral CT scan. During transfer to the CT scan his pupils are noted to be fixed and dilated.

Describe the important features shown on these CT images.

Viva 7 – Communication Station

A 30 day old girl with seizures is admitted as an emergency to PICU. A lumbar puncture has just been performed and is positive for Herpes simplex on PCR. She has been on the ward for the last 3 days and was thought to have bronchiolitis. Her parents have been worried about funny movements of her arms and legs but staff had not been concerned.

MRI of the brain has just been done which shows widespread abnormalities with restricted diffusion.

You have arranged to meet the parents to discuss the MRI.

Just before you walk in the bedside nurse tells you that the parents are really angry that nobody listened to them about the fitting movements.

Viva 8

A 15 year old boy with relapsed AML presents 10 days after induction chemotherapy with worsening respiratory distress over 24 hours. He is receiving 15 litres per minute of oxygen via a non-rebreather mask.

He has also become confused over the past 24 hours.

His blood tests are shown below:

Parameter	Value	Reference Range
Haemoglobin	109*	125 – 170 g/L
White cell count	0.1*	4.5 – 13 x 10 ⁹ /L
Neutrophils	0.0*	1.8 – 8 x 10 ⁹ /L
Platelets	40*	150 – 400 x 10 ⁹ /l
CRP	395*	< 10 mg/L
Sodium	138	134 – 146 mmol/L
Potassium	4.5	3.4 – 5.0 mmol/L
Chloride	107	98 – 108 mmol/L
Bicarbonate	21*	22 – 28 mmol/L
Urea	10.7*	3.0 – 8.0 mmol/L
Creatinine	177*	< 75 micromol/L
pH	7.35	7.35 – 7.45
PaO ₂	60 mmHg (7.9 kPa)	85 – 110 mmHg (10 – 15 kPa)
PaCO ₂	33 mmHg (4.3 kPa)*	29 – 45 mmHg (4.5 – 6.0 kPa)
Base excess	- 7*	- 3 to + 3
Lactate	3.0*	< 1.3 mmol/L

Given the information, above outline potential factors contributing to his respiratory distress.

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