COLLEGE OF INTENSIVE CARE MEDICINE
OF AUSTRALIA AND NEW ZEALAND

SECOND PART PAEDIATRIC EXAMINATION

EXAM REPORT

AUGUST / NOVEMBER 2023

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 written section of the Examination was held in Auckland, Brisbane, Melbourne, and Sydney. The Examination included two 2.5 hour written papers, each composed of 15 ten-minute short answer questions. The pass mark for the written section is derived by the Angoff method and for this sitting was set at **50%.** The clinical section of the examination was held in Sydney, Australia at Children's Hospital at Westmead and the vivas were held at Novotel Sydney Parramatta. The oral component comprised 8 interactive vivas and two clinical hot cases.

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

STATISTICAL REPORT

Overall pass rates	**2023**	**2022**	**2021**	**2020***	**2019**	**2018**
Total number presenting (written + carry + SIMG)	15	23	11	9	11	12
Total number invited to the oral section	15	16	9	5	4	10
Total number successful at orals	15	15	8	5	4	10
	100%	94%	89%	100%	100%	100%
Overall pass rate	15/15	15/23	8/11	5/9	4/11	10/12
	100%	**65%**	**72%**	**56%**	**36%**	**83%**

**Oral component postponed until 2021 due to COVID.*

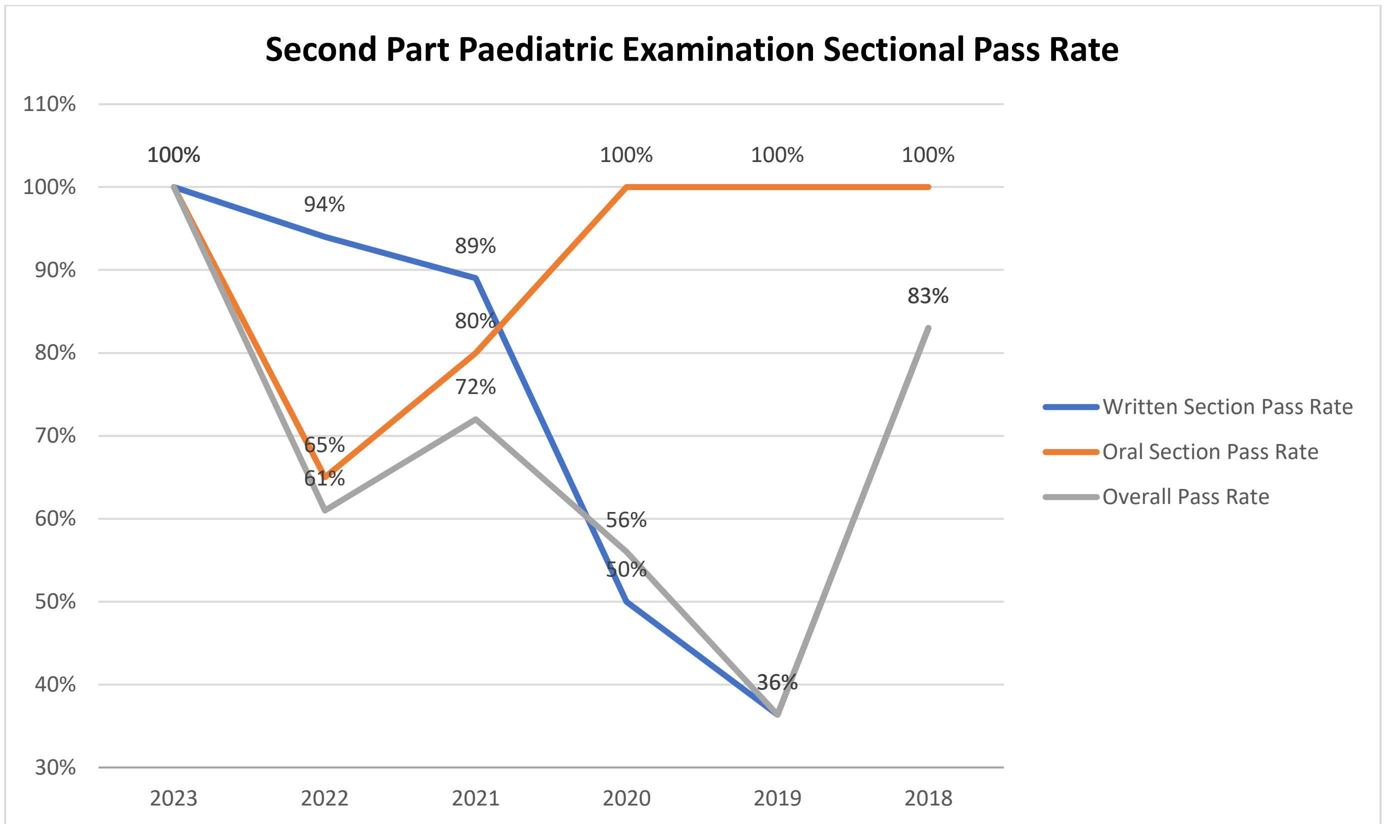
Clinical Pass Rates	**2023**		**2022**		**2021**		**2020***		**2019**		**2018**	
	Pass rate	Highest individual mark	Pass rate	Highest individual mark	Pass rate	Highest individual mark	Pass rate	Highest individual mark	Pass rate	Highest individual mark	Pass rate	Highest individual mark
Hot Case 1	73%	78%	85%	75%	89%	78%	60%	70%	75%	78%	50%	73%
Hot Case 2	87%	90%	88%	81%	67%	95%	60%	70%	50%	70%	70%	78%
Total number successful in the Hot Case section	14		14/16		6/9		3/5		3/4		6/10	
Overall Hot Case pass rate	93%		88%		67%		60%		75%		60%	

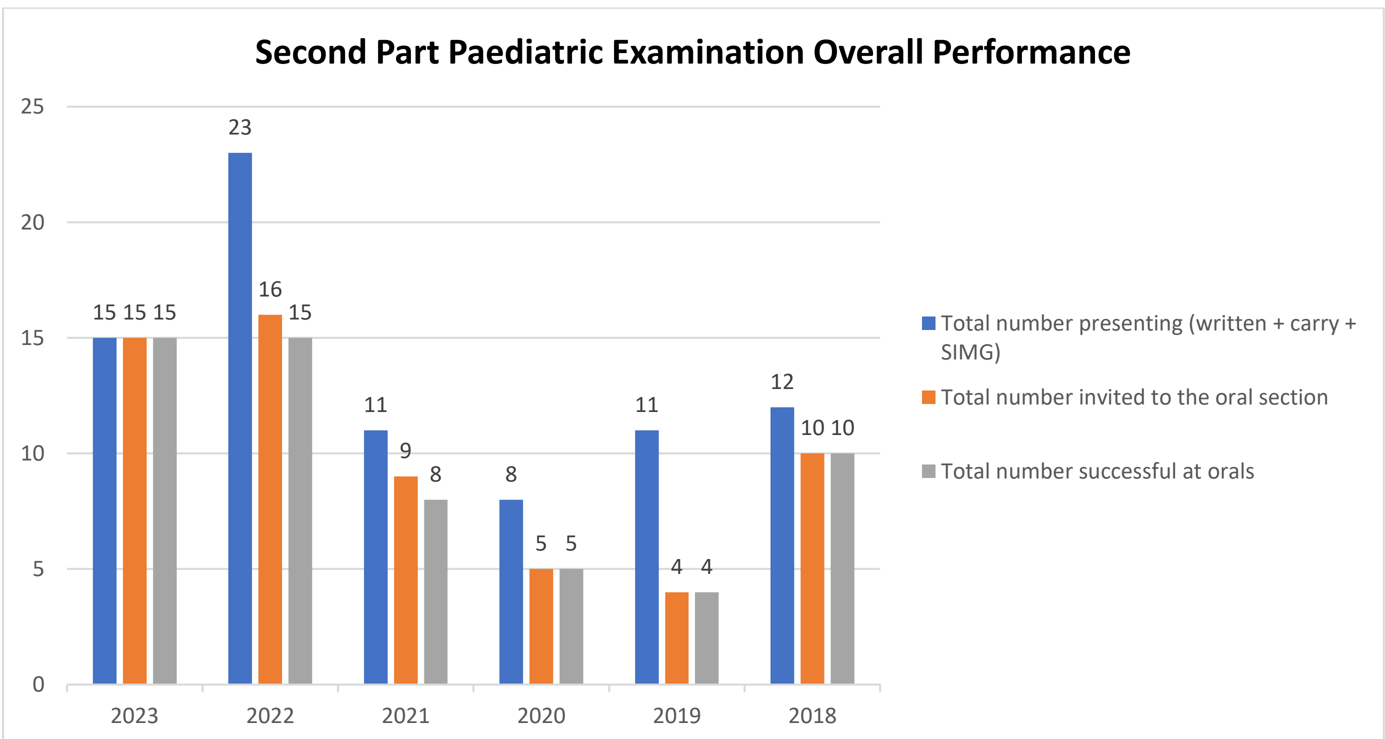
**Oral component postponed until 2021 due to COVID.*

Viva Pass Rates	**2023**		**2022**		**2021**		**2020***		**2019**		**2018**	
	Pass rate	Highest individual mark	Pass rate	Highest individual mark	Pass rate	Highest individual mark	Pass rate	Highest individual mark	Pass rate	Highest individual mark	Pass rate	Highest individual mark
Viva 1	53%	80%	88%	90%	88%	80%	100%	74%	25%	54%	70%	75%
Viva 2	47%	88%	88%	100%	45%	70%	100%	90%	50%	60%	70%	85%
Viva 3	60%	100%	56%	76%	45%	75%	100%	80%	75%	70%	60%	83%
Viva 4	73%	83%	100%	95%	100%	74%	100%	80%	100%	88%	80%	59%
Viva 5	80%	88%	88%	100%	88%	94%	60%	86%	75%	69%	80%	73%
Radiology Viva	73%	72%	44%	72%	67%	60%	80%	71%	100%	65%	100%	90%
Communication Viva	87%	100%	38%	68%	34%	56%	100%	73%	25%	58%	70%	75%
Procedure Viva	80%	83%	56%	85%	78%	70%	80%	60%	75%	88%	80%	83%
Total number successful in the Viva section	13/15		13/16		8/9		5/5		4/4		10/10	
Overall Viva pass rate	87%		81%		89%		100%		100%		100%	

**Oral component postponed until 2021 due to COVID.*

Overall Performance





EXAMINERS' COMMENTS

Written Paper

Four of the thirty short answer questions had a pass rate of less than 50%. Topics covered by these questions related to post-operative ECG interpretation, hypercalcaemia, use of magnesium and interpretation of clinical trial reporting.

The most common reasons for candidates to fail questions were:

- Insufficient knowledge of the topic
- Insufficient detail or incomplete answer
- Failure to answer the question asked
- Answer not at consultant level
- Lack of structure

Once again, candidates are reminded that it is crucially important to write legibly; examiners need to be able to read written answers.

Candidates are reminded to read the questions carefully and thoroughly, and to include in their answer only information that is relevant to the question. 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

Hot cases run for twenty minutes, with an additional two minutes at the start of each case for the candidate to read a written introduction. The written introduction is to allow candidates greater opportunity to plan a focused approach to the case.

The following comments are a guide to the expected standard for performance in the hot cases:

- Candidates should address and answer the question asked in the introduction.
- Candidates should interpret and synthesise information, rather than just describing the clinical findings.
- Candidates need to seek information relevant to the case in question.
- Candidates should be able to provide a sensible differential diagnosis and appropriate management plan. A definitive diagnosis is not always expected, and in some cases, may yet to be determined.
- Candidates should not rely on a template answer or key phrases but answer questions in the specific context of the case in question.
- Candidates must be able to describe, with justification, their own practice for specific management issues.

Candidates who performed well in the hot cases were able to demonstrate the following:

- A professional approach, showing respect and consideration for the patient and family.
- Competent, efficient and structured examination technique and an ability to appropriately adapt the examination to suit the case.
- Pursuit of information relevant to the case.
- An ability to interpret and synthesise their findings appropriately.
- Presentation of conclusions in a concise, targeted and systematic fashion.
- Listing of a differential diagnosis that is relevant to the clinical case.
- Discussion of management issues in a mature fashion, displaying confident and competent decision-making.
- Overall performance at the expected level (competent senior registrar / junior consultant).

Candidates who did not perform at the acceptable standard did so for the following reasons:

- Missing or misinterpreting key clinical signs on examination.
- Incomplete or poor technique for examination of a system.

- Poor synthesis of findings with limited differential diagnosis.
- Poor interpretation of imaging and data or omitting to request important tests.
- Inability to construct an appropriate management plan for the case in question.
- Limited time for discussion as a consequence of taking too long to present the clinical findings or to interpret basic data.
- Inability to convey the impression that he/she could safely take charge of the unit.
- Inability to maintain global overview and answering within a narrow focus.
- Failing to address the question asked.

Some candidates were able to elicit and describe the clinical signs and data but were unable to synthesise all the information and to formulate an appropriate management plan.

The overall pass rate was improved on 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 Second Part Paediatric 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. Professionalism, manner and empathy are also important components.

WRITTEN EXAMINATION 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. 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.

Notes

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

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

Question 1

A 5-year-old child is admitted to PICU with an acute febrile illness and chest pain and is found to have a large pericardial effusion on echocardiogram.

a) Describe the clinical and echocardiographic features typically found in pericardial tamponade.

(5 marks)

b) Outline how you would facilitate urgent pericardiocentesis and immediate post-procedural care of this patient.

(5 marks)

Maximum Score	9
Percentage Passed	93%

Examiners' comments:

Most candidates were well able to describe the clinical features of pericardial tamponade, but marks were lost for lack of knowledge of specific echocardiographic features. The second part of the question required candidates to describe a safe environment, team approach and practicalities of periprocedural care, rather than the simple mechanics of pericardial drainage.

Reference(s):

Oh's Intensive Care Manual, 8th Edition. Chapter 27, pp 351-2.

Question 2

A 4-month-old boy presents to your hospital after rolling off a bed and onto a carpeted floor. He was intubated by the paramedics for reduced level of consciousness (Glasgow Coma Score 8/15). On arrival he has a fixed and dilated right pupil and tonic-clonic movements involving the left arm.

A non-contrast CT brain is performed; a single axial image is shown below: *(Image removed)*

Outline your immediate and ongoing management over the next 48 hours.

Maximum Score	9.5
Percentage Passed	100%

Examiners' comments:

This was a straightforward question and was generally very well answered. Candidates were expected to cover acute resuscitation, seizure management, surgery, neuroprotection and ICP management in their answer, including responses to deterioration. Candidates could not pass without sufficient consideration of non-accidental injury in their answer.

Reference(s):

Guidelines for the Management of Severe Paediatric TBI, Third Edition 2019.*:*
https://braintrauma.org/coma/guidelines/pediatric

Question 3

a) Define ventilator-associated pneumonia (VAP).

(2 marks)

b) Discuss the following aspects of VAP: epidemiology, risk factors, prevention, and management.

(8 marks)

Maximum Score	7.5
Percentage Passed	79%

Examiners' comments:

Although most candidates could define VAP, knowledge of some aspects of the second part of the question was less comprehensive. Some candidates were unable to describe risk factors, and discussion of management was often limited to antibiotic therapy.

Reference(s):

Chang I, Schibler A. Ventilator associated pneumonia in children. Pediatr Respir Rev 2016; 20: 10-16.
Foglia M, et al. Ventilator-associated pneumonia in neonatal and pediatric intenisve care unit patients. Clin Microbiol Rev 2007; 20: 409-25

Question 4

A previously well 5-year-old girl has been intubated and ventilated in PICU for 15 days with pneumonia (Streptococcus pneumoniae and Influenza A).

She is receiving noradrenaline at 0.02 mcg/kg/minute and is on infusions of morphine and midazolam, but not treated with neuromuscular blockers. Although her lungs have improved, she still requires mechanical ventilation.

a) Outline your approach to early mobilization in this patient.

(8 marks)

b) List 8 exclusion criteria when selecting patients for early mobilization in PICU.

(2 marks)

Maximum Score	8
Percentage Passed	79%

Examiners' comments:

Early mobilization is a highly topical field in PICU. To score highly the candidate needed to describe a comprehensive approach, including aspects of nutrition, airway management, safety, MDT input and medications. Some candidates omitted the second part of the question and did not list exclusions – a lost opportunity to score marks.

Reference(s):

Thompson S et al. Barriers and enablers to the development and implementation of early mobility programs for children in the pediatric intensive care unit: a scoping review protocol. JBI Evid Synth. 2021 Jul 1;19(7):1735-1741. doi: 10.11124/JBIES-20-00142. PMID: 33851943.

Betters KA et al. Development and implementation of an early mobility program for mechanically ventilated pediatric patients. J Crit Care. 2017 Oct;41:303-308. doi: 10.1016/j.jcrc.2017.08.004. Epub 2017 Aug 9. PMID: 28821360.

Question 5

In table form, display the changes in the following laboratory parameters:

i. Activated Partial Thromboplastin Time
ii. International Normalised Ratio
iii. Fibrinogen
iv. D-dimer
v. Platelet count

Typically seen the following disorders:

i. Disseminated Intravascular Coagulation (DIC)
ii. Vitamin K deficiency or haemorrhagic disease of newborn
iii. Haemophilia A or B
iv. Snake envenomation (Venom-induced Consumption Coagulopathy)

Maximum Score	9.75
Percentage Passed	100%

Examiners' comments:

A very straightforward question testing candidates' knowledge of coagulation abnormalities in disease states. Well answered by all.

Question 6

The mixed cardiac/non-cardiac PICU where you have just started work has 16 beds in an open plan design. However, it is moving to a new building where it will be divided into 2 ‘pods’, each of 10 beds.

The pods will cohort patients based on diagnosis - one caring for cardiac patients and one caring for non-cardiac patients, each overseen by a dedicated intensivist during the day.

Outline the potential advantages and disadvantages of dividing the unit into 2 specialised ‘pods’.

Maximum Score	8.25
Percentage Passed	93%

Examiners’ comments:

This question required candidates to think critically about the consequences of a change in unit structure. Answers were generally very good, with broad-reaching and considered responses covering effects on staff, patients, workflow, education, finances and outcomes.

Question 7

A 6-month-old boy presents with an out of hospital cardiac arrest. He has had a recent viral illness with fever and diarrhoea. Today he had an episode of being irritable, went pale and became unresponsive. The paramedics found him pulseless in ventricular tachycardia, and delivered 2 shocks, obtaining return of circulation after 10 minutes. He was intubated at the scene and brought to the emergency department.

He is ventilated via an appropriately positioned and secured endotracheal tube, with Sp02 99% in FiO2 0.5. Blood pressure is 45/30 mmHg.

The ECG is shown below.

a) Describe the ECG. (2 marks)
b) List 5 potential causes of the arrest. (2 marks)
c) Outline your immediate management (over the next 2 hours). (6 marks)

ECG (Image removed)

Maximum Score	7
Percentage Passed	100%

Examiners’ comments:

Candidates were expected to provide a differential diagnosis for a broad complex rhythm and provide a management plan for this patient with a marginal circulation. Those that scored most highly were able to describe an approach to post-arrest care as well as contingencies for ongoing inadequate perfusion.

Question 8

a) Outline five (5) principles of gas exchange involved in high frequency oscillatory ventilation (HFOV).

(5 marks)

b) List the anticipated risks in initiating HFOV and how these can be mitigated

(5 marks)

Maximum Score	8.75
Percentage Passed	71%

Examiners' comments:

The first part of this question is basic knowledge that has been examined before. This was generally quite well done. However, some candidates were unable to describe the haemodynamic, respiratory and general consequences of initiation of HFOV and describe an anticipatory approach to their management.

Question 9

Outline the management of a child with suspected ischaemic stroke. Include in your answer potential causes, investigation, treatment, and ongoing care in PICU for the first 24 hours.

Maximum Score	8.5
Percentage Passed	93%

Examiners' comments:

Candidates should know about cerebrovascular disease in children and the emergent nature of multidisciplinary responses. Candidates were expected to identify these factors and the risks/benefits of various interventions. Better responses were able to maintain a broad differential and encapsulate the requirements above.

Reference(s):

Acute Ischaemic Stroke in Childhood: A comprehensive review. European Journal of Paediatrics (2022). 181: 45-58

Question 10

In table form, list the benefits and limitations of rewarming methods available in PICU for a child with hypothermia.

Maximum Score	8
Percentage Passed	50%

Examiners' comments:

Thermoregulation is core business in PICU. Mechanisms of warming (and cooling) should be familiar to candidates at this level. Reasonable responses were able to identify multiple methods and describe details of benefits (cost, ease, ages, response time) and limitations (capacity, rate, expense, technical difficulty, invasiveness). Many responses provided limited, superficial and often repetitive answers - outlining only 2-3 rewarming methods or spending time describing different types of warm fluids instead of focusing on other modalities. Simple things such a warm blanket or complex things like RRT/ECMO were often missed.

Reference(s):

Rogers' textbook of pediatric intensive care / editors, David G. Nichols, Donald H. Shaffner, Fifth edition 2016. Page 511

Question 11

Discuss the following aspects of Streptococcus pyogenes (Group A Strep) toxic shock syndrome:

a) Pathogenesis. (5 marks)
b) Your approach to antibiotic selection. (3 marks)
c) The role of intravenous immunoglobulin. (2 marks)

Maximum Score	8.25
Percentage Passed	71%

Examiners' comments:

A very topical question reflecting emerging disease variant with increased morbidity; however, hardly any candidates mentioned this feature. Candidates were expected to identify at risk groups, clinical scenarios, role (and putative mechanism) of superantigen activation of T cells with immune dysregulation. The importance of appropriate antibiotic selection, urgency, dose and duration, along with the role of clindamycin or linezolid was also expected. Marks were awarded for a discussion of the theoretical role and evidence for the use of intravenous immunoglobulin.

Reference(s):

Nature Commications 2023;14(1):1051
Clinical Infectious Diseases 2018;67:1434-1436

Question 12

a) List five complications of bronchopleural fistula. (2.5 marks)

b) Outline your strategies for mechanical ventilation in patients with bronchopleural fistula, including your rationale for each.

(7.5 marks)

Maximum Score	8.55
Percentage Passed	50%

Examiners' comments:

Bronchopleural fistual is a common clinical scenario and candidates were expected to list a range of complications including (but not limited to) pleural and mediastinal gas. This aspect was surprisingly poorly done. The second (major) part of the question required a more detailed description of management and its rationale. Better responses were able to identify limiting airway pressure and reducing gas flow through the fistula as the aims of mechanical ventilation. It was expected that candidates identified that tolerance of lower saturations and permissive hypercapnoea might be required. Better responses provided detailed settings, adjustments and graded escalation including the pros and cons of HFOV, JET, single lung ventilation, surgical intervention and even VV ECLS.

Reference(s):

Bronchopleural Fistula in the mechanically ventilated patient: A concise review. Critical Care Medicine 2021, 49 (2): 292-301

Question 13

For each of the following three (3) cases (a to c):

i. List the ECG abnormalities.
ii. What is the diagnosis?
iii. Briefly outline your clinical response.

a) 7-year-old, routine ECG on day one post mitral valve repair for severe mitral regurgitation (underlying diagnosis chronic rheumatic heart disease). *Image removed*

(2 marks)

b) 12-year-old, day 2 post aortic root replacement and mitral valve repair for severe mitral and aortic regurgitation (underlying diagnosis rheumatic heart disease). Moderate to severe left ventricular dysfunction on post operative echocardiogram. This is an atrial ECG. *Image removed*

(4 marks)

c) 4-year-old, 1hr post mechanical mitral valve insertion (underlying diagnosis of Shone's complex). *Image removed*

(4 marks)

Maximum Score	7.75
Percentage Passed	36%

Examiners' comments:

Three post-operative ECGs were presented showing (a) pericarditic changes, (b) atrial tachycardia with 2:1 block and (c) widespread inferolateral ischaemia. These are diagnoses that candidates are expected to be able to recognise and manage. Erroneous diagnosis of JET and poor recognition of ischaemia and the attendant urgency were common mistakes in responses.

Question 14

A 15-year-old girl with cystic fibrosis, who has had a second lung transplant, presents with decreasing respiratory function on a background of non-adherence to immunosuppressive medications. She has mood and attachment disorders and has had episodes of self-harm and suicidal ideation.

She is admitted to hospital for high dose intravenous (IV) methylprednisolone, for which she requires insertion of an IV line. She refuses, stating she doesn't want to live. Her mother consents to IV insertion for treatment, but the anaesthetic team are not willing to force the patient to be treated. As the intensivist on service, you are asked to admit her for sedation to enable treatment.

a) Outline briefly how the principles of biomedical ethics apply to this case. (5 marks)

b) Outline your approach to managing this situation. (5 marks)

Maximum Score	8.75
Percentage Passed	57%

Examiners' comments:

A question regarding a) the ethical principles to be considered when faced with a mature minor's refusal of (potentially life-saving) treatment and management plan and b) a practical approach to this complex problem. In part b), some candidates appeared pressured to make a decision quickly and treat against patient's wishes, whereas exploring all options with multiple medical teams, clinical ethics, ICU Director and Executive was the expected approach.

Question 15

a) Outline the causes of acquired adrenal insufficiency in children. (3 marks)

b) What clinical features raise your suspicion that an unwell child may have an undiagnosed adrenal insufficiency?

(3 marks)

c) Outline how to manage an acute adrenal crisis. (4 marks)

Maximum Score	7.25
Percentage Passed	50%

Examiners' comments:

This is an important topic that was relatively poorly answered. Many candidates omitted to mention prolonged corticosteroid administration as a cause of adrenal insufficiency. Many candidates gave vague answers, in particular regarding treatment. Candidates should understand that few marks will be awarded in the examination for phrases such as "ABC's", "supportive care to manage hypotension and electrolytes", "check and correct electrolytes", and "fluid resuscitate and inotropes".

Reference(s):

Rogers' Textbook of Pediatric Intensive Care, Fifth edition: pp1741-49.

Question 16

a) Outline the clinical and laboratory features of the propofol infusion syndrome (PRIS).

(4 marks)

b) List the risk factors for development of PRIS.

(2 marks)

c) Outline how propofol might be used in PICU whilst minimising the risk of PRIS.

(4 marks)

Maximum Score	8.075
Percentage Passed	86%

Examiners' comments:

Overall, candidates had reasonable knowledge of this topic, which is an important one for our population. Many candidates were unable to describe the cardiac manifestations of PRIS, and very few gave a comprehensive answer to part c, simply suggesting a few scenarios for use.
Better answers to this aspect covered a unit-wide approach to reducing risk including protocol and monitoring strategy.

Reference(s):

BJA 2019;122(4):448-59
Anaesth Intensive Care 2002;30(6):786-93

Question 17

a) List four (4) indications for delayed sternal closure in paediatric patients following cardiac surgery.

(2 marks)

b) List four (4) important clinical prerequisites/criteria for sternal closure.

(2 marks)

c) Outline the potential cardiac effects of sternal closure.

(2 marks)

d) Outline the a) advantages and b) disadvantages of delayed sternal closure.

(4 marks)

Maximum Score	8.5
Percentage Passed	93%

Examiners' comments:

This question was generally well answered, with the majority of candidates scoring highly. Candidates had most difficulty with the cardiac effects of chest closure, with some very unsophisticated answers. Comment was expected on how sternal closure would affect filling, function, afterload and interventricular dependence.

Question 18

A 2-year-old boy arrives in the emergency department following a 35 minute out-of-hospital cardiac arrest. Return of spontaneous circulation was achieved at the scene and the paramedics have not intubated him as he is now spontaneously breathing.

a) Briefly outline the pathophysiology of post–cardiac arrest brain injury.

(3 marks)

b) Outline your neuroprotective management goals for this child. Do not include investigations.

(7 marks)

Maximum Score	9.5
Percentage Passed	100%

Examiners' comments:

Most candidates scored well, but only a few managed an accurate description of the pathophysiology of post-arrest brain injury. Clinical aspects were generally well-organised, with comprehensive answers scoring highly. Those who scored highly commented on areas of controversy such as targeting cerebral perfusion pressure in this group and the role of ICP monitoring.

Reference(s):

Pediatric Post-Cardiac Arrest Care: A Scientific Statement From the American Heart Association. Circulation. 2019 Aug 6;140(6):e194-e233.

Question 19

a) List 5 (five) pathophysiologically distinct causes, with examples, of hypercapnia in a ventilated patient in PICU (not on ECLS).

(5 marks)

b) List 4 (four) indications for tolerating or encouraging hypercapnia in PICU, briefly outlining the rationale for each.

(5 marks)

Maximum Score	9
Percentage Passed	100%

Examiners' comments:

This question was well answered, with candidates demonstrating an ability to think broadly about the question asked. In part a), problems beyond inadequate ventilation were expected, including reductions in pulmonary blood flow and states of increased CO_2 production. Candidate responses to part b) demonstrated a broad and practical exposure to management of lung disease and injury and univentricular cardiac circulations.

Reference(s):

Circulation 2001;104(Suppl 1):1-159 – 1-164
JTCVS 2003;126(4):1033-39
TAME trial - NEJM June 2023. DOI: 10.1056/NEJMoa2214552

Question 20

A 15-year-old male has been in PICU for 3 months. He was admitted with septic shock, which has now resolved. He remains ventilator dependent with significant critical illness weakness. He has acute lymphoblastic leukaemia, currently in remission.

You note that his serum calcium levels have been increasing steadily. His current calcium levels are:

Parameter	Patient Value	Normal range
Calcium	3.2 mmol/L*	2.20 - 2.65 mmol/L
Corrected calcium	3.4 mmol/L*	2.20 - 2.65 mmol/L
Ionized calcium	1.66 mmol/L*	1.13 - 1.33 mmol/L

a) List the differential diagnosis for hypercalcaemia in this situation.

(2 marks)

b) List the clinical manifestations of severe hypercalcaemia.

(2 marks)

c) Outline your approach to investigating hypercalcaemia in this patient.

(2 marks)

d) Outline the management of severe hypercalcaemia, including thresholds to institute therapy.

(4 marks)

Maximum Score	6.9
Percentage Passed	36%

Examiners' comments:

Most candidates did not demonstrate adequate knowledge of calcium homeostasis and consequently were unable to score well on clinical manifestations and investigations of hypercalcemia. Better answers managed to produce a relevant differential diagnosis and had a structured approach to management.

Reference(s):

Hypercalcemia in the Intensive Care Unit: A Review of Pathophysiology, Diagnosis, and Modern Therapy. J Intensive Care Med 2015;30(5):235-52.

Question 21

Leukostasis is a complication of acute myeloid leukaemia in young children.

a) Define leukostasis. (1 mark)

b) Outline the pathophysiology of leukostasis. (2 marks)

c) List the clinical signs of leukostasis. (2 marks)

d) What is your approach to management of hyperleucocytosis after a child has been intubated and stabilised?

(5 marks)

Maximum Score	7.75
Percentage Passed	64%

Examiners' comments:

There was a wide range of scores in this question, with some answers not providing an accurate definition or pathophysiological description of leukostasis. Most candidates could describe a reasonable clinical approach to management of hyperleukocytosis, but leukopheresis was poorly discussed.

Reference(s):

Leung KKY et al. Therapeutics for paediatric oncological emergencies. Drugs Context. 2021 Jun 23;10:2020-11-5. doi: 10.7573/dic.2020-11-5. PMID: 34234831; PMCID: PMC8232653.

Question 22

You are the doctor performing the retrieval of a very sick infant from a regional Emergency Department to your PICU.

The patient is a 7-month-old who is day 2 of bronchiolitis on a background of chronic lung disease of prematurity. She is otherwise well and neurodevelopmentally normal.

You arrive 2 hours after she has been intubated with a 4.0 cuffed endotracheal tube. She has recently received rocuronium and is sedated on morphine 40mcg/kg/hour and midazolam 3mcg/kg/minute.

The transport involves a 60-minute road trip. There is no capacity to perform an ECMO transport.

On examination:
Heart rate: 154 beats per minute
Blood pressure: 96/54 mmHg (mean 67 mmHg)

Ventilator settings:
Synchronised intermittent mandatory ventilation (pressure controlled)
Peak inspiratory pressure: 40 cmH_2O
Peak end expiratory pressure: 10 cmH_2O
Respiratory rate: 20 breaths per minute
Inspiratory time: 1 second
Tidal Volume: 4mL/kg

Question 22 continued next page.

A recent arterial blood gas is shown below:

Parameter	Patient Value	Normal Range
pH	*7.06**	*7.35 – 7.45*
PaO_2	*51 mmHg (6.8 kPa)**	*80 – 105 (10.7 – 14.0)*
$PaCO_2$	*95 mmHg (12.7 kPa)**	*35.0 – 45.0 (4.7 – 6.0)*
SaO_2	*76%*	
Bicarbonate	*26.0 mmol/L*	*22.0 – 26.0*
Base excess	*-5 mmol/L**	*-2.0 to 2.0*
Lactate	*1.8 mmol/L*	*< 2*

Chest X-ray shown below. (Image removed)

Outline your approach to transporting this patient.

Maximum Score	6.5
Percentage Passed	71%

Examiners' comments:

This question required candidates to demonstrate a broad and considered approach to undertaking the retrieval of a very sick infant, rather than just describing how to set the ventilator etc. Good answers addressed local resources, previously tried manoeuvres, risk/benefit of pre-transport interventions, medical management and communication with family and receiving team.

Question 23

a) Briefly outline the normal physiological roles of magnesium. (2 marks)

b) Discuss the indications for use and relevant mechanisms of action of magnesium administration in PICU.

(8 marks)

Maximum Score	6.25
Percentage Passed	36%

Examiners' comments:

Many candidates were unable to describe the physiological roles of magnesium. In the second part of the question, candidates were expected to discuss magnesium use in a variety of scenarios including (but not limited to) hypomagnesaemia, asthma, pulmonary hypertension and arrhythmias. A simple list of indications or uses did not score well.

Question 24

a) List the potential benefits of nutrition for the critically unwell paediatric patient. (4 marks)

b) Outline the barriers to meeting caloric requirements in PICU patients. (6 marks)

Maximum Score	6.75
Percentage Passed	93%

Examiners' comments:

This was answered well by most candidates. Candidates scored highly in the second part of the question if they covered problems of assessment of requirements, effects of critical illness on gut motility and perfusion, fluid restriction and interruptions of enteral feeds, and administration of parenteral nutrition.

Reference(s):

Journal of Parenteral and Enteral Nutrition2017;41(5):706–742

Intensive Care Medicine 2020:46:411–425.

Question 25

You are the consultant supervising journal club. The senior registrar describes the conclusions of an article she has reviewed:

"Drug X significantly improved capillary refill time in all age groups and there was a trend towards improved mortality that did not reach statistical significance - the p value was 0.08.
…the authors suggested it was because the study was underpowered.
…the accompanying editorial reminds us to be cautious about secondary outcomes and surrogate markers of cardiac output."

a) Describe what is meant by:

i. "Did not reach statistical significance - the p value was 0.08". (2 marks)

ii. "Underpowered". (2 marks)

iii. "Secondary outcome". (2 marks)

iv. "Surrogate marker" (2 marks)

b) She asks if you would introduce the drug to your PICU. How would you respond?

(2 marks)

Maximum Score	6.67
Percentage Passed	43%

Examiners' comments:

The ability to interpret the critical care literature is core examination material in the second part exam. This question tested candidates' ability to explain key basic principles in clinical trial reporting and interpretation. Many answers were brief, superficial and simply incorrect or inaccurate.

Reference(s):

Myles PS, Gin T. Statistical Methods for Anaesthesia and Intensive Care. Butterworth Heinemann, London 2000.

Question 26

A 10-year-old boy with severe idiopathic pulmonary hypertension has had decreasing exercise tolerance over the last 3 months despite sildenafil, bosentan and epoprostenol infusion.

Today he has coryza and cough and has presented to emergency with rapidly worsening shortness of breath.

On examination:

- Afebrile
- Glasgow coma score 13-14
- SpO_2 85% in 15 litres per minute oxygen via facemask
- Respiratory rate 45 breaths per minute
- Heart rate 120 beats per minute
- Blood pressure 75/55 mmHg

A chest X-ray shows some new perihilar changes only.

a) Outline your approach to intubation of this patient. (6 marks)

b) Outline your approach to extracorporeal life support in this patient. (4 marks)

Maximum Score	8
Percentage Passed	100%

Examiners' comments:

To score highly in this question, candidates needed to recognize the clinical urgency and potential for serious deterioration, and to prepare for this. In addition, a broader consideration of underlying disease, treatment goals and limitations was also expected, particularly when discussing ECLS.

Question 27

As a newly appointed consultant, you are tasked with establishing a new paediatric transport service in a large region with which you are unfamiliar. Discuss the key considerations in such a task.

Maximum Score	8.5
Percentage Passed	86%

Examiners' comments:

Some candidates lost marks here for providing a simple list of considerations (rather than discussing these), or for limiting the scope of their answer to personnel and equipment. Better answers covered governance, stakeholder engagement, finance and local geography.

Question 28

a) What is “right ventricular restrictive physiology” (RVRP) and what is the hallmark echocardiographic feature?

(2 marks)

b) How might RVRP manifest clinically in an infant immediately post repair of Tetralogy of Fallot?

(3 marks)

c) Outline management principles to optimise cardiac output in RVRP.

(5 marks)

Maximum Score	8
Percentage Passed	71%

Examiners' comments:

This question required candidates to demonstrate a specific understanding of this common post-operative problem, to describe its clinical presentation and to build on this to describe a management plan. A surprising number of candidates were vague about the definition and manifestations of RVRP. The management part of the question was generally answered better.

Reference(s):

Cullen S, Shore D, Redington A. Characterization of right ventricular diastolic performance after complete repair of tetralogy of Fallot: restrictive physiology predicts slow postoperative recovery. Circulation 1995;91(6):1782-9.

Question 29

A 2-year-old girl weighing 10 Kg with acute respiratory failure is on VV ECMO via a right internal jugular dual lumen ECMO cannula.

ECMO flow 1L/minute; sweep gas 100% oxygen at 0.8 L/minute.

Ventilation: Rate 10 breaths per minute; peak end expiratory pressure (PEEP) 10 cmH_2O; peak inspiratory pressure 10 cmH_2O above PEEP; FiO_2 0.5; tidal volume 3ml/Kg.

Heart rate 110 beats per minute, blood pressure 110/60 mmHg, SpO_2 90%.

a) List the causes of a sudden drop in arterial saturations in this patient.

(4 marks)

b) Outline your approach to transport of this patient to radiology for an urgent CT brain.

(6 marks)

Maximum Score	8.75
Percentage Passed	79%

Examiners' comments:

Candidates that scored well in the first part of this question provided a structured list, which tended to be more comprehensive. Answers were expected to cover patient-related, ventilation-related and ECMO-related causes for desaturation. The second part of the question was answered well, with most candidates describing a safe and team-based approach to such a transport and adequate planning for potential problems.

Question 30

A 4-year-old male with no significant past medical history is transferred to your PICU from a regional centre with a provisional diagnosis of dilated cardiomyopathy.

On arrival he is pale, sweaty, tachypnoeic and tachycardic.

- SpO_2 100% in 2l/Kg/minute high-flow humidified nasal cannulae oxygen (30%).
- Blood pressure: 80/50 mmHg.
- ECG: low voltage R waves.
- Chest x-ray: cardiomegaly, pulmonary plethora, small left pleural effusion.
- Echocardiogram: severely decreased left ventricular systolic function (ejection fraction 20%), biventricular dilatation, severe mitral regurgitation. No evidence of pulmonary hypertension, coronary arteries, and aortic arch normal.

He has a peripheral intravenous cannula in the hand and is booked for definitive venous access tomorrow morning.

The senior registrar asks for your overnight management plan. Outline your response.

Maximum Score	7.375
Percentage Passed	79%

Examiners' comments:

The clinical description is one of a clearly parlous situation, and the answer was expected to cover the potential for deterioration, consider risks and benefits of any intervention, describe a clear management plan, including escalation, and to ensure that this was adequately communicated with all staff and family. Some answers were limited in scope and omitted some of the above aspects.

ORAL SECTION

The Clinical Section

The Clinical Section (2 clinical cases – 20 minutes per case) was conducted in the Paediatric Intensive Care Unit at the Children's Hospital at Westmead in 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 were given a written introduction to the hot cases, which they studied for 2 minutes prior to commencement. This allowed candidates time to think about how best to approach the case, what information to seek and how to structure the examination. These two minutes are in addition to the 20 minutes taken to perform the hot case.

Cases are usually presented as problem-solving exercises. For maximum 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:

- A 5-month-old child, 90 days following AVSD repair and ECPR who was still dependent on positive pressure ventilation.
- A 9-year-old with developmental delay and an epileptic syndrome, day 14 of an ICU admission with lower respiratory tract infection.
- A 16-year-old, day 3 following mitral valve replacement.
- A 2-month-old, day 38 in ICU with enterovirus myocarditis, day 14 post ECMO decannulation.
- A 13-month-old with renal failure following a liver transplant.
- A 14-year-old on VA ECMO with acute myocarditis.

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 5-year-old previously well girl is transferred to your PICU with suspected Haemolytic Uraemic Syndrome. She has been unwell for 3 days with severe lethargy, vomiting and decreased oral intake.

She has been intubated for respiratory failure and is on Pressure-Control Synchronized Intermittent Mandatory Ventilation (PC-SIMV):

Peak inspiratory pressure (PIP) 25cmH2O
Positive end-expiratory pressure (PEEP) 8 cmH2O
Respiratory rate 25/minute
FiO2 0.5

On arrival, she is pale, febrile to 38.6°C, with periorbital oedema.
HR 160beats per minute, Blood pressure 135/90mmHg.

CXR shows a large left pleural effusion.
Arterial blood gas and initial biochemistry results are follows:

Parameter	Patient Value	Normal Range
pH	7.19*	7.34-7.43
PaCO2	43 mmHg 5.7 kPa	35-45 mmHg 4.6-6 kPa
PaO2	38 mmHg* 5.1 kPa*	80-105 mmHg 10-14 kPa
Bicarbonate	16 mmol/L*	20-26 mmol/L
Base excess	-12* mmol/L	-5-5 mmol/L
Sodium	130 mmol/L*	135-145 mmol/L
Potassium	4.7 mmol/L	3.5-5 mmol/L
Chloride	106 mmol/L	95-110 mmol/L
Glucose	3.7 mmol/L	3.6-5.4 mmol/L
Lactate	1.7 mmol/L	1-1.8 mmol/L

Parameter	Patient Value	Normal Range
Urea	12 mmol/L*	1.3-6.6 mmol/L
Creatinine	250 µmol/L*	10-50 µmol/L
Haemoglobin	65 g/L*	110-140 g/L
Haematocrit	0.18*	0.34-0.42
Platelets	30 x109/L*	150-400 x109/L
White blood cells	10.7 x109/L	6-17 x109/L
INR	3.5*	0.8-1.2
APTT	73 sec*	27-45 sec
Fibrinogen	8.6 g/L*	1.5-4.3 g/L

What are your immediate management priorities?

Viva 2

A 13-year-old male has been extricated from a burning crashed car. He was unconscious (GCS 4) but breathing and had strong pulses. On intubation at the scene there was soot and vomitus in the pharynx and larynx, but nothing on endotracheal suction. On the patient's arrival in the Emergency Department the following features are noted:

Burns to the face, scalp, neck, anterior chest, abdomen, shoulders and both arms. Arms and upper body are covered with clear plastic (cling film). There are no burns below the waist.

A – Oral cuffed ETT, size 6.5, 18cm at teeth, secured firmly with a tied cotton ribbon.
B – Equal air entry and chest rise with widespread expiratory wheeze.
    SpO2 89%, EtCO2 45mmHg
    Ventilation: FiO2 100%, PEEP 0cm, Ppeak 25cm, Vt 300ml x 14 breaths/min, I:E = 1:2.
C – Heart rate 160/minute, sinus rhythm, strong pulses, blood pressure 165/98 mmHg.
    20g IV in burnt area of left arm.
    1000ml of normal saline (approx. 20ml/kg) has been given en route.
D – Pupils equal and reactive, tears in both eyes. Nil movements or responses. Temp 38.2°C.
E – When he is log rolled there are no burns, bruises, or deformities evident on his back or buttocks

The Emergency consultant has already ordered 5mg of nebulised salbutamol and delegated personnel to manage the airway, to establish more IV access/take bloods, and to insert a urinary catheter.

Outline the priorities in this boy's immediate care.

Viva 3

A 13-year-old girl presents 16 hours after ingesting an unknown quantity of modified-release paracetamol, and an unknown quantity of a selective serotonin reuptake inhibitor (SSRI). Her past history includes family violence, recurrent overdoses and an eating disorder. She currently weighs 30 kg. She is asymptomatic. Initial investigations (venous) are as follows.

Parameter	Value	Reference range
Paracetamol level		Above the upper nomogram line
Alanine amino transferase	50 U/L*	0-35 U/L
International normalized ratio (INR)	1.3	0.9-1.3
pH	7.45	7.35-7.45
Na	140 mmol/L	135-145 mmol/L
K	1.7 mmol/L*	3.3-4.9 mmol/L
Lactate	2.0 mmol/L	0-3.0 mmol/L

She has been started on N-Acetylcysteine following the local protocol.

Outline your approach for the next 24 hours, giving reasons for your plans.

Viva 4

A 4-year-old boy presents to the emergency department with a 3-day history of diarrhoea and vomiting. On arrival he is difficult to rouse and poorly perfused. His heart rate is 50 beats per minute, with palpable central pulses. Below is his 12 lead ECG in resus.

Image removed.

Describe the 12 lead ECG and formulate a differential diagnosis.

Viva 5

A 14-year-old male has been in your PICU for the past 36 hours, intubated and ventilated after a hanging injury. His initial GCS was 3. His CT scan 4 hours after admission demonstrates severe hypoxic ischaemic encephalopathy. He has been receiving neuroprotective measures in the PICU. On clinical exam, he has no response to painful stimuli, has fixed and dilated pupils and has no spontaneous respiratory effort.

Describe your approach to diagnosing brain death (neurological determination of death) in this patient.

Viva 6 – Radiology Viva

Candidates were shown a series of radiological investigations and asked to describe the important findings in each.

Viva 7 – Procedure Viva

You are asked to attend an arrest call to the Emergency Department to find a 9-year-old child presented with breathing difficulty following anaphylaxis with drooling and upper airway obstruction following accidental ingestion of peanuts.

On examination they are unconscious, apnoeic, and cyanosed with an spO2 of 65% and heart rate 50bpm. A pulse is palpable.

Two doses of intramuscular adrenaline have been administered.

The Senior ICU Registrar is present and has performed videolaryngoscopy, reporting that there is a grade 4 view with redness and swelling of the airway.

Please proceed with your assessment and management.

Viva 8 – Communication Viva

You are the consultant on call for the ICU. You have been called in to the hospital by your registrar following an event for one of your patients.

Jet is a nine-month-old, previously well boy. He has been intubated, ventilated and sedated in your ICU for 48hours for treatment of severe community acquired pneumonia. He has been very stable for last 24hours but remains on high oxygen requirements. He has also had high sedation requirements due to endotracheal tube intolerance, and an oral endotracheal tube. The expectation of the ICU team which had been relayed to Jet's parents is that he was unwell but progressing nicely and would be expected to make a full recovery after a few more days on the ventilator.

In the middle of the night Jet had an accidental extubation of an oral tube. It was immediately recognised. The 2 registrars covering the floor were unable to reintubate him which led to a hypoxic cardiac arrest requiring 5 min of CPR before Jet was able to be reintubated by the anaesthetist who responded to the cardiac arrest code.

Jet is now back on the ventilator and appears stable on 75% oxygen.

Jet's parents Amanda and Ken, who were asleep at home, have been called into the hospital by the bedside nurse, who informed them something had happened to Jet but gave no further details. They have just been in to see him and are now waiting in a family room to speak to you about what has happened. You have not met them before.