



COLLEGE OF INTENSIVE CARE MEDICINE OF AUSTRALIA AND NEW ZEALAND

SECOND PART PAEDIATRIC EXAMINATION

EXAM REPORT

AUGUST / NOVEMBER 2022

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, Perth 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 49.6%.

The clinical section of the examination was held in Melbourne, Australia at Royal Children's Hospital, and the vivas were held at the Exhibition Hall in Crown Promenade Melbourne. 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.

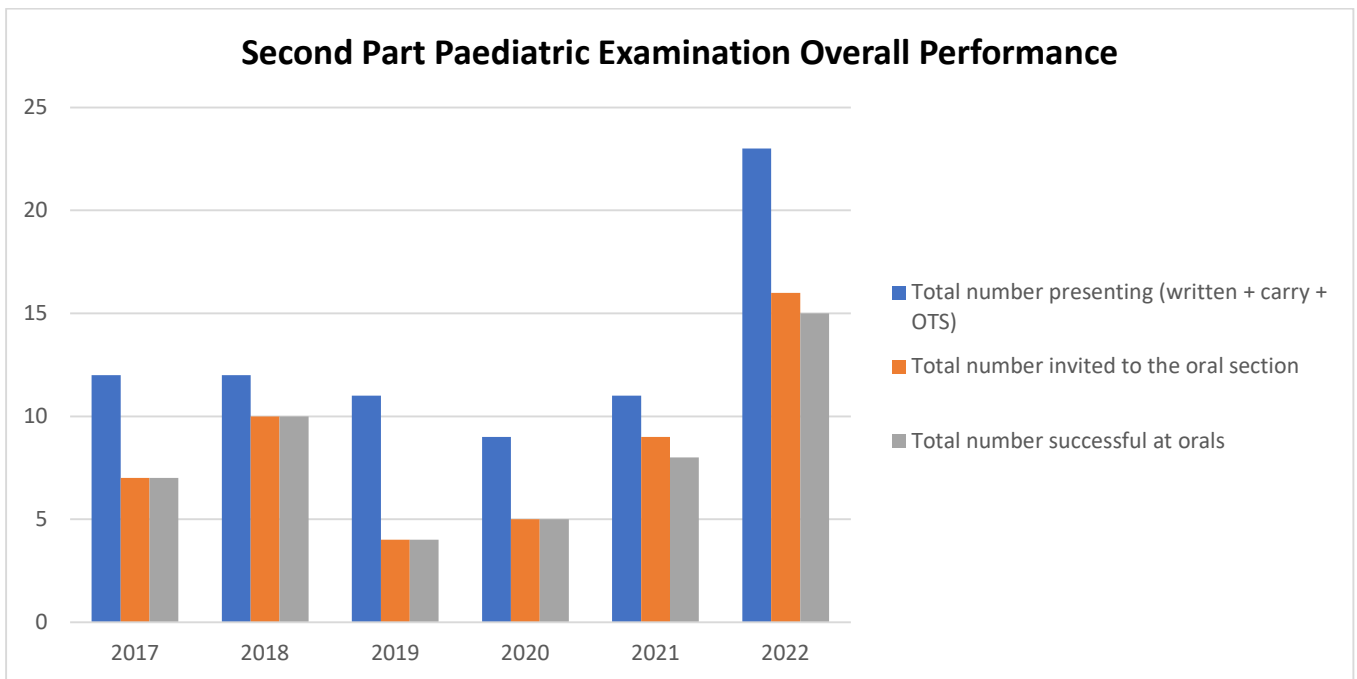
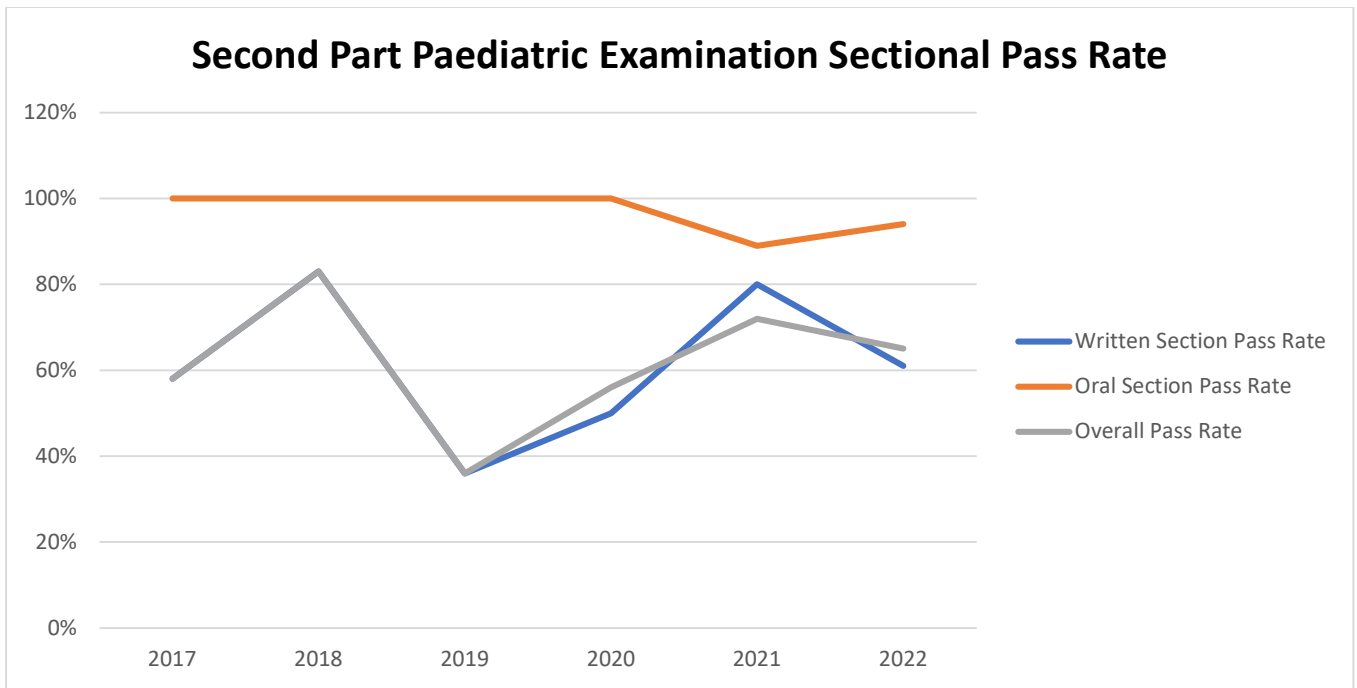
STATISTICAL REPORT

Overall pass rates	2022	2021	2020	2019	2018	2017
Total number presenting (written + carry + OTS)	23	11	9	11	12	12
Total number invited to the oral section	16	9	5	4	10	7
Total number successful at orals	15	8	5	4	10	7
	94%	89%	100%	100%	100%	100%
Overall pass rate	15/23	8/11	5/9	4/11	10/12	7/12
	65%	72%	56%	36%	83%	58%

Clinical Pass Rates	2022		2021		2020		2019		2018		2017	
	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	85%	75%	89%	78%	60%	70%	75%	78%	50%	73%	71%	75%
Hot Case 2	88%	81%	67%	95%	60%	70%	50%	70%	70%	78%	86%	76%
Total number successful in the Hot Case section	14/16		6/9		3/5		3/4		6/10		6/7	
Overall Hot Case pass rate	88%		67%		60%		75%		60%		86%	

Viva Pass Rates	2022		2021		2020		2019		2018		2017		2016	
	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	Pass rate	Highest individual mark
Viva 1	88%	90%	88%	80%	100%	74%	25%	54%	70%	75%	100%	70%	67%	80%
Viva 2	88%	100%	45%	70%	100%	90%	50%	60%	70%	85%	86%	78%	100%	85%
Viva 3	56%	76%	45%	75%	100%	80%	75%	70%	60%	83%	86%	85%	0%	49%
Viva 4	100%	95%	100%	74%	60%	80%	100%	88%	80%	59%	86%	78%	67%	90%
Viva 5	88%	100%	88%	94%	80%	86%	75%	69%	80%	73%	43%	76%	100%	88%
Procedure Viva	44%	72%	67%	60%	100%	71%	100%	65%	100%	90%	100%	70%	100%	83%
Radiology Viva	38%	68%	34%	56%	80%	73%	25%	58%	70%	75%	86%	85%	83%	80%
Communication Viva	56%	85%	78%	70%	40%	60%	75%	88%	80%	83%	57%	90%	83%	95%
Total number successful in the Viva section	13/16		8/9		5/5		4/4		10/10		6/7		6/6	
Overall Viva pass rate	81%		89%		100%		100%		100%		86%		100%	

Overall Performance



EXAMINERS' COMMENTS

Written Paper

Ten of the thirty short answer questions had a pass rate of less than 50%. Topics covered by questions with a pass rate of 35% or less related to consent in research, advice for a multitrauma patient, biventricular repair for HLH and management of renal failure in a child with a mediastinal mass. Other areas with low pass rates included endocrine questions, tracheostomy decision making and qualitative research.

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 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. 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

You have been asked to review a 12-year-old girl admitted to the ward less than 48 hours ago with symmetrical weakness and areflexia in her lower limbs. Today she is unable to stand, has increasing weakness in both arms, is nauseated, and has pain in her lower back and both thighs. She is afebrile. Prior to this she was fit and healthy. The provisional diagnosis is Guillain-Barré syndrome, and one dose of intravenous immunoglobulin has been administered. The Paediatric team is concerned about her trajectory.

- a) List three potential differential diagnoses in this setting and indicate how these would be excluded. (30% marks)
- b) List the factors you would take into account when deciding on the need for ICU admission. (30% marks)
- c) Discuss the role of plasmapheresis in the treatment of severe paediatric Guillain-Barré syndrome. (40% marks)

Maximum Score	7.45
Percentage Passed	100%

Examiners' comments:

Candidates were asked to list three differential diagnoses. In some cases, these were too narrow in scope or lacked full answers about how to exclude each of these. Most candidates listed appropriate indications for ICU, by prioritizing common pathologies based on the specific clinical findings given and giving specific details around reasons for admission to ICU (including refractory pain).

The role of plasmapheresis was reasonably well answered, with comparison to IVIG being relevant in this discussion.

Reference(s):

Intensive Care treatment in Severe Guillain Barre Syndrome. Shang, P et al, Frontiers in Pharmacology 27 April 2021

Anticipating mechanical ventilation in GBS. Lawn N, et al, Arch Neurol v58 June 2001

Evidence based guidelines - Diagnosis and management of Guillain–Barré syndrome in ten steps. Nat Rev Neurology, v15, 2019

Question 2

Outline the infection control precautions necessary to keep staff safe during the intubation of a patient with COVID-19 pneumonia.

Maximum Score	8.0
Percentage Passed	83%

Examiners' comments:

Infection control measures for COVID is an area candidates are expected to be highly familiar with. Candidates set this out well, presenting points under subheadings. This question required specific details, such as elements of PPE, precautions with intubation. Candidates who did well gave very detailed information listing the precautions, and exactly what was needed rather than giving only general points.

Reference(s):

Brewster D, et al. Consensus statement: Safe Airway Society principles of airway management and tracheal intubation specific to the COVID-19 adult patient group. *Med J Aust.* 2020;212(10):472-481

Online Clinical Practice Guideline - Emergency airway management in COVID-19 context (endorsed by Paediatric Improvement Collaborative)

Question 3

- a) Define the Fick principle. (20% marks)
- b) How can the Fick equation be used to calculate Qp:Qs? (10% marks)

A newborn infant with hypoplastic left heart syndrome (mitral and aortic atresia), an unrestrictive ASD and a patent ductus arteriosus is intubated and ventilated in the PICU. Chest X-ray shows the endotracheal tube in good position, moderate cardiomegaly and pulmonary oedema. He is receiving intravenous alprostadil at 20 ng/kg/min.

Ventilator settings:

FiO₂ 0.3, peak inspiratory pressure 20 mmHg, peak end expiratory pressure 5 mmHg, rate 40 breaths/min, inspiratory time 0.6 seconds.

Arterial blood gas is shown below:

Parameter	Patient Value	Normal Range
pH	7.36	7.32 – 7.46
PaCO ₂	35 mmHg (11.2 kPa)	31 – 42 (4.1 – 5.6)
PaO ₂	65 mmHg (3.7 kPa)*	80 – 105 (10.7 – 14.0)
SaO ₂	90%	
Base excess	-8*	-5 to +5
Bicarbonate	18 mmol/L*	20 – 26
Lactate	4.5 mmol/L*	1.0 – 1.8

- c) Assuming a 25% saturation difference between arterial and mixed venous blood, and a pulmonary venous saturation of 100%, calculate Qp:Qs in this infant. (10% marks)
- d) Discuss your approach to mechanical ventilation in this infant. (60% marks)

Maximum Score	9.75
Percentage Passed	89%

Examiners' comments:

The Fick principle and equation was expected baseline knowledge. Candidates who did well understood the Fick principle but were also able to apply it to the patient example and manipulate the ventilation appropriately. Most candidates were able to calculate a Qp:Qs.

However, the approach to mechanical ventilation was less well answered. This required an understanding of the predictable risk of managing a child with Stage 1 HLHS. Candidates who did well combined physiological basis with a practical strategy. This focus on the practical aspect favoured those who have worked in a cardiac ICU. Those who gave management plans that were pertaining to alteration in systemic vascular resistance did not score additional points. Those who mentioned ceasing

prostaglandins in context of aortic atresia and mitral atresia, which is of concern. Those who suggested increasing PEEP or putting in chest drains did not score well for that aspect. Given the wording of question, points were not given for manipulating Qs.

Reference(s):

<https://www.rch.org.au/uploadedFiles/Main/Content/picu/HLHS.pdf>

Theilen U, Shekerdemian L. The intensive care of infants with hypoplastic left heart syndrome. *Arch Dis Child Fetal Neonatal Ed* 2005;90:F97–F102

Feinstein JA et al. Hypoplastic Left Heart Syndrome: Current Considerations and Expectations. *J Am Coll Cardiol.* 2012 January 03; 59(1 Suppl): S1–42. doi:10.1016/j.jacc.2011.09.022.

Question 4

- a) What are qualitative methods best used for in ICU research? (25% marks)
- b) In table form, list specific differences between qualitative and quantitative research in ICU in the following four domains:
 - i. Indication or area of study
 - ii. Goals
 - iii. Methodology
 - iv. Sample size (40% marks)
- c) List three limitations of qualitative research. (15% marks)
- d) Briefly outline four strategies used in qualitative studies. (20% marks)

Maximum Score	7.5
Percentage Passed	33%

Examiners' comments:

Given the increasing importance of qualitative research in intensive care, this is an area candidates should have an understanding of. Despite this, many candidates struggled with this question, largely due to lack of knowledge. This question related to qualitative research (observation, interviews, focus groups - data in the form of words rather than numbers - explorative/hypothesis generating). There was significant confusion between quantitative vs qualitative research, & quality improvement. Many candidates mixed quantitative research components into their qualitative answer suggesting they didn't understand the difference. Some people answered question with appropriate answers for either QI (PDSA cycle) or quantitative research (large sample size, adequate statistical power, control group).. Some candidates gave answers with a lot of overlap between strategies used and methodology.

Reference(s):

How qualitative research can contribute to research in the intensive care unit. Sinuff T, Cook D, Giacomoni M, Journal of Critical Care, Vol 22 (2) 2007, p104-11
<https://doi.org/10.1016/j.jcrc.2007.03.001>

Question 5

A 13-year-old boy weighing 50 kg has been intubated in the Emergency Department for respiratory failure. He is COVID-19 positive on PCR testing.

On admission to PICU:

Warm and well perfused
Heart rate 100 beats/min, blood pressure 134/85 mmHg
SpO₂ 87%
Reduced air entry left base, bilateral crepitations, no wheeze

Ventilator settings:

Time-cycled, pressure-limited ventilation
FiO₂ 0.55
Rate 18 breaths/min. No spontaneous breaths.
Peak inspiratory pressure 20 mmHg, peak end-expiratory pressure 7 mmHg

(Image removed from report.)

- Describe the findings on the chest X-ray. (10% marks)
- Outline your ventilation management for this patient over the next 24 hours, including escalation if he does not respond to your initial treatment strategy. (40% marks)
- In table form, list medications targeting COVID-19 and complications of COVID-19, and the trigger for starting each medication. (50% marks)

Maximum Score	9.3
Percentage Passed	89%

Examiners' comments:

This question required identification of CXR abnormalities, a reasoned approach to ventilation of the "sick lung" and a list of COVID-19 medications and the indications for use. Nearly all candidates could give a good description of chest xray. It is important to note and comment on all lines and tubes and noted that many candidates failed to mention the nasogastric tube.

Answers for ventilation management varied in detail. Most candidates good gave a good description of lung protective strategies but plans on how to escalate support were limited in detail. Many responses were able to describe escalation consistent with PALISI or ARDS net recommendations but linked them to COVID less often. Multiple medications are used in COVID therapy - many options were allowed and scored marks, especially if the specific indication or criteria for use were included. In general, there was poor knowledge of COVID -19 medications and triggers to start them. Many candidates misunderstood the use of complications in part 3 of the questions thinking that they needed to list the complications of the medications used for COVID-19 rather than treatment for the complications of COVID-19.

Reference(s):

COVID-19 - guidance for management of children admitted to hospital and for treatment of non-hospitalised children at risk of severe disease - <https://www.rcpch.ac.uk/sites/default/files/generated-pdf/document/COVID-19---guidance-for-management-of-children-admitted-to-hospital-and-for-treatment-of-non-hospitalised-children-at-risk-of-severe-disease.pdf>

Blumenthal JA, Duvall MG. Invasive and noninvasive ventilation strategies for acute respiratory failure in children with coronavirus disease 2019. *Curr Opin Pediatr.* 2021 Jun 1;33(3):311-318. doi: 10.1097/MOP.0000000000001021. PMID: 33851935; PMCID: PMC8117173.

Howard-Jones AR, Burgner DP, Crawford NW, Goeman E, Gray PE, Hsu P, Kuek S, McMullan BJ, Tosif S, Wurzel D, Bowen AC, Danchin M, Koirala A, Sharma K, Yeoh DK, Britton PN. COVID-19 in children. II: Pathogenesis, disease spectrum and management. *J Paediatr Child Health.* 2022 Jan;58(1):46-53. doi: 10.1111/jpc.15811. Epub 2021 Oct 25. PMID: 34694037; PMCID: PMC8662268.

Anissa M. Tsonas, Michela Botta, Ary Serpa Neto, Janneke Horn, Frederique Paulus & Marcus J. Schultz (2021) Ventilation management in acute respiratory failure related to COVID-19 versus ARDS from another origin – a descriptive narrative review, *Expert Review of Respiratory Medicine*, 15:8, 1013-1023, DOI: 10.1080/17476348.2021.1913060

Practice recommendations for the management of children with suspected or proven COVID-19 infections from the Paediatric Mechanical Ventilation Consensus Conference (PEMVECC) and the section Respiratory Failure from the European Society for Paediatric and Neonatal Intensive Care (ESPNIC). <https://sviluppo.senzafiltro.it/espnic/wp-content/uploads/2021/07/2020-ESPNIC-PEMVECC-COVID-19-practice-recommendations.pdf>

Question 6

Discuss overfeeding in PICU.

Maximum Score	6.75
Percentage Passed	50%

Examiners' comments:

This question required a definition of overfeeding, reasons for why it occurs, list of complications and the candidate's approach to the problem. This needed to include a well-structured answer outlining these components and limitations to the assessment (equations or indirect calorimetry).

Overall, candidates displayed poor understanding of the complications of overfeeding and many candidates did not give an approach to how they would monitor/prevent this. Few responses were able to delineate mechanical and metabolic (CHO, protein, and fat) consequences or provide an overall impression of the problem. Some responses were superficial or inadequate. For example, involving a dietician as part of a multi-disciplinary team to help optimise nutrition/prevent overfeeding is more appropriate than suggesting a dietician should manage it.

Reference(s):

Energy imbalance and the risk of overfeeding in critically ill children. Mehta NM et al PCCM 2011;12(4):398-405.

Can energy intake alter clinical and hospital outcomes in PICU? Larsen BMK et al Clin Nutrition ESPEN 2018;24:41-46

A narrative review: the impact of nutrition on clinical outcomes in the critically ill child. Marino et al Pediatr Med 2020;3

Question 7

Your oncology department has contacted you because they are considering the use of chimeric antigen receptor (CAR) T cell therapy in a patient with refractory B-cell acute lymphoblastic leukaemia.

- What is CAR T cell therapy? (20% marks)
- Outline the specific problems/toxicities associated with CAR T cell therapy that might necessitate PICU admission. (80% marks)

Maximum Score	10.0
Percentage Passed	44%

Examiners' comments:

CAR-T therapy is increasingly discussed in the literature. Responses ranged from excellent to very poor. Many responses demonstrated a good understanding of the mechanisms of induction and specific post treatment syndromes. The question asked for specific information on CAR-T complications and its management. Good responses focused on a full description of these problems. Marks were not awarded for general oncologic complications of oncologic immunosuppression and bone marrow failure or emergencies NOT specific to CAR-T therapy.

Reference(s):

Management of the Critically Ill Adult Chimeric Antigen Receptor-T Cell Therapy Patient: A Critical Care Perspective. Gutierrez Crit Care Med 2018;46:1402-10

Management guidelines for paediatric patients receiving chimeric antigen receptor T cell therapy. Machadeo Nature reviews Clin Onc 2019;16: 45-63

Tisagenlecleucel in children and young adults with B- cell lymphoblastic leukemia. Maude, S. L. et al. NEJM 2018;378:439–448.

Böll B, Subklewe M, von Bergwelt-Baildon M. Ten things the hematologist wants you to know about CAR-T cells. Intensive Care Medicine. 2020;46(6):1243-5

Critical Care Management of Chimeric Antigen Receptor T Cell–related Toxicity. Be Aware and Prepared A m J Respir Crit Care Med Vol 200, Iss 1, pp 20–23, Jul 1, 2019

Critical care management of chimeric antigen receptor T-cell therapy recipients. Shimabukuro-Vornhagen et al. CA Cancer J Clin 2022;72:78–93

Question 8

A 2-month-old male infant underwent a double-outlet right ventricle repair with a long cardiopulmonary bypass duration 5 days ago. He remains intubated and ventilated and is receiving milrinone 0.75 µg/kg/minute and adrenaline 0.08 µg/kg/minute.

Fluid balance has been positive each post-operative day and the patient is grossly oedematous. Current weight is 30% higher than the pre-operative weight.

Outline your approach to managing fluid overload in this infant.

Maximum Score	8.0
Percentage Passed	67%

Examiners' comments:

Many responses were correctly able to identify fluid overload and the essential requirements for fluid restriction and fluid removal (diuretics, peritoneal dialysis and CVVH). Good answers included both management steps for fluid removal but also consideration for underlying causes contributing to current situations. This included looking for contributing causes such as residual cardiac lesions, thrombosis, infection, renal issues and abnormalities of venous and lymphatic function that could be contributing to refractory fluid retention. Better responses described aspects of assessment and the role of ongoing vasodilator therapy and vasopressors.

Candidates who described 'day to day' clinical practice without nuanced responses considering why the child had fluid overload did not achieve high marks.

Reference(s):

Kerling, A., Toka, O., Ruffer, A., Müller, H., Habash, S., Weiss, C., Dittrich, S. and Moosmann, J., 2019. First experience with Tolvaptan for the treatment of neonates and infants with capillary leak syndrome after cardiac surgery. *BMC pediatrics*, 19(1), pp.1-11.

Question 9

You are asked to review a 12-year-old girl on the ward. She is day 4 of admission with a new diagnosis of Crohn's disease, currently treated with gut rest, intravenous fluids (NaCl 0.9% + Dextrose 5%) and IV methylprednisolone. Diarrhoea is reducing in frequency.

Over the last 2 days she has become increasingly drowsy. Today she is not responding to voice or touch.

On examination:

- Temperature 37.6°C
- Pupils normal and reacting
- Respiratory rate 30 breaths/min
- SpO₂ in oxygen is 100%
- Heart rate 155 beats/min, blood pressure 89/45 mmHg
- Abdomen soft

The following are current laboratory results:

Parameter	Patient Value	Normal Range
Haemoglobin	165 g/L*	110 – 140
White Cell Count	33.0 x 10 ⁹ /L*	4.5 – 11.0
Platelet count	440 x 10 ⁹ /L*	150 – 400
Sodium	148 mmol/L*	135 – 144
Potassium	3.9 mmol/L	3.3 – 5.1
Chloride	115 mmol/L*	99 – 107
Urea	18.8 mmol/L*	2.0 – 6.5
Creatinine	160 µmol/L*	10 – 60
Glucose	66.0 mmol/L*	3.6 – 5.4
Ketones	0.5*	< 0.3
pH (venous)	7.22*	7.35 – 7.45
PvCO ₂	30 mmHg (4.00 kPa)*	35 – 50 (4.67 – 6.67)
HCO ₃ ⁻	15 mmol/L*	22 – 28
Lactate	5.4 mmol/L*	0.5 – 2.2
Base excess	-4 mmol/L*	-5 to +5
Urinalysis	Glucose 1+ Ketones 1+	

- a) Briefly outline the pathophysiology leading to hyperglycaemia in this syndrome. (15% marks)
- b) Outline your immediate management plan over the next 24 hours, including further investigations. (85% marks)

Maximum Score	7.75
Percentage Passed	33%

Examiners' comments:

Many candidates failed to diagnose hyperglycaemic hyperosmolar (non-ketotic) state, and thereafter, management tended to be non-specific/generic such as "protect airway", "neuroprotection." Despite this, there was sufficient detail in the clinical scenario to allow for a reasonable discussion on resuscitation/management of a critically unwell child. This needed to address the issues outlined for this specific patient rather than giving a generic management plan for their stated diagnosis. A good answer needed to remain broad in scope and consider sepsis and holistic management of a sick patient. Some

answers were too narrow in focus, discussing only on intubation and abnormal neurology. Many did not comment at all on the abnormal haemodynamic. Where subspecialty referral is suggested, a good answer should set out the question to be addressed by the specialty team as part of the candidate's management plan, rather than asking the specialty team to make the management plan.

Reference(s):

Agrawal, S., Baird, G. L., Quintos, J. B., Reinert, S. E., Gopalakrishnan, G., Boney, C. M., & Topor, L. S. (2018). Pediatric diabetic ketoacidosis with hyperosmolarity: Clinical characteristics and outcomes. *Endocrine Practice*, 24(8), 726–732. <https://doi.org/10.4158/EP-2018-0120>

Shahramian I, Ostad Rahimi P, Radvar S. Hyperosmolar hyperglycemic state in children: case report and review of the literature [published online ahead of print, 2022 May 31]. *J Klin Endokrinol Stoffwechs*. 2022;1-3. doi:10.1007/s41969-022-00164-1

Roger's textbook of Pediatric Intensive Care

Oh's Intensive Care manual

Question 10

An 18-month-old boy is admitted after pouring dishwasher powder from the packet into his mouth. He has stridor and is drooling.

- a) What is the mechanism of injury in caustic ingestion? (20% marks)
- b) List four risk factors for serious injury with dishwasher powder ingestion. (20% marks)
- c) What are your immediate management priorities? (20% marks)
- d) Outline the early and late complications of caustic ingestion that you will discuss with his parents. (40% marks)

Maximum Score	7.125
Percentage Passed	61%

Examiners' comments:

This question required knowledge of the specific issues and complications associated with caustic ingestion, an important cause of trauma which results in significant morbidity if not addressed effectively. Good answers listed early and late complications and addressed issues specific to this particular problem, including early involvement of surgeons and endoscopy. Some candidates lacked sufficient knowledge, failed to name the major complications or focused on consultation with toxicologists for elimination/decontamination suggesting lack of understanding of the important issues.

Reference(s):

Bertinelli A, Hamill J, Mahadevan M, Miles F. Serious injuries from dishwasher powder ingestions in small children. *J Paediatr Child Health*. 2006 Mar;42(3):129-33. doi: 10.1111/j.1440-1754.2006.00811.x. PMID: 16509913.

<https://doi.org/10.1016/j.jcrc.2007.03.001>

Question 11

In table form, describe the infection control requirements for each of the clinical scenarios (a to d) in PICU.

Use the following three columns in your table: PPE requirements, room allocation, and brief rationale.

- a) A 4-year-old with febrile neutropenia.
- b) A 6-month-old with Influenza A on CPAP.
- c) A 9-year-old with diarrhoea positive to Clostridium difficile following antibiotic use.
- d) Intubation of a 3-year-old with suspected meningococcal septic shock.

Maximum Score	9.0
Percentage Passed	100%

Examiners' comments:

This was a very straightforward question concerning infection control measures required for a range of conditions. This was well answered with good answers giving specific detail rather than general points. All candidates presented information clearly in table format.

Reference(s):

Australian Guidelines for the Prevention and Control of Infection in Healthcare. AUSTRALIAN COMMISSION ON SAFETY AND QUALITY IN HEALTH CARE

NZ: Ministry of health infection control and prevention <https://www.health.govt.nz/our-work/infection-prevention-and-control#measures>

Question 12

- a) List six risk factors for cerebral oedema in patients presenting with diabetic ketoacidosis (DKA). (30% marks)
- b) List six measures that may help prevent the development of cerebral oedema during the treatment of DKA. (30% marks)
- c) Briefly outline the treatment of cerebral oedema in a patient with DKA. (40% marks)

Maximum Score	7.25
Percentage Passed	94%

Examiners' comments:

This question focused on cerebral oedema, a rare but important complication of DKA management which was generally well answered. A good answer should give specific information relating to the question, rather than a generic ABC approach for all ICU management. For example, many candidates described a rapid move to intubation without discussing CO₂ management. The generic pCO₂ targets of 35-40 mmHg suggested by some candidates could be potentially dangerous in this child with DKA and should have been discussed.

Reference(s):

Lawrence SE, Cummings EA, Gaboury I, Daneman D. Population-based study of incidence and risk factors for cerebral edema in pediatric diabetic ketoacidosis. *J Pediatr* 2005; 146:688.

Glaser N, Barnett P, McCaslin I, et al. Risk factors for cerebral edema in children with diabetic ketoacidosis. The Pediatric Emergency Medicine Collaborative Research Committee of the American Academy of Pediatrics. *N Engl J Med* 2001; 344:264.

Decourcey DD, Steil GM, Wypij D, Agus MS. Increasing use of hypertonic saline over mannitol in the treatment of symptomatic cerebral edema in pediatric diabetic ketoacidosis: an 11-year retrospective analysis of mortality*. *Pediatr Crit Care Med* 2013; 14:694.

Soto-Rivera CL, Asaro LA, Agus MS, DeCoursey DD. Suspected Cerebral Edema in Diabetic Ketoacidosis: Is There Still a Role for Head CT in Treatment Decisions? *Pediatr Crit Care Med* 2017; 18:207.

Question 13

- Describe four physiological states for which pulmonary artery (PA) banding may be used. Give one specific example for each physiological state. (40% marks)
- A 1-month-old baby returns from theatre after PA banding for multiple VSDs. Outline how you will assess the adequacy of the PA band. (40% marks)
- For the above clinical example, list four factors that influence flow across the PA band. (20% marks)

Maximum Score	7.5
Percentage Passed	67%

Examiners' comments:

PA Banding is an important technique used in paediatric cardiac surgery which candidates are expected to have reasonable knowledge and experience with. This question was well answered by candidates with good knowledge who gave sufficient detail to show understanding and outline a practical approach. Many candidates did not give complete answers, such as omitting part of questions or giving only 2 states when PA banding is used rather than four as required. Although asked for a state and an example, some candidates gave only one of these or two from same state. Many candidates could have scored higher marks but skimmed over important detail, such as what findings they would look for in a 'CXR' or a 'blood gas'.

Reference(s):

Agasthi P, Graziano JN. Pulmonary Artery Banding. [Updated 2021 Dec 26]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK560838/>

Schranz et al. Pulmonary artery banding in dilative cardiomyopathy of young children: review and protocol based on the current knowledge. *Translational Pediatrics* 2019;8(2)

Pulmonary Artery Banding. Shabir Bhimji, MD, PhD; Chief Editor: Suvro S Sett, MD, FRCSC, FACS Updated: Dec 10, 2016 <https://emedicine.medscape.com/article/905353-overview>

Question 14

With respect to mechanical ventilation:

- a) Draw and label the features of an idealised pressure-volume loop in a paralysed patient on volume-controlled ventilation. (50% marks)
- b) Draw and explain the changes that will occur in this loop in the setting of:
- i. Decreased respiratory compliance (25% marks)
 - ii. Lung overdistension (25% marks)

Maximum Score	8.5
Percentage Passed	33%

Examiners' comments:

Candidates either had good knowledge of pressure volume loops or they did not. Overall, it was poorly done. A good answer needed accurately labelled axes, separate diagrams for each situation, labels and explanations in addition to the drawings. Incorrect labelling of axes was common, and diagrams were generally sloppily drawn, sparsely labelled or with combined into one, making them confusing. Failure to indicate inspiratory and expiratory directions was also surprisingly common and many candidates did not give explanations for the differences in their graphs. As a general comment, it is helpful to write answers in a single colour, as colours are not always reproduced for examiners, and this question illustrates the importance of reading the question.

Reference(s):

Gentile. Cycling of the Mechanical Ventilator. RESPIRATORY CARE JANUARY 2011 VOL 56 NO 1

Harris. Pressure Volume Curves of the respiratory System. RESPIRATORY CARE • JANUARY 2005 VOL 50 NO 1

Question 15

You receive a call from an emergency physician in a regional emergency department 300 km away. A 12-year-old has been brought in by ambulance in cardiac arrest following multiple stab wound injuries.

The ambulance arrived 5 minutes after the injury. She lost output after a further 10 minutes. She was intubated at the scene, had needle decompression of her chest, and 20 mls/kg of 0.9% saline.

She has had continuous CPR by the paramedic crew for the last 15 minutes.

On arrival:

- 6.0 cuffed ETT 18 cm at lips. End-tidal CO₂ trace present
- Pulseless electrical activity on monitor, heart rate 50 beats/min
- SpO₂ 89% on FiO₂ 1.0
- Multiple stab wounds to lower chest, upper abdomen and lumbar regions

Parameter	Patient Value	Normal Range
pH	6.90*	7.32 – 7.46
PaCO ₂	67 mmHg (8.9 kPa)*	31 – 42 (4.1 – 5.6)
Potassium	5.0 mmol/L	3.5 – 5.0
Bicarbonate	8.9 mmol/L*	20.0 – 26.0
Lactate	11.0 mmol/L*	1.0 – 1.8
Haemoglobin	80 g/L*	115 – 155

a) List three likely causes of cardiac arrest in this patient. (15% marks)

b) Outline your advice to the referring doctor. (85% marks)

Maximum Score	7.25
Percentage Passed	28%

Examiners' comments:

This question required critical thinking, global overview and an organisational approach to a very high-risk situation. Advice to the referring doctors required a statement that this was a very high-risk situation, clearly set out structured, organised overview and specific details of the immediate resuscitation. The advice needed to discuss teamwork, specifying who was needed and why. An advanced management plan should have discussed surgical options and feasibility, discussion of whether to transfer and consideration of palliation. Most candidates could identify potential life-threatening injuries but struggled to describe a plausible practical approach to the management of this crisis that would help a caller in a remote location. A simple ABC approach was insufficient, and some candidates did not specify this was high risk. Overall candidates did not give sufficient detail, discuss teamworking, or management beyond the initial ABC resuscitation. Some candidates suggested ECMO support before basic steps, which would not be appropriate to this case or setting. Very few discussed talking with the family. An important principle in answering this question is to maintain a global overview.

Reference(s):

Paediatric traumatic arrest: the development of an algorithm to guide recognition, management, and decisions to terminate resuscitation Vassallo et al, Emerg Med J. 2018; 35, 669-674

Question 16

The pressure trace (Figure 16) shown below is from a direct intracardiac left atrial (LA) line placed during cardiac surgery (the corresponding ECG trace is shown for comparison).

(Image removed from report.)

a) Describe the physiological correlates of the letters a, c, x, v, and y. (25% marks)

b) List (or draw) the changes seen if the LA line catheter migrates through the mitral valve. (10% marks)

c) List eight complications associated with a direct LA line. (20% marks)

d) Outline the process for safe removal of a direct LA line. (45% marks)

Maximum Score	8.5
Percentage Passed	61%

Examiners' comments:

This question tested understanding of physiological principles behind a common monitoring device. A good answer should outline an understanding of the basic sciences and physiological principles underlying equipment used in PICU. Many candidates struggled to interpret the physiological correlates of the waveforms of LA catheter and changes in the waveform when it migrates to LV. Candidates equated a ventricular wave form with an arterial line trace showing a lack of understanding of diastolic

pressure. Most candidates displayed good understanding of the complications and process of safe removal of LA catheter consistent with clinical experience.

Reference(s):

Cardiovascular Physiology, by Pappano and Weir RCH/CHW/Starship – Post op cardiac surgery unit protocols

J Cardiothoracic and Vascular Anaesthesia. Management and Diagnosis of Post Operative Cardiac Tamponade. VOLUME 26, ISSUE 2, P302-311, APRIL 01, 2012

Question 17

A 14-year-old girl presents with a 1-day history of cough, pleuritic chest pain and shortness of breath on exertion. She is previously well but was COVID-19 positive on PCR testing 7 days ago and has been isolating at home since then. She is a non-smoker, has no family history of cardiac disease and is taking the oral contraceptive pill for acne.

On examination:

- Alert
- Temperature 37.5°C
- SpO₂ 90% in air
- Respiratory rate 22 breaths/min
- Chest clear to auscultation
- Heart rate 110 beats/min, blood pressure 105/60 mmHg
- Chest X-ray shows a normal cardiac silhouette and clear lung fields
- Her ECG (ECG 17) is shown on page 4

(Image removed from report.)

Outline your approach to investigation and initial management.

Maximum Score	9.0
Percentage Passed	78%

Examiners' comments:

Although pulmonary embolism is an uncommon clinical problem in paediatric ICU, most candidates identified the clinical problem and outlined an appropriate management plan. A good answer showed understanding of a diagnosis of pulmonary embolus, possible differentials, and management of a serious but not imminently life-threatening PE. Although not specifically asked for, a good answer included comment on the ECG attached. Many candidates did not comment or struggled to interpret the ECG given. Indiscriminate listing of all possible PE treatments without reference to the clinical scenario did not score highly.

Reference(s):

Pulmonary embolism in children. Navanandan et al. Pediatr Emer Care 2019;35:143-153

Oh's Intensive Care Manual, 7th Edition, Chapter 34

Question 18

A 3-year-old girl with pneumococcal pneumonia and sepsis has been in PICU for 5 days. She has weaned from inotropes but remains intubated and ventilated.

Enteral feeds were started on day 2 but increases in feed volumes have been stalled by large volume gastric aspirates and occasional vomiting. Feeds have been discontinued overnight after a large vomit.

On examination her abdomen is moderately distended but soft to palpation. There are quiet bowel sounds present.

- a) List four likely factors contributing to feed intolerance in this patient. (20% marks)
- b) Outline the clinical consequences of feed intolerance. (40% marks)
- c) Outline strategies to improve the delivery of nutrition to this patient. (40% marks)

Maximum Score	8.5
Percentage Passed	89%

Examiners' comments:

Feed intolerance is a common problem in paediatric ICU with candidates showing a good understanding of contributing factors and consequences of poor nutrition in PICU, with a graded response to feed intolerance to improve nutrition. Candidates were able to outline pragmatic strategies reflecting clinical experience in day-to-day management of the patients in PICU. Better answers were well structured and clearly set out.

Reference(s):

Solana et al. Feed intolerance and pyloric feeding in the critically ill child. Pediatric Medicine 2020;3(19)

Martinez et al. Gastric Dysmotility in Critically Ill Children: Pathophysiology, Diagnosis, and Management. PCCM 2015;16(9):828-836

Tume et al. A review of feeding intolerance in critically ill children. European J of Pediatrics 2018;177:1675-1683

Question 19

Outline the important considerations regarding consent in paediatric intensive care research. Do not address the requirements for consent from competent adults in non-urgent situations.

Maximum Score	6.0
Percentage Passed	17%

Examiners' comments:

This question required an understanding of the principles of consent for research in PICU. These issues are well described in research protocols, but marks were awarded for any reasonable answers. A good answer required a discussion of principles of consent, consideration of different developmental stages and implications of these. Discussion required gaining consent for research in emergency situations and balancing public benefit with issues of risk, privacy, and confidentiality. This question was generally

poorly answered. Few candidates appeared to have read around this subject, considered consent issues or had experience in seeking consent, with answers reflecting this.

Reference(s):

<https://www.nhmrc.gov.au/about-us/publications/national-statement-ethical-conduct-human-research-2007-updated-2018>. Chapter 2.2

Question 20

Outline the principles for the safe transfer of a COVID-19 positive or suspected COVID-19 positive patient from the Emergency Department to PICU. Address both ventilated and non-ventilated patients in your answer.

Maximum Score	7.65
Percentage Passed	83%

Examiners' comments:

Most candidates answered this question well. Candidates needed to discuss ensuring patient stability before the transfer and outlining how they would clear the transfer route (such as priority access to lifts). Better answers gave more specific detail. Very few candidates discussed briefing the family and decontamination post transfer.

Reference(s):

Agency for Clinical Innovation. Intrahospital transfer of COVID-19 positive and suspected COVID-19 positive patients from the emergency department. 09/2021

Kamil IN. Safe Intrahospital Transport of Critically ill COVID-19 Patients. J Crit Intensive Care. 2020;11 (Suppl. 1):18–19

Australian and New Zealand Intensive Care Society. The Australian and New Zealand Care Society (ANZICS) COVID-19 Guidelines: Version 3 [Internet]. Melbourne: ANZICS; 2020

Australian College for Emergency Management (ACEM). Transport of Patients [Internet]. West Melbourne, VIC: ACEM Available at Australian College for Emergency Medicine - Transport of Patients

Question 21

Outline the pros and cons of a biventricular surgical repair when the left ventricle is considered to be 'borderline' in size. You may present your answer in table form if you wish.

Maximum Score	6.5
Percentage Passed	28%

Examiners' comments:

The question was "pros and cons of a biventricular surgical repair when the left ventricle is considered to be 'borderline' in size." However many candidates did not address the question asked, and instead compared the pros and con of doing a univentricular with a biventricular repair. Candidates were invited to present a table comparing pros and cons, with a good answer setting out a structured comprehensive overview. Few candidates were able to discuss the development of pulmonary hypertension and subsequent consequences. Marks were not awarded for general information about post operative care or indications for surgery.

Reference(s):

Baird C et al. Biventricular Repair in Patients with a Borderline Left Heart. Paediatric and Congenital Cardiology, Cardiac Surgery and Intensive Care 2013; 1765-1785.

Desai M. Small and borderline left ventricular outflow tract - a perplexing malady. In-dian Journal of Thoracic and Cardiovascular Surgery; 2021; 37(Suppl 1): S123-S130.

Hickey E et al. Critical left ventricular outflow tract obstruction: The disproportionate impact of biventricular repair in borderline cases. J Thorac Cardiovasc Surg 2007; 134(6): 1429-36.

Loffland et al. Critical aortic stenosis in the neonate: a multi-institutional study of management, outcomes and risk factors. Congenital Heart Surgeons Society (CHSS). J Thorac Cardiovasc Surg 2001; 121:10-27.

Question 22

Critically evaluate the association between hyperoxia and mortality in PICU.

Maximum Score	8.53
Percentage Passed	28%

Examiners' comments:

This question asked candidates to "critically evaluate" the association between hyperoxia and mortality in PICU. Many candidates answered this instead as a 'discuss' question. A good answer required the candidate to discuss the salient findings of important recent studies, and to conclude with a statement of their perspective. Candidates with good knowledge of current evidence did this well, while those with less knowledge provided answers lacking in detail.

Reference(s):

Effect of Oxygen Therapy on Mortality in the ICU. Young PJ, NEJM 2021 384;14:1361-3.

ICU-ROX NEJM 2020;382:989-98.

LOCO2. NEJM 2020;382:999-1008.

HOT-ICU. NEJM 2021;384:1301-11

Mega-ROX protocol and SAP. Young PJ et al. Crit Care Resusc 2022;24(2):137-149

Association of arterial hyperoxia with outcomes in critically ill children: a systematic review and meta-analysis. Lilien et al. JAMA Network Open 2022;5(1):e2142105.

Admission hyperoxia is a risk factor for mortality in pediatric intensive care. Numa A et al PCCM 2018;19(8):699-704.

Oxy-PICU pilot trial. Peters MJ et al. Intensive Care Medicine 2018;44:1240-1248.

Question 23

An 11-month-old boy is admitted from the Emergency Department with tachypnoea, increased respiratory effort and desaturation to 82% on high flow nasal prong oxygen (2 L/kg/min). He is COVID-19 negative on PCR testing.

He was born at 24 weeks gestation and was ventilated in NICU for 8 weeks, requiring a course of steroids to separate from mechanical ventilation. He has recently weaned his home oxygen therapy to 0.25 L/min.

Following intubation, he deteriorates further. His chest X-ray (Figure 23) is shown below.

(Image removed from report.)

Review the X-ray and outline your plan for immediate care and a plan for escalation.

Maximum Score	7.5
Percentage Passed	50%

Examiners' comments:

This question required a structured approach to escalation for a young patient with severe air leak. This needed to progress from the acute drainage to discussion regarding ventilation techniques and ECMO in the context of an acute on chronic insult. Discussion needed to include the wider issue of the background problems, limitations for treatment and parent involvement in this patient. Some candidates did not consider the background of the patient. Poor answers demonstrated poor understanding of the concept of ventilating a patient with significant air leak. Many candidates suggested inappropriate treatment, such as paralysing the patient with air leak rather than aiming for spontaneous ventilation, steroids and hyperbaric oxygen.

Reference(s):

Furhmann and Zimmerman Pediatric Critical Care 6th Ed 2021

Section V Pulmonology Ch 51 Neonatal Pulmonary Disease

CXR image

https://www.researchgate.net/publication/271280444_A_Case_of_Severe_Acute_Exacerbation_of_Bronchial_Asthma_Treated_with_Low_Minute_Ventilation_-_A_Case_Report_-/figures?lo=1

Question 24

A 4-year-old girl was intubated in the Emergency Department following a seizure, and has been admitted to PICU.

Her mother reports that the child has had “gastro” for the last few days, and was given several doses of ibuprofen for fever.

Her initial laboratory results are shown below:

Parameter	Patient Value	Normal Range
Sodium	130 mmol/L*	135 – 145
Potassium	5.9 mmol/L*	3.5 – 5.0
Urea	16.8 mmol/L*	3.0 – 8.0
Creatinine	314 µmol/L*	15 – 60
Albumin	29 g/L*	33 – 47
Haemoglobin	95 g/L*	115 – 155
Platelets	105 x 10 ⁹ /L*	150 – 400
WCC	12.8 x 10 ⁹ /L	4.5 – 13.5
Neutrophils	9.1 x 10 ⁹ /L*	1.5 – 8.0
Lymphocytes	2.1 x 10 ⁹ /L	1.5 – 6.5
Eosinophils	1.2 x 10 ⁹ /L*	0.0 – 0.5

She has not passed urine for more than 24 hours.

- What is the most likely diagnosis? List four differential diagnoses. (15% marks)
- Briefly outline your management plan. (40% marks)
- Briefly outline the pathophysiology of this condition. (15% marks)
- List six potential complications of this condition. (30% marks)

Maximum Score	7.125
Percentage Passed	67%

Examiners' comments:

The question describes a 4 year old with a neurological presentation, renal failure, anaemia and mild thrombocytopenia in the context of a GIT disease. Candidates were expected to recognise that this was likely to be HUS (hemolytic uraemic syndrome) and to have a good understanding of this condition. Most candidates did well in this question.

Reference(s):

Grisaru S. Management of hemolytic-uremic syndrome in children. *Int J Nephrol Renovasc Dis.* 2014;7:231-239. Published 2014 Jun 12. doi:10.2147/IJNRD.S41837

Joseph A, Cointe A, Mariani Kurkdjian P, Rafat C, Hertig A. Shiga toxin-associated hemolytic uremic syndrome: A narrative review. *Toxins.* 2020 Feb;12(2):67.

Question 25

A 10-year-old girl, day 12 following bone marrow transplant for relapsed B-cell ALL, is admitted to PICU with fever, abdominal pain and bilious aspirates.

On examination:

Glasgow Coma Score 14

In pain despite morphine 30 µg/kg/hour

SpO₂ 94% in 4 L/min facemask oxygen

Heart rate 145 beats/min, blood pressure 85/50 mmHg

Abdomen distended and tense with occasional bowel sounds

Abdominal CT scan demonstrates severe diffuse colitis but no frank ischaemia or perforation.

Recent laboratory tests are shown below:

Parameter	Patient Value	Normal Range
pH	7.28*	7.32 – 7.46
PaCO ₂	45 mmHg (6.0 kPa)*	31 – 42 (4.1 – 5.6)
Bicarbonate	19 mmol/L*	20 – 26
Lactate	4.0 mmol/L*	1.0 – 1.8
Sodium	132 mmol/L*	135 – 145
Potassium	5.2 mmol/L*	3.5 – 5.0
Glucose	9.00 mmol/L*	3.60 – 5.47
Urea	18.2 mmol/L*	2.1 – 6.5
Creatinine	220 µmol/L*	20 – 60
Albumin	30 g/L*	33 – 47
Alkaline Phosphatase	121 U/L*	100 – 300
Bilirubin	32 µmol/L*	0 – 10
Alanine transferase (ALT)	45 U/L*	< 45
Aspartate transferase (AST)	60 U/L*	< 41
γ-Glutamyl transferase (GGT)	90 U/L*	0 – 40
Haemoglobin	90*	115 – 155
Platelets	13 x 10 ⁹ /L*	150 – 400
White cell count	0.1 x 10 ⁹ /L*	4.5 – 13.5
International Normalised Ratio (INR)	1.4*	0.8 – 1.2
Activated Partial Thromboplastin Time (APTT)	52	27 – 46

Outline your approach to management, specifically including analgesia, gut management, antimicrobial therapy, haematological support and renal dysfunction. Do not include details about renal replacement therapy in your answer.

Maximum Score	6.75
Percentage Passed	72%

Examiners' comments:

This question required a comprehensive structured and detailed approach to management of this complex child with multiple comorbidities. A good answer required the candidate to address the specific needs of an immunocompromised patient with severe colitis. This needed to include discussion of escalation management of the colitis (including monitoring for perforation, ACS, and timing of surgical management). Most candidates described a reasonable approach to analgesia, renal support, and haematology support, though not addressing the specific escalation and management of colitis.

Reference(s):

Neutropenic enterocolitis, Rodrigues, *World J Gastroenterol*. 2017 Jan 7; 23(1): 42–47.

Intra-abdominal hypertension and the compartment syndrome: updated consensus definitions and clinical practise guideline. Kirkpatrick et al, ICM, 2013, 39: 1190-1206

Micromedex: dose adjustments in renal failure.

Question 26

Outline the important principles of open disclosure following a significant adverse event in ICU.

Maximum Score	7.5
Percentage Passed	67%

Examiners' comments:

This question asked for important principles of open disclosure. A good answer required discussion of these principles which are clearly set out in policy documents and an important part of clinical practice. Several candidates answered this well. However, some candidates were unable to define the formal process of Open Disclosure and confused it with the initial discussion with the family following a significant incident. Many candidates confused the "open disclosure" process with a root cause analysis and some candidates focused on offering legal advice to the parents.

Reference(s):

B A Liang: A system of medical error disclosure. Qual Saf Health Care 2002;11:64–68

Australian Commission of Safety and Quality in Healthcare: Australian Open Disclosure Framework

Question 27

You are called by the Emergency Department (ED) to help manage a 10-year-old boy who has just been intubated with severe asthma.

He received nebulised salbutamol, IV methylprednisolone, magnesium, and aminophylline in the preceding hour. Ketamine and suxamethonium were given for intubation. A 6.5 mm cuffed endotracheal tube was inserted by an experienced ED consultant.

The ventilator was pressure limiting without any measurable tidal volumes and he is now being manually ventilated with a Laerdal bag. You are told the chest is 'tight' and there is minimal chest movement.

SpO₂ is 81% and end tidal CO₂ is > 70 mmHg with a steeply up-sloping trace.

ECG shows sinus tachycardia at 190 beats/min.

Blood pressure is 70/40 mmHg.

A venous blood gas taken just prior to intubation is shown below:

Parameter	Patient Value	Normal Range
pH	6.90*	7.35 – 7.45
PCO ₂	92 mmHg (12.27 kPa)*	40 – 48 (5.33 – 6.40)
HCO ₃	26 mmol/L	23 – 27
Lactate	5.0 mmol/L*	< 2.0
Sodium	143 mmol/L*	138 – 142
Potassium	4.6 mmol/L	3.5 – 5.5
Glucose	13.0 mmol/L*	3.1 – 6.0

- a) List potential reasons for the difficulty ventilating this patient. (30% marks)
- b) Outline how you would manage this crisis. (70% marks)

Maximum Score	8.5
Percentage Passed	61%

Examiners' comments:

This question asks about how to manage a specific respiratory crisis and achieve adequate ventilation in a child with severe asthma. This is a common PICU problem with potential for candidates to score high marks. Candidates were expected to provide detailed specific answers displaying knowledge, and a structured approach to identifying and managing the problem. Most candidates did not give sufficient detail or focus on basics including ensuring correct position of the ETT. Although the question did not ask for overall management of asthma, many candidates focused on medications and cardiac support, including early ECMO support instead of addressing the crisis.

Reference(s):

T-36

Question 28

Outline common methods used for effecting and sustaining change in the ICU.

Maximum Score	7.5
Percentage Passed	56%

Examiners' comments:

This question required candidates to have a structured approach combining concepts and a process for achieving change. Candidates who performed well provided a global overview of identifying an issue, establishing a comprehensive and inclusive process of education, support, and monitoring. This question illustrates the benefit of having an approach to conceptual questions relating to organisations.

Reference(s):

Gershengorn HB et al. Management Strategies to Effect Change in Intensive Care Units: Lessons from the World of Business Part III. Effectively Effecting and Sustaining Change. Ann Am Thorac Soc 2014; Vol 11, No 3, pp 454–457.

Michailidou EM. Change Management in ICU. Am J Biomed Sci Res. 2020; 8(6): 524-29.

Question 29

A 10-year-old boy was admitted 11 days ago with a severe head injury following a motor vehicle accident. He has weaned from all sedative and analgesic agents. MRI yesterday confirmed moderate (Grade 2) diffuse axonal injury, no intracranial collections, and normal sized ventricles. His cervical, thoracic, and lumbar spine are all normal.

He failed extubation from low levels of pressure support in air 48 hours ago with weak cough and inability to clear secretions. It is felt he will require prolonged rehabilitation. Tracheostomy is suggested in morning handover.

Discuss your response, including in your answer the risks and benefits of a tracheostomy in this boy.

Maximum Score	6.75
Percentage Passed	39%

Examiners' comments:

This question required a discussion of the risks and benefits of tracheostomy, discussion of surgical vs percutaneous insertion and post tracheostomy recovery time and a statement of the candidates' perspective based on critical thinking. This is a common scenario in PICU but was poorly answered. Most candidates included a list of risks and benefits, but the majority failed to 'discuss' the role of a tracheostomy in this particular patient. A number of candidates questioned the validity of the previous extubation attempt which did not score extra points. Many candidates provided a list of risks and advantages of tracheostomy but not a critical discussion on pro and cons. Answers needed to include detail and depth of understanding.

Question 30

A 5-year-old boy with a new diagnosis of T-cell lymphoma and an anterior mediastinal mass is referred for urgent renal replacement therapy to manage tumour lysis syndrome.

He commenced chemotherapy 36 hours ago with steroids and hyperhydration. In the last two hours he has become oliguric, with urine output 0.4 ml/kg/hr.

On examination he is pale, moderately breathless with a soft stridor, and is reluctant to lie flat.

Recent investigations are shown below:

Parameter	Patient Value	Normal Range
Potassium	6.3 mmol/L *	3.5 – 5.2
Chloride	102 mmol/L	95 – 110
Urea	27.1 mmol/L*	3.2 – 7.7
Creatinine	314 µmol/L*	< 80
Uric acid	0.10 mmol/L*	0.23 – 0.42
Calcium	1.61 mmol/L*	2.10 – 2.55
Phosphate	3.92 mmol/L*	0.90 – 2.00

Parameter	Patient Value	Normal Range
Haemoglobin	64 g/L*	125 – 160
White Cell Count	28.75 x 10 ⁹ /L*	4.20 – 10.00
Platelets	25 x 10 ⁹ /L*	150 – 400

Outline the potential problems you anticipate while preparing for and initiating renal replacement therapy in this patient, and how would you mitigate them.

Maximum Score	4.4
Percentage Passed	0%

Examiners' comments:

This question required a structured approach relating to patient stability, risks of sedation versus GA and issues relating to catheter insertion. Most candidates discussed intubation with OT and ECMO standby with little discussion of risk and how to mitigate these. Deferring to anaesthesia to manage this patient fully was not an appropriate response, although including requesting support was a reasonable plan. Answers were generally poorly structured.

Reference(s):

Tan, Nolan. Anesthesia for children with anterior mediastinal masses. Pediatric Anesthesia. 2022;32:4-9

Campbell et al. Risk factors for anesthetic-related complications in pediatric patients with a newly diagnosed mediastinal mass. Pediatric Anesthesia. 2021;31:1234-1240

Pearson, Tan. Pediatric Anterior Mediastinal Mass: A Review Article. Seminars in Cardiothoracic and Vascular anesthesia. 2015;19(3):248-254.

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 Royal Children's Hospital in Melbourne.

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:

- 2 month old with HLHS post Norwood/Sano requiring ongoing respiratory support
- 2 month old baby with AVSD and PAPVD and recurrent failed extubations post AV valve repair
- 7 weeks old baby with HLHS ventilator dependent five weeks post aortic arch repair
- 18 year old girl with Rett Syndrome, IBD, seizures and pneumonia dependent on NIV
- 4 month old with chromosomal abnormality, recurrent viral infections and hypoxic respiratory failure
- 4 month old with critical aortic stenosis and chylothorax ventilator dependent post Norwood/Sano
- 18 month ex 34/40 week twin day 5 of acute viral illness requiring high levels of ventilatory support
- 2 month old baby with abnormal neurology post AVC repair and IVC thrombus

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

You are called by a GP in a regional hospital (300 km from your hospital) for advice about a 12-year-old girl who fell from a horse 1 hour ago. The event was witnessed by bystanders. She landed on her back. There was a brief loss of consciousness (less than 30 seconds). She has been subsequently distressed and inconsolable. She was unable to move from the position in which she landed. An ambulance crew brought her to the hospital on a spinal board with a neck collar on. She has no feeling or movement in her lower limbs and cannot sit up. A plain AP chest X-ray shows an abnormal alignment of the spine at C6-T1 and rib fractures (5,6 and 7) on the right side. The GP is Early Management of Severe

Trauma/Advanced Trauma Life Support trained and reports that the primary survey is otherwise unremarkable. The girl has tingling in both hands. The GP seeks further advice for management and retrieval. In particular, he would like to administer midazolam for her distress.

Outline the information you require to establish the nature and severity of this girl's injuries.

Viva 2

A previously well 4-year-old boy has a history of 3 days of fever and lethargy, and 1 day of vomiting. Today he was found at home poorly responsive, then had a witnessed prolonged tonic-clonic seizure. On arrival of the ambulance, he required multiple doses of intramuscular midazolam and was subsequently intubated for airway protection after fitting for 30 minutes. On arrival to your Emergency Department, seizures had ceased. He received steroids, antibiotics, antivirals and levetiracetam. A non-contrast CT head was reported as normal. He was admitted to your PICU, and his sedation was ceased. On assessment 16 hours later, he does not open eyes, and he has abnormal posturing to painful stimulus. He has a cough but is not consistently triggering the ventilator. The presumed diagnosis is meningoencephalitis.

Consider the potential causes for the persistently depressed conscious state and outline your approach to the investigation of this patient.

Viva 3

You have been called to the emergency department to assist with resuscitation. A previously well 15-year-old boy was at the beach surfing with friends. He was found face down in the water after he had been missing for ~ 1 minute. Bystander CPR was administered and there was ventricular tachycardia on arrival of the ambulance which briefly reverted with defibrillation. Bag & mask ventilation was commenced. En route there was intermittent VT & VF which persisted on arrival to ED for which he was repeatedly defibrillated to normal sinus rhythm with poor output for brief periods, only before reverting to VT/VF. An adrenaline infusion has been commenced and is running at 0.3 mcg/kg/min. The rhythm strip is shown below.

Describe the rhythm strip and your differential diagnoses.

(Image removed from report.)

Viva 4

You are the consultant on for PICU overnight. You receive a call from the emergency department to say that they have had notification of multiple homes affected by a fast-moving bush fire in a town 80km from your hospital. So far emergency services have identified 8 severely burned children, 4 of whom have been intubated at scene. There are multiple burned adults and 4 known adult deaths. The fire is not yet under control. You work in the major paediatric trauma and burns centre in the region. Your unit is staffed for 22 beds, and currently has 21 patients, of whom 10 are intubated, with 2 on ECMO and one on haemofiltration.

Describe how you will prepare the intensive care unit to receive these patients.

Viva 5

A 16-month-old girl presents with a 1-day history of fever, lethargy, vomiting and rapidly progressive non-blanching rash (pictured below).

On examination:

- she is responsive only to pain
- heart rate is 220 beats per minute
- blood pressure is 85/40 mm Hg
- SpO₂ is 90% on 8 L/minute of O₂ via Hudson mask.

What is your provisional and differential diagnosis, and what are your immediate priorities?

(Image removed from report.)

Viva 6-Procedure Viva

This equipment-based viva will examine your knowledge of temporary cardiac pacing equipment and procedures. Please enter the room after the 2 minutes reading time has elapsed.

Viva 7 – Radiology Viva

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

Viva 8 – Communication Viva

You are about to meet Felicity, one of the PICU registrars on the team. You were assigned as Felicity's mentor at the beginning of the term. You met with her early in the term but haven't had regular formal meetings. You have asked to meet with her today for a routine catch up. Felicity was formerly a neonatology trainee who switched to PICU training 6 months ago. She is well liked by the nurses, but your fellow consultants consider her uninterested; she has repeatedly cancelled her teaching responsibilities, declined a project you thought suited her, and declined some shift swaps when asked to cover for a sick colleague. She also seems to lack basic knowledge expected in an early career CICM trainee.