



SECOND PART EXAMINATION

EXAM REPORT

AUGUST / OCTOBER 2019

This report is prepared to provide candidates, tutors and Supervisors of Training with information regarding the assessment of candidates' performance in the CICM Second Part Examination. Answers provided are not necessarily model answers but a guide as to what was expected and for use as an educational resource. Trainees should discuss the report with their tutors so that they may prepare appropriately for future examinations. Trainees should not rely solely on writing practice answers to previous exam questions for exam preparation, and first establish a strong knowledge base from learning at the bedside and studying relevant texts, journals and on-line sources.

The exam comprises a written section and an oral section. The written exam consists of two 2.5hr papers of 15 short answer questions each. The pass mark for the written section is derived by the Angoff method and for this sitting was set at 51%. The oral exam consists of eight interactive vivas and two separate clinical "hot cases".

The tables below provide an overall statistical analysis as well as information regarding performance in the individual sections. A comparison with data from the five previous exams is provided.

In all sections of the exam the candidate has to demonstrate performance consistent with that of a junior consultant, i.e. demonstrate he/she has the ability for safe, effective, independent practice as an Intensivist. Candidates who are not at this level are encouraged to defer their attempt at the exam.

Overall Performance	October 2019	May 2019	October 2018	May 2018	October 2017	May 2017
Presenting for written (Including OTS)	57	44	67	49	49	40
Carrying a pass or exempted from a previous attempt	7	13	7	11	8	9
OTS Exempt	0	0	0	0	0	0
Total number presenting (written + carry + OTS)	64	57	74	60	57	49
Invited to orals (passed written section)	34	20	47	28	39	24
Total number invited to oral section	40	33	54	38	47	33

Analysis of Performance in Individual Sections	October 2019	May 2019	October 2018	May 2018	October 2017	May 2017
Successful in the written section	34/57 60%	20/44 45%	47/67 70%	28/49 57%	39/49 80%	24/40 60%
Successful in the Hot Case section	27/40 68%	24/33 73%	33/54 61%	23/38 61%	33/47 70%	15/33 45%
Successful in both Hot Cases	15/40 38%	11/33 33%	19/54 35%	11/38 29%	18/47 38%	11/33 33%
Successful in the Viva section	33/40 83%	26/33 79%	36/54 67%	31/38 82%	36/47 77%	24/33 73%

Sectional Pass Rates	October 2019		May 2019		October 2018		May 2018		October 2017		May 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	55%	88%	64%	88%	57%	85%	58%	85%	60%	100%	42%	90%
Hot Case 2	60%	83%	55%	80%	65%	90%	58%	90%	62%	98%	55%	95%
Viva 1	83%	92%	73%	80%	56%	75%	76%	95%	64%	90%	73%	85%
Viva 2	80%	80%	61%	85%	46%	95%	87%	100%	30%	68%	73%	90%
Viva 3	90%	85%	76%	77%	74%	85%	87%	100%	51%	83%	55%	71%
Viva 4	50%	85%	61%	93%	63%	95%	71%	98%	62%	83%	73%	93%
Viva 5	65%	90%	48%	83%	70%	83%	50%	80%	79%	100%	70%	77%
Procedure Viva	45%	93%	85%	90%	81%	95%	53%	90%	45%	78%	73%	90%
Radiology Viva	90%	91%	36%	67%	30%	77%	76%	97%	66%	95%	73%	94%
Communication Viva	50%	95%	67%	88%	50%	90%	53%	84%	91%	100%	52%	95%

Oral Section Pass Rates	October 2019	May 2019	October 2018	May 2018	October 2017	May 2017
Candidates who passed in written section and passed the overall exam	24/34 71%	17/20 85%	35/47 75%	22/28 79%	30/39 77%	17/24 71%
All candidates invited to oral section and passed the overall exam (written + carry + OTS)	30/40 75%	26/33 79%	39/54 72%	30/38 79%	37/47 79%	21/33 64%
Overall Pass Rate	30/64 47%	26/57 46%	39/74 53%	30/60 50%	37/57 65%	21/49 43%

EXAMINERS' COMMENTS

Written Paper

The pass rate for the written section was 60% which is close to the average. Questions dealing with clinical signs, ECG interpretation and statistics were particularly poorly answered. Several examiners commented that candidates had not appeared to consider the mark distribution in some multi part questions, spending too little time on the more important sections.

As in previous exams, candidates who failed questions did so for one or more of the following reasons:

- Insufficient knowledge of the topic in question
- Insufficient detail and/or depth of the answer
- Poorly structured answer
- Inadequate reference to supportive evidence where relevant
- Failure to answer the question as asked
- Omission of all or part of the question

Candidates that failed questions most often gave insufficiently detailed answers that were not at the level expected of a junior consultant. Candidates often gave generic "proforma" answers that did not deal with the specific issues in the question.

Candidates are advised to read the questions carefully and thoroughly and ensure they answer the question as asked and address all parts of each question. **Candidates are reminded to make sure their writing is legible and to avoid using non-standard abbreviations.** Candidates are also reminded that professional conduct is assessed throughout the exam process and that inappropriate comments written on the answer paper are not acceptable.

Candidates who failed the written section scored an average of 45% compared with those candidates who passed, whose average score was 56%.

SECOND PART WRITTEN EXAMINATION

- (A) Write your answers in the blue book 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

NOTE

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

Please note that in this report all images from the SAQs have been removed.

Question 1

Outline the pathophysiology, diagnosis and management of acalculous cholecystitis in the critically ill.

ANSWER TEMPLATE

Pathophysiology

(2 marks)

Acalculous cholecystitis is caused by gallbladder stasis from hypomotility that leads to increased intraluminal pressures in the gallbladder wall, resulting in ischemia, inflammation, and potential necrosis. Stasis can lead to bacterial colonisation and progress to infection.

Note: It was important to appreciate that hypomotility is the cause of stasis in this case as opposed to obstruction in the case of calculous cholecystitis

Diagnosis:

(4 marks)

Often associated with severe critical illness, trauma or burns, period of “shock” state e.g. post-cardiac arrest, prolonged fasting/on TPN.

History and physical examination generally unreliable – may have abdominal signs.

Features of systemic inflammation, including fever, raised WCC, septic shock, general deterioration during critical illness, but these are non-specific.

May be elevation of LFT's but again non-specific.

Diagnosis usually based on consideration of possibility when investigating fever or shock in critically ill patient.

Radiology is mainstay of diagnosis

Ultrasonography is most reliable and convenient method-

Increased GB wall thickness is primary diagnostic criteria (>3.5mm)

Other signs include oedema, peri-cholecystic fluid, intramural gas.

Other imaging modalities:

CT scan- sensitive, not very specific

Cholescintigraphy (HIDA-CCK scan- measures ejection fraction of the GB (<35% abnormal) in response to CCK- time consuming and requires transport of critically ill patient)

Management:

(4 marks)

1. General supportive care (e.g. IV fluids; NBM; Pain control; Antiemetics)

2. Antibiotics (similar to peritonitis regimes)

Either single agent regimen; Piperacillin/Tazobactam or Meropenem

Or combination regimen; Cefepime or Ceftazidime plus metronidazole

(*Note: any suitable regime acceptable*). Duration depends on achievement of source control

3. Gall bladder drainage- indicated in the setting of deterioration/shock despite antibiotics other causes ruled out.

1. Percutaneous cholecystostomy (preferred technique, can be performed at the bedside)

2. Open or laparoscopic cholecystectomy

3. Transpapillary drainage through ERCP (not preferred method), or more recently endoscopic placement of covered metal stent

Examiners Comments:

Very few candidates had any idea about hypomotility in the pathophysiology of the disease. Knowledge gaps existed about pathophysiology, precise USS findings and role of cholecystostomy.

Maximum Score	8.6
Percentage Passed	64.9%

Question 2

A 49-year-old female is intubated and ventilated in your ICU following a motor vehicle accident. You are called to the bedside when the ventilator low pressure alarm is triggered. List the potential causes and outline your approach to this problem.

ANSWER TEMPLATE

Potential causes:

Most likely air leak:

ETT cuff rupture or incompetent pilot balloon valve,
 ETT dislodgement,
 Disconnection/ defect in ventilator circuit,
 Leak into chest drain, Bronchopleural fistula
 Pressure alarm or Tidal Volume set too low
 Ventilator failure

(3 marks)

Approach

1. Examine the patient. – will indicate urgency of problem: e.g.:
 - a. SpO2
 - b. ET CO2
 - c. Chest movement
 - d. Breath sounds
 - e. Bubbling in chest drains if present
2. Carefully check ETT
 - a. Insertion depth? any change from previous to indicate dislodgement
 - b. Air pressure in cuff- re-inflate if low
 - c. Audible air leak
 - d. If suspect dislodgement have direct look with laryngoscope and reintubate if necessary (2 marks)
3. Check ventilator settings and alarms? any inadvertent change to these (1 mark)
4. Check total length of ventilator circuit, specially connections and any access ports (1 mark)

Depending on status of patient may have to take off ventilator and hand-bag patient, +/- exchange ETT if thought to be culprit. (1 mark)

Exchange circuit if necessary. Internal ventilator problem unlikely but may need to change out ventilator. (1 mark)

Examiners Comments:

Those candidates who clearly identified that a low-pressure alarm is usually associated with an air leak (anywhere in the system/patient) and had a logical approach to managing the problem were able to score good marks. Those who gave a random selection of 'any problem that a patient may develop and may trigger any alarm' did not score so well.

Maximum Score	8.8
Percentage Passed	75.4%

Question 3

3.1

A 32-year-old male is admitted to your ICU after an appendicectomy for a perforated appendix. He has a background of schizoaffective disorder. On admission, he is receiving vasopressor support with noradrenaline at 7 mcg/min. and has a temperature of 41°C. The first arterial blood gas on admission is given below:

Parameter	Patient Value	Adult Normal Range
FiO ₂	50%	

pH	7.01*	7.35 – 7.45
pO ₂	120.0 mmHg (16.4 kPa)	
pCO ₂	58.0 mmHg (9.6 kPa)*	35.0 – 45.0 (4.6 – 6.0)
SpO ₂	96%	
Bicarbonate	14.0 mmol/L*	22.0 – 26.0
Base Excess	-15.0 mmol/L*	-2.0 to +2.0
Lactate	8.5 mmol/L*	0.5 – 1.6
Sodium	135 mmol/L	135 – 145
Potassium	5.2 mmol/L*	3.5 – 5.0
Chloride	99 mmol/L	95 – 105
Glucose	8.0 mmol/L*	3.5 – 6.0

- a) Comment on the acid base status. (10% marks)
- b) List four likely explanations for these findings other than sepsis. (10% marks)

3.2

A 58-year-old female presents with muscle weakness and fatigue. Her arterial blood gas is given below:

Parameter	Patient Value	Adult Normal Range
FiO ₂	0.21	
pH	7.01*	7.35 – 7.45
pO ₂	88.0 mmHg (5.6 kPa)	
pCO ₂	29.0 mmHg (3.9 kPa)*	35.0 – 45.0 (4.6 – 6.0)
Bicarbonate	7.0 mmol/L*	22.0 – 26.0
Base Excess	-21.0 mmol/L*	-2.0 to +2.0
Lactate	0.5 mmol/L	0.5 – 1.6
Sodium	120 mmol/L*	135 – 145
Potassium	2.3 mmol/L*	3.5 – 5.0
Chloride	97 mmol/L	95 – 105
Glucose	4.8 mmol/L	3.5 – 6.0
Urinary pH	6.1	

- a) Comment on the acid base status. What is the likely cause for her symptoms and give a rationale for your answer. (30% marks)

3.3

A 65-year-old male is found wandering and incoherent in the street before presenting to hospital. His arterial blood gas is shown below:

Parameter	Patient Value	Adult Normal Range
FiO ₂	0.3	
pH	7.50*	7.35 – 7.45
pO ₂	105 mmHg (14 kPa)	
pCO ₂	20.0 mmHg (1.9 kPa)*	35.0 – 45.0 (4.6 – 6.0)

SpO ₂	98%	
Bicarbonate	15.0 mmol/L*	22.0 – 26.0
Base Excess	-7.3 mmol/L*	-2.0 to +2.0
Lactate	2.3 mmol/L*	0.5 – 1.6
Sodium	120 mmol/L*	135 – 145
Potassium	3.9 mmol/L	3.5 – 5.0
Chloride	71 mmol/L*	95 – 105
Glucose	11.0 mmol/L*	3.5 – 6.0

a) Comment on the acid base status.

(30% marks)

3.4

The following data refer to a 34-year-old male admitted to ICU twenty days after an allogeneic stem cell transplant for acute myeloid leukaemia. Over the last few days he has been complaining of right upper quadrant abdominal pain, and observed to have gained several kilograms in weight.

Venous Biochemistry		
Parameter	Patient Value	Adult Normal Range
Sodium	142 mmol/L	135 – 145
Potassium	4.8 mmol/L*	3.5 – 4.5
Chloride	97 mmol/L	95 – 105
Bicarbonate	22 mmol/L	22 – 26
Urea	11.2 mmol/L*	2.9 – 8.2
Creatinine	134 µmol/L*	70 – 120
Calcium	2.13 mmol/L	2.10 – 2.55
Phosphate	1.21 mmol/L	0.65 – 1.45
Total bilirubin	342 µmol/L*	0 – 25
Aspartate aminotransferase (AST)	175 U/L*	< 40
Gamma glutamyl transferase (GGT)	123 U/L*	< 40
Alanine aminotransferase (ALT)	87 U/L*	< 40

a) Give the most likely diagnosis.

(10% marks)

b) What are the characteristic findings on liver ultrasound scan?

(10% marks)

ANSWER TEMPLATE

3.1

a) Comment on the acid base status.

(1 mark)

- Increased anion gap metabolic acidosis/lactic acidosis (AG 22, delta ratio 1)
- Respiratory acidosis

b) List four likely explanations for these findings other than sepsis

(1 Mark)

1. NMS
3. MH
4. Serotonin syndrome
5. Haemolytic transfusion reaction
6. Thyroid storm
7. Illicit drug use

3.2

Metabolic and respiratory acidosis

High anion gap acidosis (Anion gap 16) and normal anion gap acidosis, (Delta- Delta 0.24)

Likely distal renal tubular acidosis due to non-anion gap acidosis, hypokalaemia and inadequate urinary acidification. (3 marks)

3.3

Respiratory alkalosis, concomitant high anion gap metabolic acidosis (AG 34, delta-delta ratio 2.44) and pre-existing metabolic alkalosis. (3 marks)

3.4

- a) Venous-occlusive disease of the liver (sinusoidal obstruction syndrome)
b) ascites and reversal of portal vein flow. (2 marks)

Maximum Score	9.7
Percentage Passed	94.7%

Question 4

Critically evaluate the use of inhaled nitric oxide in the ICU.

ANSWER TEMPLATE

Indications:

Nitric oxide is used as a rescue therapy for ARDS with refractory hypoxemia and right ventricular dysfunction in ICU. Evidence for its use in ICU is limited. However, because of the immediate physiological benefits, it continues to be one of the agents used in ICU in these scenarios.

Mechanism of Action of iNO

- Causes selective pulmonary arteriolar vasodilatation
- This leads to a reduction in pulmonary artery pressure and pulmonary vascular resistance.
- Reduction in PVR leading to reduced afterload on RV → improvement in right ventricular cardiac output and organ perfusion.
- Dilates pulmonary vessels in better ventilated areas of the lung which in turn reduces V/Q mismatch and improves oxygenation.

Advantages:

- Quick onset of effect
- Minimal systemic hypotension

Disadvantages:

- Can cause methaemoglobinemia in patients with methaemoglobin reductase deficiency
- Very expensive
- Needs specialized/complex equipment to deliver
- Needs to be weaned slowly as can cause rebound pulmonary hypertension
- Air filtration rates of 10-12 air exchanges per hour are necessary to prevent accumulation of NO/ NO₂ in the ambient air in ICU
- Decrease platelet aggregation.

Evidence

For hypoxemia in ARDS:

Despite obvious physiological benefits iNO has not been shown to change ICU outcomes of mortality, ventilator-free days in large randomised control trials in adult and paediatric patient groups. In a Cochrane Review published in 2016, there were no statistically significant effects of iNO on longest follow-up mortality, 28-day mortality in both adults and children- moderate quality of evidence. There was a statistically significant improvement in P/F ratio and oxygenation index at 24 hours- moderate quality of evidence. There was a statistically significant increase in renal failure in iNO groups- high quality evidence.

For right ventricular dysfunction:

Only small randomised control trials and case series are available. Most of them have been conducted in post-cardiac surgery patients with right heart dysfunction, patients on LVAD, heart transplantation with primary graft dysfunction and patients with pulmonary arterial hypertension. Again all the studies demonstrate a physiological reduction in pulmonary artery pressure and ?increase cardiac output. No randomised trials have demonstrated mortality benefit with iNO.

Other studies on LVAD and heart transplantation are case series only, and there are no randomised clinical trials. Theoretical benefit for ischaemia-reperfusion injury post- lung transplant (decreased leucocyte and platelet aggregation) but no difference in clinical outcomes.

Summary statement

Inhaled nitric oxide in ICU provides short-term physiological benefits to the patients in ICU with refractory hypoxemia and right heart dysfunction. However, none of the studies has shown any mortality benefit. When used for refractory hypoxemia in ARDS, there is strong evidence that it is associated with renal failure. Also, it is an expensive therapy. Candidates might state that they use alternative selective pulmonary vasodilators like inhaled epoprostenol instead of iNO. This is also acceptable.

Examiners Comments:

Some insightful, thoughtful and well-balanced answers. However, there are quite a few candidates who have minimal knowledge of a mainstream agent used in intensive care practice. A structured approach to this type of question i.e. " Critically evaluate " was quite variable; some have practiced this template well whilst others have not thought about this prior to the exam.

Maximum Score	7.2
Percentage Passed	47.4%

Question 5

5.1

A 62-year-old female with a history of obstructive sleep apnoea (OSA) is admitted to your ICU for monitoring after an orthopaedic procedure. The results of her routine post-operative blood tests are given below:

Parameter	Patient Value	Adult Normal Range
Sodium	144 mmol/L	135 – 145
Potassium	4.0 mmol/L	3.5 – 4.5
Bicarbonate	24 mmol/L	22 – 26
Urea	8.7 mmol/L*	3.0 – 8.0

Creatinine	88 µmol/L	45 – 90
Total Calcium	3.00 mmol/L*	2.15 – 2.55

- a) List four likely aetiologies for the hypercalcaemia. (20% marks)
- b) List four other specific blood tests you would order to investigate the cause. (20% marks)

5.2

A 27-year-old male presents to the ICU febrile, ill and bleeding with the following results:

Parameter	Patient Value	Adult Normal Range
Prothrombin time (PT)	60.7 sec*	12.0 – 16.5
International normalised ratio (INR)	4.7*	0.9 – 1.3
Activated partial thromboplastin time (APTT)	> 220.0 sec*	27.0 – 38.5
Fibrinogen	0.2 g/L*	2.0 – 4.0
Platelet count	12 x 10 ⁹ /L*	150 – 350
Prothrombin time mixing study	13.8 sec	
APTT mixing study	33.5 sec	

- a) List three differential diagnoses for this presentation. (20% marks)

5.3

The following results were obtained from a 55-year-old female following an uneventful cholecystectomy:

Parameter	Patient Value	Adult Normal Range
Prothrombin time (PT)	16.0 sec	12.0 – 16.5
International normalised ratio (INR)	1.2	0.9 – 1.3
Activated partial thromboplastin time (APTT)	56.0 sec*	27.0 – 38.5
Fibrinogen	2.8 g/L	2.0 – 4.0
Platelet count	223 x 10 ⁹ /L	150 – 350
APTT mixing study	52 sec	

- a) List three causes of these results. What further blood tests would help to differentiate between them? (20% marks)

5.4

What is a mixing study, how is it performed and what is its purpose? (20% marks)

ANSWER TEMPLATE

5.1

a)

- 1) Primary hyperparathyroidism
- 2) Malignancy (including myeloma)

Note 1) and 2) are the two commonest causes accounting for 90% cases. 0.5 mark for each of these
For the two other causes, any of:

Vitamin D toxicity

Granulomatous disorders (e.g. sarcoid)

Medications (Thiazides, Lithium etc)

Factitious (high albumin, dehydration)

Hyperthyroidism

Acromegaly

Phaeochromocytoma

Adrenal Insufficiency

Or any other recognised cause consistent with the stem.

b)

1. Albumin OR ionised calcium
2. PTH
3. Vitamin D metabolites
4. PTH related protein
5. Tests for a specific cause – e.g. Thyroid function tests, Serum ACE etc.

5.2

- Sepsis/DIC,
- Malignancy (especially acute promyelocytic leukemia)
- Liver failure
- Envenomation

5.3

Lupus Anticoagulant

Heparin contamination

Artefact

Other tests:

Repeat APTT

Thrombin Time, Reptilase assay, Anticardiolipin Ab.

5.4

Mixing studies distinguish between factor deficiencies and the presence of inhibitors. They are performed by measuring the clotting time of the patient's plasma diluted serially with normal plasma. If the mixture yields a 10% near normal result the study is said to be corrected and factor deficiency is inferred.

Maximum Score	8.2
Percentage Passed	73.7%

Question 6

As a newly appointed intensive care specialist, you are put in charge of safety and quality in your ICU. The infection control department informs you that your ICU has a higher than acceptable rate of central line associated blood stream infections (CLABSI).

- a) Define CLABSI rate. (10% marks)
- b) Outline your approach to this problem in terms of initial investigation and ongoing management and monitoring. (90% marks)

ANSWER TEMPLATE

CLABSI = confirmed blood stream infections / central line days x 1000
i.e. Number of confirmed blood stream infections per 1000 central line days
CLABSI count and central line days defined by Australian Commission on Safety and Quality in Health Care

Investigation

Review data/audit to ensure counts are correct and that data quality issues are not responsible for a false estimation.

Review the cases of confirmed blood stream infection and ensure no false positives or negatives.
Review method of counting line days as missed days will result in artificially high rate.

Involve relevant stakeholders – nurses, infection control, ICU medical staff – and form working party

Compare with historical CLABSI data for the unit – is this a spike or has it always been a problem

Benchmark rate against published targets or benchmarked targets referenced against peer hospitals. Generally reported as number of infections per 1000 line days with expectation of rate <1/1000. Review practices of centres with favourable CLABSI rates and compare with local practice.

Ideally benchmark based on contemporary registry based data (ANZICS CORE CLABSI Registry) with risk adjustment although no risk adjustment exists within current reporting

Management

If increased rate confirmed investigate potential causes of high rate

Implementation of specific strategies based on best available evidence and ideally as part of an established wider program.

Specifically:

Staff training and use of correct aseptic technique (ANZICS Central Line/Local Health jurisdiction Insertion and Maintenance Guideline)

Insertion site selection

Use of insertion bundle or checklist

Consideration of limiting insertion to fewer more experienced operators (insertion team) with accreditation process

Documentation of daily review of line

Removal of all lines at earliest feasible time
 Specific evidence for
 Use of antimicrobial impregnated lines and biopatches
 Use of Chlorhexidine plus alcohol as disinfectant
 Consider alternatives to conventional CVC when possible e.g. PICC lines and tunnelled lines.

Ongoing monitoring
 Audits of process such as observation of aseptic technique
 Ongoing monitoring of rates over time
 Implementation and monitoring may require additional resources to be provided by administration (equipment, staff etc.)
 Submission of data to ANZICS CORE CLABSI Registry
 Regular reporting back to staff and hospital S&Q / infection control committee

Important Points:

Lists at least one reason for possible inaccuracy of data

Management and monitoring include elements of audit cycle (identification of issue, working party, implementation of change, audit and follow-up data collection, feedback, re-training, ongoing audit etc)

Includes importance of technique in CVC insertion and maintenance and use of insertion bundle

Maximum Score	7.5
Percentage Passed	64.9%

Question 7

- a) List the clinical signs associated with severe (< 28°C) hypothermia. (30% marks)
- b) Outline the considerations in providing advanced cardiac life support (ACLS) in a severely hypothermic patient. (70% marks)

ANSWER TEMPLATE

Neuro: Loss of cerebrovascular regulation, coma, loss of ocular reflexes
CVS: Decline in BP and cardiac output, VF (<28°C) bradycardia and asystole (<20°C)
Respiratory: Pulmonary oedema, apnoea
Renal: Oliguria
Musculoskeletal: Pseudo-rigor mortis (may appear dead)
Metabolic: Decreased metabolic rate, hyper or hypoglycaemia

Considerations in providing ACLS

Decision to start

May commence cardiac life support in an apparently “dead” hypothermic patient. Beware that very slow, irregular small volume pulse may be present and an unrecordable blood pressure. The brain can tolerate cardiac arrest for long periods at 18°C.

Rewarming

Patients need to be actively rewarmed while resuscitation is being continued.
 Extra-corporeal support, not mandated, but can be mentioned
 More emphasis on the continuing re-warming, an issue of priority, should state early
 Temperature should be measured centrally

Physical difficulties

Hypothermia can cause stiffness of chest wall making ventilation and chest compression difficult – early use of mechanical devices as resuscitation attempts are likely to be prolonged.

Be aware that interventions (e.g. CPR, central line placement, endotracheal intubation) may precipitate arrhythmias

Medications

Consider withholding drugs (e.g. Adrenaline) until core temp > 30°C and then double the interval between giving the drugs (i.e. give adrenaline every 4th cycle compared with every 2nd cycle) until temperature 35°C

The hypothermic heart may be unresponsive to cardioactive drugs, electrical pacing and defibrillation.

Arrhythmias

Arrhythmias other than VF tend to revert spontaneously as temperature rises. Bradycardia does not usually need treatment as it is physiological in severe hypothermia

VF therapy: unclear at which temp shocking should be first attempted. After 3 shocks if no response, consider delaying further attempts at defibrillation until temperature > 28-30°C

Examiners Comments:

In part a), candidates listed things that were not clinical signs e.g. ECG changes and ETCO₂, and there was also a focus on the CVS aspect which showed a limited breadth of clinical signs, and hence limited marks. In part b), many candidates did not show a breadth of considerations, and focussed mainly on the rewarming in great depth, hence did not score well on this section. Also, candidates often listed their management rather than outline their considerations, so the aspects they discussed also often lacked depth.

Maximum Score	7.0
Percentage Passed	42.1%

Question 8

A 22-year-old male is admitted to your ICU with meningococcal sepsis and a high vasopressor requirement. A right radial arterial line is inserted.

The following morning the bedside nurse reports the right hand is cold and pallid.

What are the potential causes for this finding and outline how you would distinguish between them?

ANSWER TEMPLATE

Potential causes

Microcirculatory disturbance secondary to DIC/Vasopressor requirement/worsening septic state.

Suggested by:

Clinical deterioration of patient: escalating vasopressor requirements, worsening acidosis etc.

Likely a gradual change not clearly temporally associated with line insertion

Likely to see similar changes in the other limbs
Radial pulse present, arterial waveform present/normal.
Doppler USS, arteriography: - no abnormalities

Traumatic Injury to artery secondary to line insertion

Suggested by:

May be history of difficult insertion, multiple attempts.

Other limbs not affected

Likely to manifest relatively quickly after line insertion.

Pulse may not be present, arterial waveform abnormal

Imaging may reveal arterial dissection flap, lack of flow distal to line.

Embolic/thrombotic phenomena (including inadvertent drug administration via line)

Rapid onset

History of drug administration through arterial line

May be other embolic phenomena

May have patchy ischaemic changes over digits

Waveform may be absent or present/normal depending on site of embolus

Imaging may demonstrate thrombus.

Examiners Comments:

Candidates listed the causes, but commonly did not outline how they would distinguish between them. The answer template focussed on history and clinical examination, whereas the candidates' answers focussed mainly on extensive investigations which would not have been appropriate. This meant that the answers often lacked depth, and therefore did not score well.

Maximum Score	7.3
Percentage Passed	57.9%

Question 9

Critically evaluate the provision of early (within seven days) nutrition in the critically ill patient.

ANSWER TEMPLATE

Rationale

- Critical illness associated with a catabolic state. Patients likely to have an energy deficit which may lead to muscle weakness and wasting
- Some patients may have pre-existing malnutrition
- Common for establishment of feeding regime to be delayed, or interrupted.
- May be a role for micronutrients both to treat deficits and to prevent refeeding complications

Advantages

- May reduce energy deficit, leading to overall improved outcome
- Small volume “trophic feeding” may improve gut integrity and outcomes

Disadvantages

- May lead to hyperglycaemia
- May be poorly tolerated leading to gastric distension, reflux and aspiration risk
Disadvantages e.g. access etc. associated with TPN

Evidence

- No clear evidence that early commencement of enteral nutrition within the first week improves outcomes
 - Notable trials:
 - EDEN (JAMA 2012, ARDSNET Investigators) Full enteral feeds vs “trophic” showed equivalent “hard” outcomes and “trophic” did better in terms of reflux, BSL control and had negative fluid balance
 - PERMiT (NEJM 2015, Saudi Arabia) 50% vs 100% caloric intake showed very similar results
- No evidence for early supplementation with TPN (EPaNIC trial)
- More recently TARGET (ANZICS 2017) showed no outcome difference between 1.5 and 1.0 kcal/mL feeds in an unselected ICU population (burns excluded), but more hyperglycaemia and upper GI effects in the 1.5 kcal/mL group (4,000 patients)

Note: TARGET was not examining timing of feeds but may be mentioned in the context of reduced caloric intake showing similar outcomes.

- Trophic feeding for gut integrity and health (25% calories) delivered enterally improves outcomes in many groups, most notably pancreatitis

Summary Statement

Allow hypocaloric feeding for up to 7 days in previously well-nourished patients
Early provision of vitamin and trace element supplementation

Examiners Comments:

Generally, well answered question. Most candidates were able to give reasonable responses to the questions addressing the important issues. Those that failed were unable to state why early feeding may be important and describe advantages/disadvantages or unable to discuss evidence around the topic.

Maximum Score	8.0
Percentage Passed	52.6%

Question 10

Describe briefly the clinical features, differential diagnosis, initial diagnostic tests and treatments for a patient with suspected acute transverse myelitis.

ANSWER TEMPLATE

Clinical Features:

[3 marks]

Acute transverse myelitis is a clinical syndrome characterised clinically by rapid onset and progression of motor, sensory and autonomic dysfunction as a result of acute inflammation involving gray and white matter at one or adjacent levels in the spinal cord.

- History: recent vaccination, travel, recent infection (esp viral). History of motor, sensory or autonomic symptoms including pain, parathesiae.

- Clinical Findings:
 - Motor weakness, paraparesis.
 - Sensory level
 - Autonomic signs – e.g. incontinence

Differentials (i.e. diagnoses other than those specifically associated with ATM);
[2 marks for any 4 of below]

1. GBS
2. Vascular event -Anterior spinal artery syndrome.
3. Multiple sclerosis (similar but different immunopathogenesis – MS mediated through cell mediated immune aberration, ATM mediated through abnormal humoral immunity)
4. Acute Compressive myelopathy due to bleed (e.g. AVM) or abscess
5. Herpes zoster myelitis
6. Post-polio syndrome (even in countries where polio has been eradicated)
7. B₁₂ deficiency (usually sub-acute)

Diagnostic work-up;

- CT spine to rule out compressive myelopathy, bleed
- MRI brain and spine with gadolinium contrast – MRI findings (T2 signal) may lag clinical findings
- CSF examination:
 - variable cellular response dependent on sub-aetiology
 - Culture and enterovirus PCR
 - Oligoclonal bands and specific immunology (NMO, ADEM) [2 marks]
- Blood tests for anti-CNS and systemic auto-antibodies (don't expect fine print, bonus marks for candidates knowing association of NMO with aquaporin-4 IgG antibodies)
- Blood for B12 levels
- ENMG (neurophysiology), if possibility of neuropathy remains.

Note: Must include imaging (either CT scan or MRI) and CSF examination in this section to score full marks.

Specific Treatments to be initiated; **[3 marks]**

– should be commenced awaiting definitive diagnosis

1. Pulse corticosteroids for ADEM, NMO and ATM associated with auto-immune diseases are usual care; trials lacking
2. Plasma exchange: for ADEM, NMO
3. IVIG described

Maximum Score	8.0
Percentage Passed	63.2%

Question 11

A 55-year-old female is admitted to your ICU with severe respiratory failure caused by a community acquired pneumonia. She has a history of rheumatoid arthritis.

What factors related to her rheumatoid arthritis require consideration during her care in the ICU?

ANSWER TEMPLATE

The relevant factors include those related to the RA disease process itself- musculoskeletal and systemic (extra-articular), and those related to the therapies for RA.

Using a system-wise approach the following areas require assessment and consideration-

Airway- The patient is likely to require invasive mechanical ventilation and intubation needs to be planned. Assessment should be performed considering

- Decreased TM joint mobility and consequently poor mouth opening.
- Cervical spine involvement – limited head and neck extension, potential atlanto-axial dislocation.
- Cricoarytenoid arthritis

Ventilation- Potential underlying

- Pulmonary fibrosis -decreased lung compliance complicating ventilation for CAP, decreased reserve
- Kyphoscoliosis
- Presence of pleural effusions/pleuritis

Cardiovascular- consider

- Presence of pericarditis/myocarditis
- Amyloid infiltration of myocardium- restrictive cardiomyopathy
- Increased risk of coronary disease.
- Associated Raynaud's phenomenon/vasculitis and exaggerated response to vasoconstrictors.

Haematological-

- Likely to have anaemia of chronic inflammation-
- May be neutropenic (associated with Felty's syndrome) and consequently immunosuppressed

Musculoskeletal/Integument-

- Joint changes and decreased range of movements/stiffness- risk of early contractures
- Increased risk of pressure areas
- Muscle atrophy/myositis/Steroid induced myopathy- early development of critical illness weakness.
- Osteopenia- risk of bone loss, fractures.

Immunological-

- Immune suppression from treatments- steroids, monoclonal antibodies. Susceptible to opportunistic infections- might influence antimicrobial choice.

Endocrine-

- Stress dose steroids if on chronic steroid therapy

Pain management-

- Likely opiate tolerance

Eye care-

- Dry eyes/scleritis/episcleritis-risk of corneal ulceration, infections.

Rheumatological-

- specialist input and advice re: ongoing management of RA especially if active disease.
- Consideration of withholding disease modifying agents

Examiner's Comments:

Generally, there was a good discussion about airway involvement and respiratory issues. Most candidates discussed effects of immunosuppression on organisms and risk of nosocomial infections.

Most considered need to supplement steroid use. Many candidates were unclear about the details of associated cardiac disease. Not many discussed the likelihood of chronic pain, including opioid use and its implications.

Maximum Score	8.1
Percentage Passed	64.9%

Question 12

A 64-year-old female patient has been ventilated in your ICU for 36 hours with septic shock and is receiving significant doses of noradrenaline and vasopressin. On the morning review you note her troponin level is elevated to over 10 times the normal range for your institution.

- a) How do you interpret the raised troponin level in this setting? (40% marks)
- b) Outline your assessment and management plan specific to the raised troponin level. (60% marks)

ANSWER TEMPLATE

Interpretation of raised troponin- should not be used in isolation in this patient. The measured value of troponin is high and should not be ignored or dismissed. If unexpected, repeat the test. Symptoms of chest pain are not easy to elicit in the ventilated patient. Troponin leak in this setting may be due to myocarditis associated with sepsis, acute cardiomyopathy, Takotsubo disease given high dose vasopressor or a STEMI or NSTEMI or right ventricular disease. Elevated troponin in renal failure should also be considered if relevant. Elevated troponins are associated with poor outcomes in septic patients.

Management plan- Comprehensive clinical assessment especially cardiovascular and haemodynamic assessment. Look for recent, rapid increase in vasopressor requirement, signs of cardiogenic shock. Review ECG for any evidence of STEMI or other new changes, Review CXR for new pulmonary oedema/heart failure. Echo- transthoracic or if available TOE is mandatory to look for any regional wall motion abnormalities that may be new. Evidence of global changes on echocardiography may indicate acute cardiomyopathy e.g. Myocarditis. Look for classic changes of Takotsubo's.

Further management will be determined by ECG and echo findings. Cardiology review, anticoagulation, careful consideration of thrombolysis or angioplasty if STEMI or regional changes on echo with consideration given to haemodynamic instability and challenges of transfer and management in cardiac catheter lab. Role of IABP in global hypokinesis related to acute cardiomyopathies.

Troponin increases in septic patients is thought to be associated with poor prognosis

Maximum Score	7.6
Percentage Passed	71.9%

Question 13

You are asked to review a 25-year-old patient with severe diarrhoea. He is two weeks post-allogeneic hematopoietic stem cell transplant.

- a) List four likely causes. (20% marks)

b) Outline your assessment and management.

(80% marks)

ANSWER TEMPLATE

Causes

Drugs: promotility agents, antibiotics
Infection – multiple possible organisms
Radiation
Neutropenic enterocolitis
GVHD

Outline your assessment and management

ABC

History:

Details of the indication for and type of transplant – esp. HLA matching etc.
Details of pre-transplant chemo/radiation etc.
Course and complications post-transplant
Whether engraftment has occurred
Medication history – esp. antibiotics
Details related to diarrhoea – associated with pain, blood etc,

Examination:

General physical with specific attention to
Volume status
Abdominal examination – signs of peritonitis
Signs of GVHD: rash, liver tenderness

Investigations:

Standard blood tests -FBC, Electrolytes, LFT's, Cultures
Stool culture including C difficile PCR
Plain AXR
CT abdomen
Sigmoidoscopy +- biopsy

Management

Fluid resuscitation – volume loss replaced by saline or balanced salt solution
Electrolyte replacement – as required but particularly potassium and magnesium
Nutrition – general enteral nutrition is satisfactory but TPN may be required where whole bowel rest is required
Antidiarrheal – loperamide can be used once infectious cause has been excluded
Anti-secretory – octreotide – particularly in early GvHD
Infection control, contact proportions
Treatment of underlying cause e.g. GVHD, C Diff.

Maximum Score	8.0
Percentage Passed	68.4%

Question 14

14.1

A 68-year-old male presents with sudden onset of coma. On examination, he is obtunded and has midsized pupils. His reflexes are difficult to elicit but present, and he has clearly extensor plantar responses bilaterally. He is intubated, and initial CT brain scan without contrast is normal.

a) Excluding a toxidrome, what is the most likely diagnosis? (25% marks)

14.2

A 72-year-old female presents with a complete right sided hemiparesis. She is conscious and alert. Cranial nerves are normal. She has had a non-contrast CT scan of her brain which is normal. Clinical examination reveals loss of pain sensation in her left arm, with intact light touch.

a) What is the site of the lesion? (25% marks)

14.3

A 64-year-old male presented with vomiting, and was ventilated for two days after an acute aspiration episode. Two days after extubation, he is noted to freely aspirate oral fluids without a resultant cough. His left pupil is constricted, and he appears clumsy with his left hand. On further examination you find no weakness, but he has past pointing in the left arm. There is nystagmus on looking to the left.

a) Where is the likely neurologic lesion? (15% marks)

b) What is the most common pathology? (10% marks)

14.4

A 72-year-old male with severe Parkinson's disease is admitted to your ICU ventilated following emergency abdominal surgery. Enteral administration of medications is not possible.

List five potential problems specific to the Parkinson's disease that may affect his acute and long-term post-op management. (25% marks)

ANSWER TEMPLATE

14.1

Midbrain infarct

14.2

Right half of cervical cord.

14.3

- a) Lateral part of medulla (Lateral Medullary Syndrome acceptable)
- b) Occlusion of PICA branch

14.4

- 1) severe muscle and trunk rigidity due to medication withdrawal

- 2) likely to be wasted and deconditioned
- 3) autonomic neuropathy and with CVS instability
- 4) gut failure and pseudo-obstruction
- 5) vocal cord dysfunction and upper airway dysfunction on extubation
- 6) failure of temperature regulation
- 7) greatly elevated risk of confusion
- 8) enhanced sedation effects and sensitivity
- 9) mobilisation and rehabilitation likely to be compromised.

Examiners Comments:

Some candidates gave multiple answers when asked for the “most likely diagnosis”. Only the first answer was considered.

Maximum Score	9.2
Percentage Passed	26.3%

Question 15

(Images removed from report.)

Please note: The following ECG has been recorded at 25 mm/sec and gain setting of 10 mm/mV.

15.1

A 60-year-old male is complaining of breathlessness of sudden onset two months previously.

There is no associated chest pain.

What are the abnormalities on the ECG and what is the likely diagnosis? (25 % marks)

15.2

You have been asked to review a 50-year-old female who has collapsed at work.

a) What are the abnormalities on the ECG? (25 % marks)

b) What is the rhythm? (25 % marks)

15.3

You are reviewing an 80-year-old female admitted to the Emergency Department after a fall and head injury. Her ECG is shown on page 15

What are the abnormalities? (25 % marks)

ANSWER TEMPLATE

15.1

Q waves in leads V1-V4 (Previous MI?)
Elevated ST segments and inverted T waves in V2-V5

Inverted T waves in aVL
Likely diagnosis is left ventricular aneurysm

15.2

Narrow complex tachycardia, rate around 300bpm
Absent p waves
ST segment depression V4-V6
Atrial flutter with 1:1 conduction.

15.3

Right axis deviation
Right bundle branch block
Bifascicular block.

Examiners Comments:

Many candidates appear to have examined the ECG, drawn a conclusion and then retrofitted findings to support that. Confabulation in answers was common. Acceptance in marking was made of relatively amorphous answers (e.g. "anterior" as opposed to specific leads) but even with this, lack of specificity was common. Many candidates ignored the highly pertinent history that was given, showing a lack of clinical context/Bayesian thinking.

Maximum Score	6.9
Percentage Passed	26.3%

Question 16

You have received a call from a junior doctor at a rural hospital awaiting retrieval for a 40-year-old male who has just presented with severe burns after a gas canister explosion.

How will you guide the junior doctor through the assessment of the patient? (Details about the management are not required.)

ANSWER TEMPLATE

The assessment should include burns assessment, trauma survey and consideration for airway burns/ inhalational injury.

Initial assessment of patient:

- Brief review of history to establish likelihood of other trauma (e.g. blast injury/ trauma from explosion or fall) and time of event
- Primary survey:
 - o Airway and potential for airway involvement
 - Burns to face/soot in mouth/nose/singed facial hair/hoarse voice
 - Whether trapped in enclosed space with fire- increase risk of inhalational injury
 - Signs of potential airway compromise or likely to develop airway compromise- may need to organise for early intubation if skilled airway practitioner available; otherwise await retrieval team
 - o Breathing:

- Particularly with assessment of possible complications if blast injury occurred or additional trauma e.g.: pneumothoraces – check airway is midline, bilateral air entry present or not- whether chest X-ray has been done and checked for pneumothorax.
 - Possible pulmonary contusions
 - Blood gas to assess ventilation, oxygen saturation, carbon dioxide, carboxyhaemoglobin levels
 - Circulation:
 - Confirm haemodynamic parameters- heart rate, blood pressure, peripheral perfusion
 - Whether adequate iv access available; ideally 2 large bore cannulae through non-burnt skin; through burnt skin if necessary, IO if unsuccessful at obtaining this access need to be organised.
 - Disability:
 - Assessment of GCS of the patient for any head injury or evidence of CO poisoning.
 - Pupillary responses
 - Exposure:
 - To assess extent of burns + environmental/temp control
- Assessment of extent of burns – with reference to estimated percentage and depth – refer junior doctor if required to Lund Browder burns chart, Wallace rule of 9s (quicker in emergency) or Hand surface area to estimate percentage; with superficial burns (erythema only) not being included in assessment – and establish if circumferential involvement
- use of photos or tele-health if available may facilitate assessment
 - establish if any compromise neurovascularly in case early escharotomies required
 - assessment of whether local surgical expertise is available to do this.
- Secondary Survey:
- Establish past medical history/co-morbidities/medications/allergies
 - Head to toe exam particularly looking for complications of burns or blast:
 - E.g.: head injury
 - Eye injury + protection/chlorsig if eye involvement
 - Fractures/lacerations
 - Neurovascular complications from circumferential burns to limbs
 - Circumferential burns to chest which may impair ventilation
 - Other assessments:
 - Pain assessment and need for analgesia
 - Urine output monitoring by inserting IDC
 - Temperature assessment

Examiners Comments:

A number of candidates gave long lists of investigations and personnel only available in a large centre- candidates were marked down for this though not failed if the rest of the answer was of an acceptable standard

Maximum Score	8.0
Percentage Passed	68.4%

Question 17

- a) Outline the pathophysiology, clinical and diagnostic features of Thrombotic Thrombocytopenic Purpura (TTP). (70% marks)
- b) Outline the specific management of TTP. (30% marks)

ANSWER TEMPLATE

Pathophysiology (2 marks)

Severe deficient activity of ADAMTS13 protease resulting in ultralarge von Willebrand factor (VWF) multimers to accumulate on the endothelial surface causing platelet aggregation and clumping with microthrombi formation leading to microangiopathic haemolytic anaemia (MAHA) and organ dysfunction.

ADAMTS13 deficiency usually acquired (inhibitory autoantibody) or hereditary (inherited ADAMTS13 mutation). Enzyme activity is reduced during sepsis, pancreatitis, liver disease, pregnancy (2nd and 3rd trimester)

Clinical and diagnostic features (5 marks)

May present with weakness, fatigue, dyspnoea, gastrointestinal symptoms (abdominal pain/nausea/vomiting), history of bruising or bleeding with clinical findings of a petechial rash

Clinical features

Fever

Neurological symptoms (headache, confusion, seizure, stroke, coma)

Acute Kidney Injury (more likely in Haemolytic Uremic Syndrome)

Diagnostic features:

FBC and peripheral smear – anaemia, thrombocytopenia

Features of MAHA (schistocytes, spherocytes, polychromasia)

Haemolysis - markedly elevated LDH, elevated indirect bilirubin, reduced haptoglobins, negative Coombs testing

Severe ADAMTS13 deficiency

Renal parameters – urea and creatinine may be deranged

Specific Management (3 marks):

Plasma exchange:

Daily exchanges 1.5 times plasma volume until remission. Replacement with cryodepleted plasma or FFP. (Replacement with 4% albumin would be inappropriate.)

Corticosteroids – reduce production of the ADAMTS13 inhibitor (autoantibody), reduced cytokine production or decreased autoantibody-mediated clearance of ADAMTS13.

Rituximab – chimeric monoclonal antibody directed against CD20 (found on B cells) – immunosuppressive

Maximum Score	9.0
Percentage Passed	80.7%

Question 18

An 82-year-old male has been cleared for discharge to the ward after spending three weeks in your ICU for a large subdural haemorrhage. A junior nurse gave him a trial of oral feeding and then removed his right subclavian vein catheter. Subsequently, he became cyanosed and suffered a bradycardic/asystolic cardiac arrest.

Following successful resuscitation and orotracheal intubation, his observations are as follows:

Heart rate: 135 beats/min (sinus)

Blood pressure: 120/72 mmHg on noradrenaline 20 mcg/min
Oxygen saturation of 90% on FiO₂ 0.8

- a) List two likely differential diagnoses that best explain the events. (20% marks)
- b) Outline your diagnostic approach to distinguish between them. (40% marks)
- c) Briefly outline the specific management for each of your diagnoses. (40% marks)

ANSWER TEMPLATE

- a) One mark each for the following diagnoses (only count first 2 listed by candidate)
 - 1) Air embolism
 - 2) Aspiration pneumonitis/pneumonia
 - 3) Pulmonary embolus
- b) For each diagnosis 2 marks for clear and concise diagnostic strategy:
 - 1 mark for appropriate history and examination features
 - 1 mark for specific investigations

e.g.

Air Embolism:

History of unclamped line especially in upright position, sudden onset typically.

Exam may reveal 'Mill Wheel' murmur

Investigation: Echocardiography to reveal air in cardiac chambers

Aspiration:

History: May be witnessed, hypoxia after eating/drinking

Exam: Signs of consolidation/collapse (crackles, bronchial breathing etc.)

Investigations: CXR usually sufficient, OK to mention US

PE:

History: risk factors, sudden onset, chest pain, SOB

Exam: usually nil specific, absence of alternative diagnostic signs e.g. normal auscultation

Investigations: CTPA confirmatory if stable enough for transport, Echo highly suggestive in correct clinical setting and occasional visualise thrombus.

- c) Clear specific, safe, sensible management strategy = 2 marks for each condition.
1 = partial detail or lacking clinical perspective

e.g.

Air embolism:

Occlude CVC site

Head down / Trendelenberg position

Catheter aspiration

O₂/supportive care

Consider hyperbaric when haemodynamically stable especially if neurological symptoms and signs

Aspiration:

Intubation/airway protection

Bronchoscopy if large volume or bronchial obstruction

Antibiotics for secondary infection

PE:

Consider embolectomy or catheter directed clot retrieval if available.

Thrombolysis may be considered even in cases of massive PE even with recent surgery if death otherwise imminent, balance risk of bleeding vs. death by PE on case-by-case basis.

Anticoagulation with Heparin/Clexane depending on perceived risk of bleeding

Maximum Score	8.0
Percentage Passed	73.7%

Question 19

19.1

A 60-year-old male with alcoholic cirrhosis and atrial fibrillation on regular flucloxacillin and paracetamol is admitted to your ICU post-variceal banding. His coagulation screen is displayed below:

Parameter	Patient Value	Adult Normal Range
Prothrombin time (PT)	28.0 sec*	12.0 – 16.5
International normalised ratio (INR)	2.4*	0.9 – 1.3
Activated partial thromboplastin time (APTT)	21.0 sec	27.0 – 38.5
Fibrinogen	2.1 g/L	2.0 – 4.0
D-Dimer	0.5 mg/L	< 0.5

- a) Give three likely causes for the coagulation abnormalities. (10% marks)

The arterial blood gas and biochemistry results from the same patient are given below:

Parameter	Patient Value	Adult Normal Range
FiO ₂	0.21	
pH	7.23*	7.35 – 7.45
pO ₂	90 mmHg (12 kPa)	
pCO ₂	22.0 mmHg (2.93 kPa)*	35.0 – 45.0 (4.60 – 6.00)
SpO ₂	92%	
Bicarbonate	9.0 mmol/L*	22.0 – 26.0
Base Excess	-16.7 mmol/L*	-2.0 to +2.0
Lactate	1.3 mmol/L	0.5 – 1.6

Parameter	Patient Value	Adult Normal Range
Sodium	135 mmol/L	135 – 145
Potassium	4.0 mmol/L	3.5 – 5.0
Chloride	100 mmol/L	95 – 105
Bicarbonate	9.0 mmol/L*	22.0 – 26.0
Glucose	6.0 mmol/L	3.5 – 6.0
Urea	7.0 mmol/L	3.0 – 8.0
Creatinine	120 µmol/L*	45 – 90

- b) Comment on the acid base status and give the three most likely causes for your findings. What further tests would you order to distinguish between them? (30% marks)

19.2

A 47-year-old female with newly diagnosed acute myeloid leukaemia presents with the following blood results:

Parameter	Patient Value	Adult Normal Range
Haemoglobin	89 g/L*	120 – 160
White Cell Count	110.0 x 10 ⁹ /L*	4.0 – 11.0
Platelet count	32 x 10 ⁹ /L*	150 – 350
Blast cells	104 x 10 ⁹ /L	

- a) What specific issues might you anticipate as a result of the white cell count, and what clinical problems might these cause? What management strategies would you employ to prevent or treat these issues? (60% marks)

ANSWER TEMPLATE

19.1

- i) Warfarin, Vitamin K deficiency, liver disease, paracetamol toxicity
- ii) High anion gap metabolic acidosis. (AG 26, delta ratio 0.93). Likeliest causes are ketosis (alcoholic or starvation), pyroglutamic acidosis and ethanol/methanol toxicity.
- iii) Serum/urine ketone levels, measured osmolality and plasma / urine assay for 5-oxoproline (pyroglutamate).

19.2

1. Leukostasis/Hyperviscosity syndrome: white cell plugs in the microvasculature. Most commonly affects lungs (dyspnoea, hypoxia, CXR infiltrates) and brain (visual changes, headache, dizziness, tinnitus, confusion progressing to coma) Can also affect Heart (ischaemia, failure), kidney (AKI), liver/bowel ischaemia.
2. Tumour lysis syndrome- either spontaneous or in response to chemotherapy Electrolyte abnormalities including hyperkalaemia, hyperphosphataemia and hypocalcaemia. Can cause arrhythmias, seizures and sudden death.
3. Artificially low PaO₂ on ABG due to metabolically active blasts which continue to utilise O₂ in the test tube (SpO₂ more reliable)

Management:

Keep hydrated

Start allopurinol or rasburicase to prevent TLS

Monitor FBC. Avoid RBC transfusion if possible (increases viscosity)

If there is a delay or contraindication to starting chemotherapy immediately, consider leukapheresis if symptomatic of hyper-viscosity.

For ABGs – sample transported on ice, analyse immediately. Monitor SpO₂.

Examiners Comments:

When asked for a specific number of responses (e.g. 'three causes of') please supply this number of responses. Extra responses will not gain extra marks. If there are more causes, then list the most

likely. Many candidates did not appear to pay attention to the mark allocation and gave insufficient detail in sections of the question worth the most marks.

Maximum Score	7.4
Percentage Passed	52.6%

Question 20

(Image removed from paper.)

Please note: The following ECG has been recorded at 25 mm/sec and gain setting of 10 mm/mV.

A 60-year-old male is Day 3 after uneventful coronary artery bypass grafting in your ICU. The ICU registrar calls you at 2:00 am to say that the patient had a sudden cardiac arrest, requiring two minutes of CPR and a single shock before ROSC.

Now the patient is awake, on no supports and in sinus rhythm with heart rate 35beats/min and blood pressure of 85/60 mmHg. The ICU registrar has commenced an amiodarone infusion after speaking to the cardiac surgical team.

You receive an image of the rhythm strip on your phone (ECG 20.1 shown on page 6), which was recorded at the time of the cardiac arrest.

State what the rhythm strip shows and outline your management plan for this patient.

ANSWER TEMPLATE

The rhythm strip shows polymorphic ventricular tachycardia, and it looks like torsades de pointes. TdP is caused by QT prolongation and is often precipitated by bradycardia.

Management Plan

ECG to establish QT interval.

Stop amiodarone

IV Magnesium infusion (to keep Mg around 1.5-2 mmol/L)

Avoid/stop any other medications that prolong the QTc e.g. haloperidol / erythromycin / quinolones / methadone etc.

Exclude hypokalaemia / hypocalcaemia and treat as appropriate

Consider using lignocaine if recurrent episodes.

Institute temporary pacing (or could use epicardial wires if in place) or may use positive chronotrope, e.g. judicious isoprenaline infusion.

Overdrive pacing may be useful in recurrent episodes.

Exclude ischaemia as a precipitant (most likely if normal QT): ECG / Troponin / ECHO / angiography of grafts. If ischemia is the cause and the QTc is normal, amiodarone and beta blockade are useful.

Urgent echocardiography is reasonable to help exclude ischemia and also in the setting of CPR post sternotomy/cardiac surgery to exclude structural problems/pericardial effusion etc.

Further follow up :Cardiology opinion (electrophysiology) regarding need for further EP studies, PPM/AICD and ongoing maintenance medication choices.

Recurrent episodes may require short term mechanical circulatory support.

Maximum Score	8.1
Percentage Passed	63.2%

Question 21

A 59-year-old female is transferred to your ICU febrile with a reduced level of consciousness. Her family have noted major behavioural change over the past three weeks.

MRI scan with contrast (two days ago) showed increased T2 and FLAIR signal in both frontal lobes, not conforming to a vascular pattern.

CSF Examination has shown the following:

Parameter	Patient Value	Adult Normal Range
Opening pressure	40 cm*	15 – 25
Glucose	4.8 mmol/L	3.3 – 6.1
Protein	2.24 g/L*	0.10 – 0.50
Red Cell count	50 cells/high power field*	0 – 5
White Cell Count	270 cells/high power field*	0 – 5
Lymphocytes	99%	
Gram stain	Nil bacteria seen	

She has been receiving Ceftriaxone and Acyclovir at appropriate doses since admission.

Please outline:

- The differential diagnosis for her presentation. (40% marks)
- The specific investigations you would order and the specific treatment for the differentials. (60% marks)

ANSWER TEMPLATE

The differential diagnosis for her presentation

The clinical presentation is suggestive of Encephalitis with numerous possible aetiologies

Infective:

HSV still possible, but less likely with relatively normal MRI (no temporal involvement)

VZV

Enterovirus

HIV

Influenza

Cryptococcal disease (unlikely without leptomeningeal involvement)

Lyssavirus, Hendravirus if bat exposure

Arthropod borne viruses

Murray Valley

Equine

Japanese encephalitis

many others up to and including rabies

Post infectious encephalitis (acute disseminated encephalomyelitis)

Auto-immune and para-neoplastic

anti-NMDA receptor encephalitis is the best studied, many other targets now described:

association with ovarian cancer, endometrial cancer, small cell lung cancer; esp. anti-NMDA

systemic auto-immune disease, e.g. SLE (limbic encephalitis)

Malignant

unlikely with minimal MRI findings
lymphoma given lymphocyte predominance

Specific Investigations

CSF (existing sample or repeat) for viral PCR (HSV, VZV, enteroviruses) and serology for suspected pathogens, oligoclonal bands Anti-NMDA antibodies, other CNS antibodies, oligo-clonal bands, Cytology & flow cytometry

Auto-antibodies: ANA, anti-dsDNA etc.

HIV testing

EEG

Imaging to look for systemic malignancy (ovarian, endometrial, breast, lung)

Investigations to consider down the track

Brain biopsy

Repeat MRI to assess for evolution

Specific treatment

Specific treatment depends on underlying aetiology, which may be challenging to establish

Some comment on current antimicrobial therapy: would be reasonable to broaden current therapy given progression and ongoing fevers:

Viral encephalitis

No specific therapies for most viruses other than HSV

Could consider broadening anti-virals to ganciclovir (as guided by ID)

Auto-immune encephalitis:

These disorders are highly responsive to immunomodulatory therapies and early initiation of treatment improves outcomes.

Once infectious cause ruled out, and there are no contraindications, commence immunotherapy in discussion with neurology/ID

no RCT,

strong recommendations for pulse steroid, plasma exchange, IVIG

other therapies for resistance incl. rituximab, pulse cyclophosphamide

Look for and treat underlying malignancy.

Maximum Score	8.0
Percentage Passed	22.8%

Question 22

With respect to the management of cardiac arrest in the pregnant patient:

- Discuss the considerations around the decision to perform peri-mortem Caesarian section (PMCD). (70% marks)
- List the other modifications to the standard advanced life support (ALS) protocol that need consideration in this situation. (30% marks)

ANSWER TEMPLATE

a)

Guidelines recommend PMCD for pregnant women in cardiac arrest > 24/40 weeks (with fundus height at or above the umbilicus) when ROSC has not been achieved with usual resuscitation measures with

manual lateral uterine displacement (LUD). In extreme circumstances may be considered in 20 – 24/40-week pregnancy but evidence for benefit is limited.

Decisions on the optimal timing of a PMCD for both the infant and mother are complex and require consideration of factors such as the cause of the arrest, maternal pathology and cardiac function, foetal gestational age, and resources. Shorter arrest-to-delivery time is associated with better outcome.

PMCD should be strongly considered for every mother in whom ROSC has not been achieved after ≈4 minutes of resuscitative efforts.

If maternal viability is not possible (through either fatal injury or prolonged pulselessness), the procedure should be started immediately; the team does not have to wait to begin PMCD.

There is no requirement for transfer to an operating theatre, obstetric/surgical expertise, equipment beyond a scalpel or lengthy antiseptic procedures

b)

Manual lateral uterine displacement +/- left lateral tilt to avoid aorto-caval compression.

Early intubation to decrease risk of aspiration – likely to be more difficult in pregnant patient

Hand placement for chest compressions may need to be slightly higher.

Standard pad placement may be difficult because of breast size so consider bilateral (bi-axillary) placement.

Early call for obstetric and paediatric help.

Maximum Score	8.0
Percentage Passed	61.4%

Question 23

A 74-year-old male has been intubated for respiratory failure developing two weeks after oesophagectomy for adenocarcinoma. He has no other significant past medical history.

After intubation, an audible air leak was apparent. Urgent bronchoscopy demonstrated a fistula between the proximal left main bronchus and the oesophago-gastric anastomosis.

Outline the principles and priorities in the management of this patient.

ANSWER TEMPLATE

Overall approach and perspective (2 marks)

2 = Clear understanding that:

This is a life-threatening complication requiring early expert assistance with surgical and anaesthetic support.

Priorities are stabilization and facilitation of urgent return to theatre for surgical repair +/- stenting.

High mortality even with optimal treatment.

1= Mentions these elements but without clear understanding of urgency and/or need for definitive repair. i.e. unable to be confident that candidate would communicate and coordinate effectively.

Management of airway and ventilation

Airway (3 marks)

Articulates main principles to support oxygenation, minimise leak by minimising airway pressures and isolate lungs prior to surgical repair.

3= Outlines the need to isolate L and R lungs prior to surgical repair.

Demonstrates clear understanding of potential approaches and the need for expert skill and consideration of clinical stability e.g. size of leak/presence of complications etc.

e.g. Ultimately likely to need for R sided DLT to enable surgical repair if oxygenation stable and appropriate equipment available (bronchoscopy etc.), ideally in theatre with surgeon present to deal with potential complications.

May need to urgently selectively intubate RMB to manage massive leak in emergency setting especially if initial intubation was difficult.

High risk of pneumothorax and/or empyema requiring pleural drainage.

2= Principles and priorities safe but lacking finer detail or clinical perspective

1= Basic understanding or listing of options without guiding principles and clinical perspective. Not clear the candidate would safely manage themselves.

Ventilation (2 marks)

2= Ventilatory strategy should include aiming for spontaneous ventilation if possible and techniques for minimizing airway pressures (e.g. low/no PEEP).

Need to consider/monitoring for likely respiratory complications (pneumothorax, hydro-pneumothorax, empyema).

1= mentions only one of clear ventilatory strategy **or** knowledge of complications. Alternatively, superficial comment on both.

Sepsis (1 mark)

1= Mentions likely complications of pneumonia, empyema and subsequent systemic sepsis. Need for cultures (esp. blood, bronch specimens) and appropriate broad-spectrum antibiotics. (half mark if one element missing)

Supportive Care (2 marks)

2= sensible concise priorities for supportive care and clear mentions need to communicate with and offer support to family.

e.g.

Haemodynamics - large bore IV access, art-line, CVC if time allows. Planning for potential need for vasopressors.

Cease feeding, NG on free drainage if present to minimise gastric dilation and/or contamination of lung via fistula.

Elevate bed

Communication with family early to inform and prepare for potential poor outcome and provide support as required.

1= some sensible elements but lacking clinical perspective or failure to mention family communication.

Maximum Score	7.8
Percentage Passed	43.9%

Question 24

In the context of clinical trials what is meant by the following terms:

- a) Stratification. (20% marks)
- b) Intention to treat analysis. (20% marks)
- c) Sensitivity analysis. (20% marks)
- d) Kaplan-Meir curve. (20% marks)
- e) Analysis of competing risk. (20% marks)

ANSWER TEMPLATE

- a) Stratification of clinical trials is the partitioning of subjects and results by a factor other than the treatment given
- b) Intention to treat analysis is the analysis of all participants allocated to a treatment group irrespective of whether they completed the treatment, withdrew, or deviated from protocol.
- c) A sensitivity analysis is the analysis of data from the trial with a change or alteration to one or more underlying assumptions used in the original analysis.
- d) A Kaplan-Meir curve is a plot of probability of survival against time.
- e) Analysis of competing risk is used when there are multiple endpoints of which the occurrence of one prevents the occurrence of another (e.g. death prevents the occurrence of shock reversal)

Maximum Score	6.5
Percentage Passed	29.8%

Question 25

Critically evaluate the use of adjunctive corticosteroid treatment in the management of septic shock.

ANSWER TEMPLATE

Rationale:

Long history of use

Potential mechanism of action includes:

Anti-inflammatory/anti- cytokine action

Treatment of adrenal dysfunction

Vasopressor and inotrope- by beta -receptor upregulation sparing action

Advantages

Cheap, simple widely available

Disadvantages

Hyperglycaemia

Muscle weakness
Increased infection risk
Increased risk of GI bleed

Evidence

Several randomised trials with conflicting results

Annane (2002) and CORTICUS (2008) used short Synacthen test to stratify patients – divergent effects on mortality reported

Recent large scale trials:

ADRENAL – no effect on mortality but more rapid reversal of shock and more rapid wean of mechanical ventilation and ICU stay

APPROCCHS – Reduction in mortality and more rapid shock reversal and ventilator wean.

Used fludrocortisone in addition to hydrocortisone – role of this is unclear.

Neither trial demonstrated clinically important side effects

Personal Use

Although effect on mortality still uncertain the evidence suggests patients are weaned from mechanical ventilation faster and discharged from ICU earlier. Given the good safety profile this may be enough rationale for use, and likely to have substantial cost benefits as well.

Maximum Score	8.9
Percentage Passed	61.4%

Question 26

You are called to urgently assess a one-month old infant who has been brought into the Emergency Department with a one-day history of fever and irritability progressing to an altered level of consciousness.

She is febrile (38.9°C), responds only to pain and has a tense anterior fontanelle.

- List three diagnoses in addition to CNS infection that need to be considered. (30% marks)
- Provide your empiric antimicrobial regimen and discuss your rationale. (60% marks)

The results of a lumbar puncture are shown below:

Parameter	Patient Value	Adult Normal Range
Glucose	1.4 mmol/L*	2.8 – 4.4
Protein	3.36 g/L*	0.1 – 0.7
Red Cell count	5 cells/high power field	0 – 5
White Cell Count	3220 cells/high power field*	0 – 5
Neutrophils	26%	
Lymphocytes	53%	
Monocytes	21%	
Gram Stain	Occasional Gram-positive bacilli seen	

- What is the likely cause of this illness? (10% marks)

ANSWER TEMPLATE

- a) Post ictal state
Haemorrhage/ oedema secondary to trauma/ non accidental injury
Hydrocephalus
Neoplasm
Spontaneous haemorrhage (e.g. first presentation coagulation disorder)
- b) Need to consider likely organisms causing meningoencephalitis in a neonate, common resistance patterns, penetration of the blood brain barrier.
Likely organisms in this age group: Group B streptococci, *Listeria monocytogenes*, Varicella zoster virus, Herpes simplex virus, *Streptococcus pneumoniae*, *Neisseria meningitidis*, *Haemophilus influenzae* B (too young to be immunised).

E. coli and other gram-negative enteric bacilli less likely at this age than in the first week of life, but not unreasonable to cover.

Regime should include:

Acyclovir (HSV, VZV)

A third-generation cephalosporin (cefotaxime, ceftriaxone) to cover gram positives as above and gram-negative cover.

Amoxicillin OR Ben Pen to cover *Listeria*

Vancomycin to cover resistant *Pneumococcus*.

- c) Bacterial meningitis, *Listeria monocytogenes*
(require organism for full marks)

Maximum Score	9.1
Percentage Passed	82.5%

Question 27

A 22-year-old male climbed to a height of 3574 m above sea level. On arrival at this altitude he complained of chest tightness, breathlessness, tiredness and had an altered sensorium. He was evacuated to a nearby medical facility which was situated at an altitude of 700 m. His ECG was unremarkable and chest X-ray showed bilateral infiltrates.

The following arterial blood gas was taken at the medical facility:

Parameter	Patient Value	Adult Normal Range
Barometric pressure	701 mmHg (94 kPa)	
FiO ₂	0.21	
pH	7.30*	7.35 – 7.45
pO ₂	57.0 mmHg (7.6 kPa)	
pCO ₂	32.0 mmHg (4.3 kPa)*	35.0 – 45.0 (4.6 – 6.0)
SpO ₂	85%	
Bicarbonate	15.0 mmol/L*	22.0 – 26.0
Lactate	6.0 mmol/L*	0.5 – 1.6
Sodium	140 mmol/L	135 – 145
Potassium	4.1 mmol/L	3.5 – 5.0
Chloride	102 mmol/L	95 – 105
Glucose	5.6 mmol/L	3.5 – 6.0

- a) Interpret the blood gas. (20% marks)
- b) What is the most likely diagnosis? (20% marks)
- c) What treatment would you institute in this patient? (60% marks)

ANSWER TEMPLATE

a) Interpret the blood gas. (2 marks)

- High anion gap metabolic acidosis with respiratory compensation
- Elevated Aa gradient 40mmHg (5.3kPa)

b) What is the most likely diagnosis? (2 marks)

- HAPE = High altitude pulmonary oedema
- HACE = High altitude cerebral oedema

c) What is the treatment would you institute in this patient? (6 marks)

General (2)

- Supplemental oxygen
- Descend to lower altitude

High altitude pulmonary oedema (2)

- Prompt reduction of pulmonary artery (PA) pressure :
 - Limit physical exertion and cold exposure,
 - Non-invasive ventilation (CPAP)
 - Pharmacological therapies to decrease pulmonary artery pressures: Nifedipine, Sildenafil/Tadalafil (Phosphodiesterase inhibitors)
- Diuretic therapy, nitrates, and morphine are no longer recommended and could be harmful

High altitude cerebral oedema (2)

- Dexamethasone
- Consider hyperbaric therapy
- ICP management – MAP maintained, minimise venous hypertension, adequate sedation and osmotic therapy

Maximum Score	6.7
Percentage Passed	12.3%

Question 28

What infection control measures are required for patients with the following conditions admitted to the ICU? Justify your answers.

- a) Neutropenic sepsis. (20% marks)
- b) Neisseria meningitidis. (20% marks)
- c) Severe Acute Respiratory Syndrome (SARS). (30% marks)
- d) Norovirus vomiting and diarrhoea. (30% marks)

ANSWER TEMPLATE

a) Neutropenic sepsis

This patient requires standard precautions in the ICU.

These include:

- Handwashing before and after every patient contact
- Gloves, gown, eye protection on direct patient bedside care
- Use of above when removing soiled linen and clothing

HOWEVER the patient is at risk from staff and other patients.

Consider

Positive pressure room.

Isolation away from overtly infected patients or visitors especially children,

Limiting staff contact. (e.g. limiting number of bedside ward rounds or staff entering room)

b) Neisseria meningitidis

Infection control is required to address droplet precautions.

In addition to standard precautions:

- Private room preferred, cohort if necessary
- Wearing of a mask (normal surgical mask OK) within 1m of patient.
- Mask of patient (normal surgical mask OK) during transport (although keep transport of patient to a minimum.)
- Limitation of staff to high-risk procedures e.g. intubation.
- Notifiable disease to public health.
- Contact tracing and prophylaxis

c) SARS,

Infection control is targeted to address airborne routes of transmission

In addition to standard precautions:

- Negative pressure room with room exhaust filtration.
- Use of an airborne filtering mask (N95) not just a surgical mask on entering room
- Patient N95 masked on transport (minimize transport)
- Notifiable disease to public health.
- Contact tracing and isolation.

d) Norovirus.

Norovirus is a highly infectious virus

It is spread predominantly via the fecal oral route AND via airborne route.

It is able to exist on environmental surfaces for weeks and contact precautions are essential.

Infection control measures are required to manage these two routes.

Standard precautions include:

- Handwashing **HOWEVER** norovirus has no lipid capsule therefore alcohol-based rubs are not recommended. Soap and water especially if hands visibly contaminated.

Contact precautions in addition to above-

- Private room and cohorting of multiple cases if necessary.
- Gloves on entering room and changing after contact with contaminated secretions
- Gown on entering room in case of touching environmental surfaces as well as patient
- Minimize patient transport around hospital unless necessary.
- Use of dedicated non-essential equipment. I.e. stethoscopes.
- Limitation of staff to high-risk procedures i.e. intubation.
- Notifiable disease to public health.
- Contact tracing and isolation.

AND managing airborne routes with an N95 mask for staff especially with active vomiting or high-risk procedures such as intubation. Similar to SARS.

Maximum Score	6.5
Percentage Passed	21.1%

Question 29

A 77-year-old diabetic, hypertensive male patient is admitted to ICU after an emergency repair of a ruptured abdominal aortic aneurysm.

His blood biochemistry the day after his admission to ICU is as follows:

Parameter	Patient Value	Adult Normal Range
Sodium	140 mmol/L	135 – 145
Potassium	5.4 mmol/L*	3.5 – 5.0
Chloride	113 mmol/L*	95 – 105
Bicarbonate	18.0 mmol/L*	22.0 – 26.0
Urea	39.0 mmol/L*	3.0 – 8.0
Creatinine	391 µmol/L*	45 – 90

- List the specific factors that may contribute to a high serum creatinine value in this patient. (30% marks)
- What factors would influence your decision whether to start renal replacement therapy (RRT) in this patient? (70% marks)

ANSWER TEMPLATE

List the specific factors that may contribute to a high serum creatinine value in this patient. (3 Marks)

Pre-existing elevation of serum creatinine:

Diabetic Nephropathy
Hypertensive Nephrosclerosis
Renal Artery Stenosis

Acute elevation of serum creatinine

Pre-renal factors
Hypotension, hypoperfusion
Prolonged aortic clamp time, surgical ligation renal artery
Intra-abdominal hypertension
Cholesterol Embolism
Renal factors
Radio-contrast
Nephrotoxic drugs
Rhabdomyolysis
Sepsis
Post renal factors
Occlusion of both ureters - rare

What factors would influence your decision whether to start RRT in this patient? (7 marks)

Several factors would influence this decision

General condition of the patient including volume status
Baseline renal function and its likely trajectory
Other factors

If the patient is clinically stable, the current biochemistry would support a watch and wait approach. The serum creatinine value of 391 $\mu\text{mol/L}$ does put the patient in KDIGO stage 3 (or RIFLE 'F'), which could be past the point when early RRT can be considered. The rate of rise of creatinine, urine output and its course (increasing or decreasing) and preoperative creatinine will give an idea of the likelihood of renal recovery. If the patient was unstable, or had evidence of compromise from volume overload then early initiation of RRT could be considered.

Other factors might include – preoperative dialysis dependence

A requirement to remove the effects of sedative drugs to allow prognostication (perhaps in the setting of a cardiac arrest for example) might be another consideration.

Examiners Comments:

Candidates who tailored their answer to the specific patient in the question scored well, in contrast to those who simply listed generic indications for dialysis.

Maximum Score	7.6
Percentage Passed	49.1%

Question 30

With respect to salicylate toxicity:

- List four severe complications. (20% marks)
- List the associated haematological abnormalities. (10% marks)
- List the options for enhancing salicylate removal and briefly explain the rationale for each option listed. (50% marks)
- When assessing a patient with salicylate toxicity, how would you interpret a declining serum salicylate level? (20% marks)

ANSWER TEMPLATE

a)
List four severe complications
Pulmonary oedema
Cerebral oedema
Arrhythmias
Hyperpyrexia
Shock and cardiovascular collapse
Acid-base disturbance (high anion gap metabolic acidosis and respiratory alkalosis)

b)
List the associated haematological abnormalities
Hypoprothrombinaemia
Thrombocytopenia

c)

List the options for enhancing salicylate removal, and briefly outline the rationale for each option listed:

Haemodialysis. Most of the drug is protein-bound, and is concentration dependent. The volume of distribution is small, and binding site saturation leads to large levels of free drug, which is easily dialyzable

Multiple-dose charcoal. Many aspirin forms are slow release and after ingestion they clump together in the GI tract, forming a large slow release preparation. It is also poorly soluble in the stomach leading to delayed absorption.

Forced alkaline diuresis. Renal excretion of salicylates becomes important when the metabolic pathways become saturated. There is a 10-20x increase in elimination when the urine pH increased from 5 to 8. Current role is questionable as haemodialysis is more efficient at removal, with less metabolic disturbance. Reasonable as initial therapy whilst waiting for circuit prime and line insertion.

d)

Give your interpretation of a declining serum salicylate level

It may indicate that the drug is moving into the tissues, and not necessarily being eliminated
This means that clinical assessment is paramount

Maximum Score	8.6
Percentage Passed	61.4%

EXAMINERS' COMMENTS

Hot Cases

The Hot Cases run for twenty minutes with an additional two minutes at the start of each case for the candidate to be given both a verbal and a written introduction to the case in question. This is to give candidates more opportunity to take in the relevant information and to plan a focussed approach to examination of the patient.

The following comments are a guide to the expected standard for performance in the Hot Cases:

- Candidates should demonstrate professional behaviour, treating the patient with consideration and respect.
- Candidates should address and answer the question asked of them in the introduction to the Hot Case.
- Candidates should interpret and synthesise information as opposed to just describing the clinical findings.
- Candidates need to seek information relevant to the clinical 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 context of the clinical 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, as in previous exams, were able to demonstrate the following:

- A professional approach showing respect and consideration for the patient.
- Competent, efficient and structured examination technique and also able to appropriately adapt the examination to suit the clinical case in question.
- Seeking of information relevant to the case.
- Appropriate interpretation and synthesis of their findings.
- Presentation of their conclusions in a concise and systematic fashion, addressing the issue in question.
- Listing of a differential diagnosis that is relevant to the clinical case in question.
- Appropriate interpretation of relevant investigations.
- Discussion of management issues in a mature fashion, displaying confident and competent decision-making.
- An appreciation of the complexities and key issues of the case.
- Overall performance at the expected level (Junior Consultant).

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

- Missing or misinterpreting key clinical signs on examination.
- Failure to perform a focussed examination relevant to the case in question.
- Incomplete or poor technique for examination of a system.
- Poor synthesis of findings with limited differential diagnosis, sometimes compounded by missed key clinical signs on examination.
- Poor interpretation of imaging and data.
- Failure to grasp the key issues relevant to the case in question and a lack of insight into the problems.
- Inability to construct an appropriate management plan for the case in question.
- Hesitancy and/or uncertainty in stating a management plan.
- The need for significant prompting during the discussion with knowledge gaps.
- 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.

It is apparent that some candidates are very nervous, and this affects their exam performance. Candidates badly affected by nerves may benefit from sessions with a performance psychologist, drama coach, public speaking coach or similar.

Candidates are advised that they should not sit the Second Part Examination until they can confidently examine patients, present the relevant clinical findings, synthesise all the information and discuss management issues at the appropriate level, **i.e. demonstrate that they are capable of safe, effective, independent practice at the level of a Junior Consultant.** Candidates should practise Hot Cases from the commencement of their exam preparation. To this end, candidates are encouraged to do the following in their daily clinical practice as preparation for the Hot Cases:

- Seek the opportunity to take charge of the unit and be responsible for management decisions.
- Practise examination of individual systems.
- Treat every case to be assessed at work as a Hot Case, i.e. pose a relevant question (e.g. 'Why is this patient not progressing?' 'What is the cause of the new fever?' 'Is this patient ready for extubation?'), perform a focussed exam and then present your findings to a colleague.

Vivas

The overall pass rate for the vivas was 83%, compared with 60% for the written paper and 68% for the Hot Cases. Three out of the eight vivas had a pass rate of 50% or lower, the procedure viva in

particular, being answered poorly. Candidates who failed a viva mostly did so because of knowledge gaps, poorly structured answers and inability to give the rationale for their responses. As in the discussion for the Hot Cases, candidates should not rely solely on generic statements, key phrases and template answers, and, instead, tailor their responses to the specifics of the question and be able to justify and expand their response. Candidates are encouraged to practise viva technique and to discuss patient management, including the rationale for their decisions, with senior colleagues. As with the Hot Cases, candidates who are very nervous or have a poor technique may benefit from training with a performance coach.

SECOND PART ORAL EXAMINATION

CLINICALS “HOT CASES”

Royal North Shore Hospital

A 62-year-old male, background of hepatitis C, following a fall down the stairs while intoxicated. Injuries included multiple rib fractures and pulmonary contusions. Candidates were asked to make a plan for weaning from ventilation. Questions also covered analgesic management, and feeding regimens.

A 73-year-old male, background history of laryngectomy for laryngeal cancer, who was admitted with respiratory failure following an oesophageal dilation. The candidates were asked to assess the contributors to his respiratory failure and make a plan for weaning. Additional questions included interpretation of his echo and assessment of nutritional status.

A 39-year-old male, previous well, admitted following a bicycle accident. He had respiratory failure and was ventilated via a tracheostomy. Candidates were asked to assess the factors contributing to his respiratory failure. Examination of the neurological system was essential. Additional questions were asked regarding causes of fever, and reasons for persistent noradrenaline requirement.

A 50-year-old male, background of spinocerebellar degeneration (normal cognition, but wheelchair bound), who was admitted after his wheelchair fell down a long escalator. He had failed extubation and remained ventilated. Candidates were asked to assess contributors to his failed extubation. Additional questions were asked about management of his ileus and timing of tracheostomy.

A 30-year-old female, background of being a Jehovah's witness, hypertension, and thalasaemia trait, who presented following a collapse at home. Candidates were asked to assess her with regards to the causes of her collapse. Discussion also included interpretation of her CT head, and management of her hypertension.

A 54-year-old male, background of dialysis dependent CKD, who was day 1 post redo AVR with an open chest, on high dose vasopressors. Candidates were asked to assess and make a management plan for the day. Discussion included management of his CRRT including the anticoagulation, management of his vasopressors.

A 76-year-old male, who had previous endovascular AAA repair, a PPM and previous infective endocarditis, who was admitted to the ICU following a revision of his AAA repair complicated by bleeding and a haemothorax. Candidates were asked to assess him for his readiness for discharge to the ward. Additional questions were asked plans for anticoagulation, further investigation of a hypercoagulable state, and pain management.

Liverpool Hospital

A 55-year-old female had been in the ICU, ventilated for 8 days following a laparotomy for a pelvic mass. She had developed an acute kidney injury (AKI). Candidates were asked to examine with a view to discussing the likely causes contributing to her AKI.

A 75-year-old male with a background history of smoking and diabetes had undergone off-pump coronary artery bypass grafts the day before. He had to return to the operating room for excessive post-operating bleeding. The patient was in a shock state with a pulmonary artery catheter and an intra-aortic balloon pump in place and had ongoing bleeding. Candidates were asked to examine to assess for causes for shock and discuss a management plan. In addition to other investigations, a single loop from a bedside echocardiogram was available at the bedside.

A 56-year-old male had been in the ICU for 2 days following a collapse from a Grade 4 SAH. There patient was intubated and ventilated with an external ventricular drain in place. Discussion was based around management of SAH, particularly vasospasm and also around causes and management of hypoxic respiratory failure in this context.

A 61-year-old male was intubated the day before following a collapse at home with left hemiplegia. He was intubated and ventilated to facilitate clot retrieval. He had a background of atrial fibrillation and was on apixaban. Candidates were asked to examine the patient to determine suitability for extubation. The patient demonstrated good neurological recovery with subtle residual left sided hemiparesis. Discussion was based around criteria for extubation and management of atrial fibrillation.

A 64-year-old female had spent 9 days in the ICU following complications after an aortic valve replacement. She had a background of type 2 diabetes, chronic kidney disease and prior coronary artery surgery. She had been extubated 3 days previously. Candidates were asked to assess her respiratory function and formulate a plan to get her ready for ward discharge.

Nepean Hospital

A 68-year-old male day 10 ICU, with Community Acquired Pneumonia with refractory hypoxic respiratory failure requiring prone ventilation. Candidates were asked to identify the current clinical issues and devise a management plan.

A 29-year-old male day 31 ICU, with multi-compartmental intracranial haemorrhage and serratia bacteraemia, complicated by seizures and a slow ventilatory wean. Candidates were asked to identify the current clinical issues and devise a management plan.

A 56-year-old female day 7 ICU, with newly diagnosed antiphospholipid syndrome and likely non-bacterial thrombotic endocarditis. Candidates were asked to identify the current clinical issues and devise a management plan.

A 73-year-old male day 21 ICU, with hypoxaemic respiratory failure on background of recent abdominal surgery. Candidates were asked to identify the current issues, and assess suitability for extubation.

A 71-year-old male day 48, with gallstone pancreatitis complicated by respiratory failure, a severe sacral pressure wound and MSSA septic shock. Candidates were asked to identify the current clinical issues and devise a management plan.

Royal Prince Alfred Hospital

A 62-year old male, day 15 in ICU. He had a background of seronegative arthritis, hypertension and ischaemic heart disease and had presented with hypoxic respiratory failure. He was intubated, sedated and receiving ECMO support. Candidates were asked to examine him to determine why he could not be weaned. Areas of discussion included management of broncho-pleural fistula, investigation of fevers, and management of pressure sores.

A 31-year-old male, day 30 ICU. Admitted with hypoxic respiratory failure, and a background of recently diagnosed HIV. Currently ventilated via a tracheostomy. Candidates were asked to examine him and to determine why he could not be weaned from the ventilator. Areas of discussion included the finding and causes of shock in the patient, causes and investigation of a petechial rash, and assessment of a CT scan demonstrating a pneumomediastinum.

A 73-year-old male, day 4 in the ICU. He had presented with acute abdominal pain requiring laparotomy, and had a significant background history of CABG and diffuse B-Cell Lymphoma. Currently intubated and ventilated. Candidates were asked to examine him and to make a management plan. Areas of discussion included criteria and management of extubation, management of nutrition, and investigation and treatment of fungaemia.

A 79-year-old female, day 15 in ICU. Day 14 post-operative after pelvic exenteration for an anal squamous cell carcinoma. Complicated by ischaemic small bowel and perineal wound necrotising fasciitis. Significant background of rheumatoid arthritis on prednisolone and leflunomide. Currently receiving low ventilatory support via tracheostomy, and requiring CVVHDF. Candidates were told she had developed candida fungaemia, and were asked to examine her looking for the source and its complications. Areas of discussion included complications of candida fungaemia and its treatment, management of necrotising fasciitis, and interpretation of a CT scan demonstrating air in the soft tissues.

A 75-year-old female, day 10 ICU. This was her second ICU admission with respiratory failure. She had a significant background of renal transplant and recent bilateral nephrectomy of native polycystic kidneys. She was intubated and ventilated. Candidates were asked to examine her, identify possible causes for her respiratory failure, and formulate a plan for progressing her to extubation. Areas of discussion included the management of chyle leak, the role of steroid replacement therapy and interpretation of imaging.

A 62-year-old male, day 8 ICU. He had presented with a STEMI at another hospital, was placed on VA-ECMO and transferred. Currently he remained on mechanical support and was is established renal failure. Candidates were asked to examine him, identify the key clinical issues and discuss their management priorities. Areas of discussion included interpretation of 12 lead ECG's, management of persistent arrhythmias, interpretation of chest X-ray and management of chest drains.

A 67-year-old male, day 10 ICU. Presented with hypoxic respiratory failure and confusion, with a background of smoking, alcohol abuse and Type 2 diabetes. He was sedated, ventilated and in a stable cardiovascular state. Candidates were asked to examine him to assess his readiness for extubation. Areas of discussion included the interpretation of chest X-rays, the findings from bronchoscopy and CT chest, and the role of tracheostomy.

A 50-year-old male, day 5 ICU. Presented with hypoxic respiratory failure, two weeks post-allogeneic stem cell transplant for acute myeloid leukemia. Background of astrocytoma treated with surgery and chemotherapy. He was ventilated and oliguric. Candidates were asked to examine him and present a management plan for the major issues. Areas of discussion included differential diagnosis and management of the hypoxia, and management of the jaundice, neutropenia and renal failure.

VIVAS

Viva 1

A 75-year-old male patient is admitted to ICU following a MET call for tachycardia and fever, one week after a Whipple's procedure. The post-operative period was complicated by a surgical site infection needing IV antibiotics. He is receiving morphine and tramadol for analgesia, and regular haloperidol for delirium.

He has a background medical history of diabetes, Graves' disease and rheumatoid arthritis for which he takes regular prednisolone.

On ICU admission, he was noted to be confused, restless, and diaphoretic with a temperature of 42°C.

Provide a differential diagnosis for his fever and outline your management plan.

Maximum Score	9.2
Percentage Passed	83%

(This viva dealt with hyperthermia.)

Viva 2

A 64-year-old previously well female had a right hemicolectomy complicated by an anastomotic breakdown with sepsis and multi-organ failure requiring a return to theatre.

After 10 days in ICU, she remains oliguric receiving intermittent renal replacement therapy but has otherwise had resolution of her organ failures.

She was extubated this morning and required re-intubation 4 hours later.

What are the possible reasons for her failed extubation?

Maximum Score	8.0
Percentage Passed	80%

(This viva dealt with respiratory weaning.)

Viva 3

You are called to assess a 56-year-old male in the Emergency Department. He was admitted with a two-day history of severe epigastric pain and vomiting.

On current examination he is conscious and distressed, has a blood pressure of 75/45 mmHg, heart rate 120 beats/minute, respiratory rate of 38 breaths/minute and a temperature of 38.6°C. Oxygen saturations are 91% on room air.

The abdomen is distended and diffusely tender without guarding. He is oliguric.

What are your differential diagnoses and how would you investigate this patient?

Maximum Score	8.5
Percentage Passed	90%

(This viva dealt with pancreatitis.)

Viva 4

You have taken over the care of a previously well 55-year-old female following a World Federation of Neurosurgeons Score (WFNS) 1, Fisher 3 subarachnoid haemorrhage from an anterior communicating artery aneurysm which occurred yesterday.

She has been stable in the ICU with a Glasgow Coma Score (GCS) of 15, a blood pressure of 120/80 mmHg and no focal neurological deficit since her admission.

She has just returned from an endovascular procedure to secure the aneurysm. Her current vital signs are:

GCS 14 (confused)
Heart rate 59 beats/minute
Blood pressure 140/80 mmHg

How would you assess this patient?

Describe your initial management.

Maximum Score	8.5
Percentage Passed	50%

(This viva dealt with subarachnoid haemorrhage.)

Viva 5

You are caring for a previously well 60-year-old male after a motorcycle accident yesterday. He has isolated chest injuries (bilateral rib fractures and pulmonary contusions).

He has been stable in the ICU overnight receiving High Flow Nasal O₂ (HFNO) with multimodal analgesia including Patient Controlled Analgesia. The anaesthetic registrar has just left after inserting a thoracic epidural, when the bedside nurse calls for assistance.

The patient has become disoriented and agitated with the following vital signs:

Heart rate = 55 beats/minute, sinus rhythm
Blood pressure = 78/38 mmHg
SaO₂ = 88% (on 40% FiO₂ HFNO) with a poor trace

Explain the likely causes for the patient's deterioration.

Maximum Score	9.0
Percentage Passed	65%

(This viva dealt with local anaesthetic toxicity.)

Viva 6 – Procedure Station

A previously well 33-year-old male (90 kg, 182 cm tall) has been admitted to your ICU following a hanging attempt. The paramedics were only able to pass a standard size 6 endotracheal tube (ETT).

The ETT was secured at 24 cm at the teeth, and shortened to a total length of 27 cm, in keeping with local pre-hospital transport policy.

What are the potential airway problems in a patient after a hanging attempt?

What problems might you encounter with a size 6 ETT in this patient?

Maximum Score	9.3
Percentage Passed	45%

(This viva dealt with a difficult airway.)

Viva 7 – Radiology Station

Maximum Score	9.1
Percentage Passed	90%

(The radiology station consisted of 4 plain X-rays and 3 CT scans.)

Viva 8 – Communication Station

You are the intensivist caring for Sandra Merton, a 75-year-old female with respiratory failure and shock. She was transferred to ICU last night from the ward. Sandra lives independently and has had little contact with the health system over the years. She was admitted to hospital with a diagnosis of multi-lobar pneumonia and commenced on antibiotics and supplemental oxygen.

Last night she deteriorated and a medical emergency team, including the ICU senior registrar, attended. Her physician was called, who confirmed that 'everything should be done'. She was transferred to ICU and was intubated.

On your ward round you note Sandra's general frailty. She is paralysed and sedated. She has saturations in the low 90s on an FiO₂ of 0.55. She is receiving a moderate dose of noradrenaline and has progressively worsening oliguria.

The bedside nurse tells you that Sandra's son / daughter is their next of kin. They were phoned for the first time this morning and informed of events overnight. The nurse tells you they were upset.

You are about to meet her son / daughter.

Maximum Score	9.5
Percentage Passed	50%