Australian and New Zealand
College of Anaesthetists
ABN 82 055 042 852

Joint Faculty of Intensive Care Medicine

The Royal Australasian
College *of* Physicians

REPORT OF THE GENERAL FELLOWSHIP EXAMINATION

April/May 2007

This report is prepared to provide candidates, tutors and their Supervisors of training with information about the way in which the Examiners assessed the performance of candidates in the Examination. Answers provided are not model answers but guides to what was expected. Candidates should discuss the report with their tutors so that they may prepare appropriately for the future examinations

The exam included two 2.5 hour written papers comprising of 15 ten-minute short answer questions each. Candidates were required to perform at a satisfactory level in the written before being eligible to sit the oral part of the exam. The oral exam comprised six interactive vivas, ten OSCE stations (with four interactive stations, including two cold cases) and two separate hot cases.

Overall statistics

Analysis of Success at each section of the exam:

Total number of candidates appearing for the written Examination	48
Number of candidates scoring > 50%	37
Number of candidates scoring 45-50%	7
Total number invited to the vivas based on written marks	44
Number of candidates carrying the written mark from a previous attempt	4
Number of OTS candidates	2
Total number eligible to present to the vivas (44+4+2)	50
Total number presenting to the vivas (1 candidate withdrew)	49

Pass rates in each section

Oral Section	OSCE Stations	33/49
	Viva Tables	35/49

"Ulimaroa", 630 St. Kilda Road, Melbourne, Victoria 3004 Telephone +61 3 9530 2861 Facsimile +61 3 9530 2862 Email jficm@anzca.edu.au
Internet www.jficm.anzca.edu.au

Clinical Section	23/49
- Clinical Hot Cases	30/49
- Clinical Cold Cases	23/49

Number of candidates approved	**28**
Pass rate (as a percentage of those presenting for the written + eligible from previous exam – [28/(47+7]	51.9%
Pass rate (as a percentage of those presenting to the vivas 28/49)	57%
Pass rate amongst those who scored >50% in the written Paper (25/37)	67%
Pass rate amongst those who scored 45-50% in the written Paper (1/7)	14.3%

Detailed statistics for the written paper

1) Highest aggregate mark in the written paper - 67%
2) In only one question was there a 100% pass rate.
3) In 11 of the 30 questions, the pass rate was < 50%

Detailed statistics for the clinical / oral component

Station	Pass rate	Highest individual mark for the station
OSCAS		
Biochemistry/ blood gases	65%	85%
Chest X Ray	92%	90%
Equipment	53%	85%
Clinical case history	69%	85%
CT	59%	85%
ECG	67%	90%
Procedure	67%	80%
Communication	57%	95%
CROSS LABEL VIVAS		
Viva 1- Management of a multi-trauma patient	65%	100%
Viva 2 – Snake bite	76%	100%
Viva 3 – Paediatric scenario	73%	100%
Viva 4 – HELLP syndrome	55%	90%
Viva 5- Status epilepticus	61%	95%
Viva 6- Antibiotic therapy and resistance	55%	85%
CLINICALS		
Hot Case 1	51%	95%
Hot Case 2	61%	90%

Cold Case 1	43%	90%
Cold Case 2	39%	91%

The courts of examiners made the following observations with regards to the performance of the candidates and suggest that candidates appearing for the exams in the future take note of these recommendations.

1) Whilst there was a high pass rate in the written paper, the proportion of candidates who passed overall amongst those who passed the written paper was only 67%. *This raised the question whether candidates were focussed on preparing for the written paper and deferring the preparation for the viva section after the written paper thus leaving themselves little time to prepare for this important component.*

2) The performance in the clinical section continues to raise concerns. The pass rate averages between 50-60% in the hot cases and around 40% in the cold cases. Reasons for failure in the clinical included
a) missing clinical signs
b) inability to present in a cogent manner
c) Lack of ability to put the fundamental aspects of the case together
d) Inability to put forward a big picture scenario
Besides it relative weight in the examination marking scheme, hot cases are integral to our practice and regular practice (at least practising presentation under exam conditions at least once a week and more frequently as the exam approaches) is recommended.

3) The pass rate in several OSCE sections continue to raise concerns. Of note are the following sections:

a) Interpretation of biochemistry and blood gases
b) ECG

An analysis of the performance in the above 2 stations led to the following conclusions:
-Lack of preparedness for these stations
- Ineffective time management
- Failure to address the question specifically put to them.

c) Communication

All the examiners and the observers were concerned by the performance in this station. A station such as this is core ICU business and forms the basis of transplant programme in the country. Thus there was an expectation that candidates would perform well in this station. The inability of candidates to demonstrate empathy and clearly spell out that the patient is brain dead and what it actually implies and in some cases providing misleading information such as the brain dead patient will breathe for a few minutes after extubation were prime causes of failure.

4) Vivas

Knowledge deficit

Failure to recognise clinically significant issues

SHORT ANSWER PAPER

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, (eg. Table form).
Management:	Generic term that implies overall plan. Where appropriate, may include diagnosis as well as treatment.

1. List the contraindications for and complications of non invasive ventilation.

Contraindications:

a) Respiratory arrest
b) Unprotected airway (coma, sedation)
c) Inability to clear secretions
d) Marked hemodynamic instability
e) Oesophageal surgery or maxillofacial surgery pathology (eg ruptured oesophagus)

Complications:

a) Mask discomfort, patient intolerance
b) Facial or ocular abrasions, pressure necrosis
c) Aspiration pneumonitis
d) Aerophagy and gastric distension
e) Oronasal dryness
f) Raised intracranial pressure
g) Hypotension if hypovolemic

35 candidates (73%) passed this question

2. a) List an antidote (1 drug specific to the agent) in the event of an overdose with each of the agents listed below in the table.

Agent	Antidote

Benzodiazepines	Flumazenil
Beta blockers	Glucagon, adrenaline
Cyanide	Na thiosulfate, hydroxocobalamin,
Digoxin	Fab,
Heparin	Protamine
Iron	Desferrioxamine
Methanol, Ethylene glycol	Ethanol, 4 -methylpyruvate
Methemoglobinemia	Ascorbic acid, methylene blue
Organophosphate	Atropine, pralidoxime
Opiates	Naloxone
Lead	Dimercaprol
Paracetamol	N-Acetylcysteine

b) Which of the agents in the above list are not adsorbed by activated charcoal?

Lead, alcohols, Fe, cyanide

All 48 candidates passed this question

3. **Outline the special considerations involved in the care of a pregnant patient involved in multi-trauma.**

a. High flow O2 to avoid maternal and fetal distress
b. Reduced respiratory reserve
c. Maternal compensation for blood loss is at the expense of uteroplacental flow
d. Avoid aortocaval compression
e. Transfusion should be Rh compatible
f. All Rh negative mothers to receive Ig because of the immunological risk of minor fetomaternal hemorrhage
g. Minimal` exposure to radiation
h. U/S may be preferable
i. Retroperitoneal hemorrhage, placental abruption, fetal distress may occur
j. Premature labour may be precipitated
k. Need for regular cardiotocograph.
l. Pelvic binders may be unsuitable
m. Physiological anemia of pregnancy

32 candidates (66%) passed this question.

4. **Discuss the use of hypertonic saline in the treatment of intra-cranial hypertension following head injury.**

List of advantages / disadvantages

Principal Advantages

- The effect is rapid, peaking at 10 minutes and waning after 1 hour.
- End point for therapy is serum Na between 145-155 and easily achieved in ICU thro blood gas machines.
- Less potential for hypovolemia than with mannitol.
- May have a better effect on CBF for a given reduction in ICP.
- Theoretical benefit in modulating the inflammatory response
- HS is inexpensive

Disadvantages

- Need for a central venous access .
- "Hypokalaemia / .Hyperchloraemic acidosis
- Lack of outcome data,
- Increase in circulating volume and risk of CCF.
- Coagulopathy – HS may affect APTT and INR as well as platelet aggregation.
- Rapid changes in serum sodium concentrations may result in seizures and encephalopathy
- Some suggest that HS affects normal brain more that injured brain which theoretically may worsen herniation

14 candidates (29%) passed this question

5. List the causes of the various pupillary abnormalities which may assist in the differential diagnosis of the comatose patient.

ABNORMALITY	CAUSE	NEUROANATOMICAL BASIS
Miosis (< 2mm in size)		
Unilateral	**Horner's syndrome** **Local pathology**	**Sympathetic paralysis** **Trauma to sympathetics**
Bilateral	**Pontine lesions** **Thalamic haemorrhage** **Metabolic encephalopathy**	**Sympathetic paralysis**
	Drug ingestion	
	Organophosphate	**Cholinesterase inhibition**
	Barbiturate	
	Narcotics	**Central Effect**

ABNORMALITY	CAUSE	NEUROANATOMICAL BASIS
Mydriasis (> 5mm in size)		
Unilateral fixed pupil	**Midbrain lesion** **Uncal herniation**	**3rd nerve damage** **Stretch of 3rd nerve against the**

		petroclinoid ligament
Bilateral fixed pupils	Massive midbrain Haemorrhage	Bilateral 3rd nerve damage
	Hypoxic cerebral injury	Mesencephalic damage
	Drugs	
	Atropine	Paralysis of parasympathetics
	Tricyclics	Prevent local reuptake of catecholamines by nerve endings
	Sympathomimetics	Stimulation of sympathetics

32 candidates (67%) passed this question

6. Examine the 2 traces illustrated in the figure below. The top trace is an ECG whilst the lower one is an arterial pressure waveform.

a) What abnormality is illustrated by the arterial pressure waveform?

Pulsus paradoxus

b) Give reasons to justify your answer.

- The systolic blood pressure fluctuates with breathing (note that this is different than pulsus alternans, where the rhythm is regular but the systolic pressure alternates between one strong and one weak stroke volume).
- There is a difference of greater than 15 mmHg between inspiratory and expiratory systolic pressures.
- R - R interval on ECG is regular, ruling out arrhythmia as the cause for the fluctuating systolic pressure.

c) List 3 causes of the above phenomenon in critically ill patients

1) Pericardial effusion

2) Asthma

3) Hypovolemia in a mechanically ventilated patient

31 candidates (64%) passed this question

7. A patient recovering from a prolonged admission to ICU has developed a new sacral pressure ulcer. Outline your management of this problem.

Assessment –

Severity of ulcer – superficial /deep The ulcer presents clinically as an abrasion, blister, or shallow crater.

Signs of infection (systemic and local), contributing devices (eg splints, etc)
Serial photographs

Management –

Continue preventative strategies –

a) pressure relief through posture and regular (two hourly) turns and pressure relief devices (range of devices but can include foam/gel pads, special mattresses
b) Aim to mobilize (reduce/minimize any sedation) adequate analgesia for painful ulcers. Alert as high risk within ICU and determine tailored team approach.
c) Also treat/manage diarrhea and urinary incontinence.
d) Avoid friction
e) Review unit protocols

Specific treatment

1) Dressings – occlusive or semipermeable dressing that will maintain a moist wound environment for superficial ulcers.
2) Infection – identify and treat accordingly
3) Surgery – ranging from minor removing infected granulation and necrotic tissue to major debridement
4) Adequate nutrition

37 candidates (77%) passed this question

8. A 62-year-old man presents to ICU with progressive oliguria and shortness of breath. He had been admitted to the ward a week before because of jaundice. His previous medical history is unremarkable, except for heavy alcohol consumption. There is no history of gastrointestinal bleeding or ingestion of nephrotoxic drugs. There is no past history of renal dysfunction. Clinical examination reveals a blood pressure of 124/60 mm Hg, jaundice, oedema and a distended non-tender abdomen. Cardiovascular examination is normal.

Investigations reveal:

Ultrasound abdomen: Nodular cirrhosis of liver, ascites and normal sized, regular shaped kidneys.

Urinalysis : No proteinuria, White cell count $<10 \times 10^6/L$ (Normal < 10)

Ascitic tap –
White cell count $<10 \times 10^6/L$ (Normal < 10)
Red cell count $<10 \times 10^6/L$ (Normal < 10),
No organisms on Gram stain.

Blood results are shown:

	On admission to hospital	On admission to ICU (7 days later)
Na (135-145 mmol/L)	139	123
K (3.5 – 5.0 mmol/L)	4.1	5.1
Creatinine (0.06-0.14 mmol/L)	0.06	0.340
Urea (4-6 mmol/L)	3.8	22
Bilirubin (0-20 µmol/L)	34	48
ALT (<40 U/L)	180	600
AST (<50 U/L)	340	870
Hb (120-150 G/L)	134	104
WCC (4-11 X 10^9/L)	14.4	16.1

a) What is the most likely cause of the renal deterioration? Give reasons.

Hepatorenal syndrome .
Reasons: Fulfils criteria for Type 1 HRS – (Acute deterioration, absent renal parenchymal disease, absent proteinuria, no shock and no history of nephrotoxic drugs)

List 4 important management measures specifically for the treatment of this patient's renal dysfunction.
Management of complications of renal dysfunction - hyperkalemia
Albumin administration
Terlipressin / Midodrine/ Octreotide
TIPS
Consideration for liver transplantation

36 candidates (75%) passed this section

9. A two year child presents with fever, stridor and a harsh cough. His condition deteriorates and he requires intubation. Outline how you would do this.

Call for help
This should be in context –
a) if the child becomes hypoxic/has a respiratory arrest etc – proceed with attempt bag mask ventilation 100% oxygen immediately – attempt intubation.
b) If there is time – aim to have the person with the best paediatric airway management expertise – intubate child

Optimise medical management
a) High flow oxygen
b) if child hypoxic – can discuss avoiding distressing the child by holding mask away from face and with child on parents lap (unless really sick)
c) IV steroids – adequate dose (0.6mg/kg dexamethasone
d) NEB adrenaline 5mg (repeated doses)
e) Oxygen/Helium mixture if tolerates

Adequate discussion of preparation for intubation
a) range of ETT's (size 4.0, 4.5. 5.0, 5.5)

b) two laryngoscopes with range of blade sizes – straight/curved
c) small diam "bougie"
d) cannula for percutaneous needle cricothyroidotomy + method for oxygen delivery
e) suction

Intubation: One of 2 approaches
(1) Inhalational induction of anaesthesia with maintenance of spontaneous ventilation until adequate depth of anaesthesia achieved to allow intubation (or to assess ability to ventilate – then proceed to paralyse child)
Or (2) IV induction – with paralysis
There must be some discussion regarding risks of either technique. Mere mention of IV approach will not be enough to gain marks . There must be some discussion regarding risks of either technique
However, if not trained in inhalational anaesthetic techniques – reasonable to proceed with IV induction of anaesthesia + muscle paralysis – with risk of being unable to ventilate

Alternate strategies if **unable to intubate**
Ventilate with LMA/face mask until help arrives
Rarely need to proceed to needle cricothyroidotomy

23 candidates (48%) passed this section

10. Critically evaluate the current approaches to the treatment of cerebral vasospasm following aneurysmal subarachnoid haemorrhage.

a) Treatment
b) Triple H therapy – HT, hypervolemia and hemodilution – controversial, not evidence based
c) Early clipping / coiling
d) Nimodipine - useful in prophylaxis,
e) Endoluminal therapies: Balloon angioplasty and intra-arterial papaverine

Investigational therapies - proven in animal models, no hard clinical evidence, no RCT

1) Statins – Early human data
2) Cisternal tPa
3) Endothelin antagonists

33 candidates (69%) passed this question

11. A sixty year old male is brought unconscious to the hospital after a motor vehicle accident. He has an initial GCS of 6 and is intubated at the scene. A non contrast CT head is performed.

a) List the most significant abnormalities that are present on this CT scan?

a) R. Fronto parietal subdural
b) Midline shift
c) Obliteration of R. lateral ventricle
d) Effacement of sulci
e) Traumatic subarachnoid hemorrhage
f) Contusions

b) List the major factors that may adversely affect his prognosis?

a) Age
b) ICP control
c) Severity of injury - GCS, traumatic SAH
d) Hypoxia
e) Hypotension

c) What is the simplest score in common usage that could be used to describe the patient's outcome?"

a) (Extended) Glasgow outcome score
b) SF-36

36 candidates (75%) passed this question

12. Write short notes on:

a) Recombinant activated protein C (drotrecogin alpha)

a) endogenous human protein, a component of natural anti-coagulant system
b) Recombinant version shown to improve survival in septic shock in a RCT.
c) Indications for use: septic shock, 2 system failure, APACHE II > 25
d) Possible mechanisms: Sepsis decreases APC levels and therefore administration increases levels, Improved microcirculation through alteration of coagulation, Anti-inflammatory and antiapoptotic
e) Side effects: Bleeding
f) Controversies: Not proven in immunocompromised patients, increases mortality in paediatric population
g) Expensive

b) Recombinant coagulation Factor VIIa

a) Novel agent for control of intractable hemorrhage
b) Evidence base: hemophilia, trauma, post cardiac bypass, intracranial hemorhage
c) Mechanism: Causes a thrombin burst which in turn converts fibrinogen to fibrin to form a clot.
d) Complications: DVT risk
e) Expensive

30 candidates (63%) passed this question

13. Compare and contrast the advantages and limitations of the intra-aortic balloon pump (IABP) and ventricular assist devices (VAD). (You may tabulate your answer).

	IABP	VAD
	Can be inserted	Whilst percutaneous

	percutaneously in ICU or CCU	insertion possible, frequently require anaesthesia and a surgeon for insertion and removal.
Indications	Used post cardiac surgery / cardiogenic shock following an infarct	Frequently used in post cardiac surgical patients. Used as a bridge to transplantation.
Logistics	Intensivists more familiar with IABP, can be used during transport	Less familiar with VAD, greater degree of complexity, more difficult to use during transport
Anticoagulation	Usually no need for anticoagulation	Need for anticoagulation
	Not effective in the setting of CI < 1.2 and tachyarrhythmias	Greater control on overall cardiac output as well as Rt and Lt ventricular output
Complications	Lower limb ischemia, hematoma, aortic trauma are complications	Bleeding, infection, hemolysis, device failure

34 candidates (71%) passed this question

14. Briefly discuss the problems specific to aeromedical transport of a critically ill patient.

a) Transport by any means involves risk to staff and patients
b) Need to be familiar with the use of the transport vehicle's O2, suction, communications,and other equipment systems.
c) Reduction in partial pressure of oxygen with altitude, critically ill patients who are already dependent on high FiO2 may be further compromised.
d) Expansion of trapped gases – pneumothoraces, intracranial air from injuries
e) Expansion of air containing equipment – ET tube, Sengstaken tube. ET cuff pressures will need to be adjusted
f) IABP difficult to transport
g) Risk of hypothermia
h) As water partial pressure falls, risk of dehydration through resp losses and passive humidification important
i) Auscultation is difficult.
j) The ventilated patient is placed in the Trendelenburg and the reverse Trendelenburg positions during take off and landing respectively. This can impact on perfusion and oxygenation.
k) Potential for pacemaker malfunction due to avionic interference.
l) Staff doing air transport should refrain from compressed gas diving for at least 24 hrs prior to transfer.
m) Physical problems: cold, noise, lighting, access to patient, motion sickness, acceleration injuries (eg head to front of plane to avoid increased ICP on takeoff

27 candidates (56%) passed this question

15. To evaluate a new biomarker as an early index of bacteraemia, you perform the measurement in a consecutive series of 200 critically ill septic patients. You find that 100 of these patients had subsequently proven bacteraemia. Of these, 70 had a positive biomarker result. Of the remaining 100 patients without bacteraemia, 40 had a positive biomarker result.

Using the above data, show how you would calculate:

a) sensitivity
b) specificity
c) Positive predictive value
d) Negative predictive value
e) Positive Likelihood ratio

	Bacteremia present	Bacteremia absent	
Biomarker +	70	40	
Biomarker -	30	60	
	100	100	

a) Sensitivity = (TP/ {TP + FN}) = 70/100
b) Specificity = (TN/{TN + FP}) = 60/100
c) PPV = (TP/{TP+FP}) = 70/110
d) NPV = (TN({TN+FN}) = =60/90
e) Positive likelihood ratio= Sensitivity / 1-specificity = 70/40

35 candidates (73%) passed this section

16. Write a short note on hypomagnesaemia.

A common electrolyte abnormality in the ICU:
Mg primary intracellular cation and plays a major role in the transfer, storage and utilization of energy.

Causes: diarrhoea, NG suction, TPN, RTA, alcoholism, malabsorption
Drugs – amphotericin B, Aminoglycosides, Carbenicillins, diuretics.

Pathophysiology: Mg deficiency leads to a drop in ICF potassium and a rise in ICF Na., leading to an elevation in the resting membrane potential. This leads to a rise in the inward Ca current and hence the enhanced neurological and cardiac irritability.

Effects: Confusion, irritability, delirium, tremors, tachyarrhythmias, Torsade, refractory hypokalemia and hypocalcemia.

Treatment: IV MgSO4 in doses of 5-10 mmol/L, given slow IV. Repeated doses may be required. Rapid administration can lead to hypotension.

28 candidates (58%) passed this section

17. Discuss briefly the advantages and limitations of four (4) strategies you would use for prevention of clotting in a continuous renal replacement therapy circuit. (You may tabulate your answer.)

	Advantages	Limitations
Systemic heparin (low to medium dose)	Easy to administer, cheap, may not have a significant systemic anticoagulation, effectively antagonized by protamine, physician familiarity	Anticoagulation with this dose not always successful, may need higher doses, risk of bleeding, pharmacokinetics altered in critical illness, need to monitor APTT, Risk of HITTS.
Regional heparin (pre filter) with post filter protamine		More complex to administer, monitoring, allergy to protamine
LMW heparin	Easy to use, expensive, useful if patients has associated HITTS	Need to measure Xa levels. Protamine not effective
Regional Citrate (pre filter) with post filter Ca	Very effective, can be used in HITTS	Clinician unfamiliarity, need for Ca free special dialysate, metabolic alkalosis, hypocalcemia, need for systemic DVT prophylaxis still.
Prostacyclin	Useful if patient has associated HITTS	Hypotension, platelet dysfunction and risk of bleeding
Heparinoids	Useful if patient has associated HITTS	
Serine protease inhibitors (nafomostat)	Only available in Japan, anaphylaxis, agranulocytosis	Bonus marks for mentioning this

Non pharmacological measures to consider include checking the integrity of the catheter, avoiding kinking of the catheter and predilution.

34 candidates (71%) passed this section

18. A 33 year old female presented with high fever and abdominal pain. She has gram negative bacteraemia and septic shock. The following are data from blood gas analysis.

Barometric pressure	760	mm Hg
FiO_2	0.3	
pH	7.43	
pO_2	107	mm Hg
pCO_2	23	mm Hg

HCO_3^-	15	mmol/L	
Standard base excess	-8.6	mmol/L	
Lactate	23.0	mmol/L	(0.2 – 2.5)
Sodium	147	mmol/L	(135 -145)
Potassium	6.7	mmol/L	(3.2 - 4.5)
Chloride	95	mmol/L	(100 -110)

a) **List the acid-base abnormalities**

High anion gap metabolic acidosis with raised lactate
Metabolic alkalosis (Delta BE < Delta AG)
Respiratory alkalosis

b) **What are the causes of elevated plasma lactate in sepsis?**
1) Circulatory failure due to hypotension and hypoxia
2) Microvascular shunting and mitochondrial failure (cytopathic hypoxia)
3) Use of adrenaline as an inotrope
4) Inhibition of pyruvate dehydrogenase (PDH) by endotoxin.

c) **Name 3 drugs which result in plasma hyperlactaemia**
- Catecholamines
- Metformin / Phenformin
- Alcohols
- Cyanide, nitroprusside
- Salicylates

31 candidates (65%) passed this question

19. Outline the important changes to Basic and Advanced Life Support guidelines for Adults in the latest revision issued by the Australian Resuscitation Council in 2006.

Basic Life Support

a) No signs of life equals: unresponsiveness, not breathing, not moving normally. Pulse check not required to commence CPR.
b) The term " Rescue Breathing " has replaced Expired Air resuscitation
c) Compression ventilation ratio 30:2 for children & adults.
d) Same ratio regardless of number of rescuers
e) Identifying the lower half of sternum by visualizing the centre of chest, no need to measure and remeasure
f) 2 initial breaths, not 5.
g) Chest compressions at 100 / min

Advanced Life Support

a) Minimise interruptions to chest compressions
b) If unwitnessed arrest, VF or pulseless VT, single shock instead of stacked shocks.

c) If witnessed arrest – up to 3 shocks may be given at the first attempt.
d) If monophasic defibrillator – energy level 360 J
e) If biphasic defibrillator – energy level 200 J
f) If unsure of device, use 200 J. After each defibrillation, 2 min of CPR before checking pulse.

35 candidates(73%) passed this section

20. List the advantages and disadvantages of the following pacemaker modes: AAI, VVI, DDD. (You may tabulate your answer).

Mode	Advantages	Disadvantages
AAI	a) Requires a single lead, b) AV synchronicity maintained, c) Able to assess ST changes,	a) Unable to use in AF, b) Ventricular bradycardia may occur in the presence of a high grade AV block, c) Instability of a single atrial lead, d) Higher risk of perforation of thin atrial wall
VVI	a) Requires a single lead, b) Useful in the presence of AF and high grade AV block,	a) AV synchronicity is lost b) Unable to assess ST changes c) Loss of atrial kick d) Risk of pacemaker syndrome
DDD	a) AV synchronicity maintained b) Useful in the presence of AF and high grade AV block c) Heart rate responsiveness	a) Pacemaker mediated endless-loop tachycardia b) Pacemaker syndrome if incorrectly setup c) May not be able to assess ST changes

38 candidates (79%) passed this question.

21. A 64 year old lady admitted with Grade V subarachnoid hemorrhage was pronounced brain dead based on a 4 vessel cerebral angiogram. Subsequent to the angiogram, the total respiratory rate was 15 /min when the ventilator rate was set at 10/min.

a) What are the potential causes of the discrepancy between the set ventilator rate and the total respiratory rate?

1) Auto-triggering of the ventilator due to
- Cardiogenic oscillations

- High sensitivity settings
- Circuit leaks
- Water condensation in the circuit

2) True spontaneous breath (although unlikely as there is a definitive test indicating brain death.

b) What steps will you take to distinguish the cause in this case?

1) Connect the patient to a T-piece circuit with a capnograph and look for spontaneous breathing movements and a CO_2 waveform.

39 candidates (81%) passed this question

22. Critically evaluate the role of Selective digestive decontamination (SDD) in critical care practice.

Definition

Selective decontamination of the digestive tract (SDD) is an infection-prophylaxis regimen that was introduced into intensive-care medicine already in 1984. Controversy remains about the effects of SDD on mortality and on antibiotic resistance.

Principle

SDD aims at eradicating the potentially pathogenic microorganisms from the mouth and stomach, while preserving the indigenous anaerobic flora to prevent overgrowth with resistant bacteria and yeasts.

Regime

The most frequently used regimen consists of topical polymyxin E, tobramycin, and amphotericin B.

Data on efficacy

1) a lower incidence of pneumonia in SDD-treated patients.
2) A reduction in mortality in SDD treated patients.
3) Initial data suggest a benefit in trauma patients

Adverse effects

Concerns about development of antibiotic resistance although no clear evidence exists.

Limitations of SDD

A major limitation of SDD is the fact that its efficacy and safety is only shown in ICU's with low prevalence of MRSA and/or VRE. Unfortunately, in most areas in the world, MRSA is endemic. In these area's, SDD should be considered experimental, and the regimen should be adapted in a way that proves effective in high-MRSA circumstances.

26 candidates (54%) passed this section

23. Discuss the advantages and limitations of the anion gap in the evaluation of acid-base disturbance.

Definition AG –a derived variable for the evaluation of metabolic acidosis to determine the presence of unmeasured anions.
AG = [(Na + K) – (Cl + HCO3)], normal reference range : 8-12 meq/ L

Utility: A raised AG is seen with elevated lactate, ketoacidosis, salicylates, alcohol poisonings, and pyroglutamate

Advantages of the anion gap:

a) A simple measure to quantify and evaluate acid-base disturbance
b) Can be easily done at the bedside

Limitations:

1) Reduced unmeasured anions such as hypoalbuminemia (frequently seen in critical illness) will reduce the AG and may mask an elevated AG
2) Unmeasured cations such as elevated Li and hyperglobulinemia will reduce AG.
3) Hypercalcemia and hypermagnesemia will also reduce the AG.
4) Calculation of AG involves measurement of electrolytes and therefore depends on the accuracy of the measurement process.

To overcome the effects of the hypoalbuminemia on the AG, the corrected AG can be used which is AG + (0.25 * (40-albumin) expressed in G/L

31 candidates (65%) passed this question

24. A 64 year old diabetic with vasculopathy undergoes an attempted endovascular repair of an abdominal aortic aneurysm. However the procedure is abandoned because of technical difficulties and he undergoes a surgical repair. In the first 6 hours after the procedure, he is noted to be oliguric and a blood test reveals a creatinine of 0.24 mmol/L (pre op value 0.15 mmol/L).

a) List 5 likely causes of deterioration in renal function.

1. Hypovolemia
2. Abdominal compartment syndrome
3. Renal artery trauma
4. Low output state from myocardial dysfunction from cross clamping and

5. peri-op ischemia
6. Use of contrast
7. Post op bleeding
8. Ischemic rhabdomyolysis
9. Nephrotoxic drugs

The patient is administered IV fluids overnight. Despite stable blood pressure overnight, the next morning he is noted to be still oliguric. The plasma biochemistry is as follows:

(Abnormal values marked with an asterisk)

Sodium	137	mmol/L	(135-145)
Potassium *	6.3	mmol/L	(3.2-4.5)
Chloride	106	mmol/L	(100-110)
Bicarbonate*	18	mmol/L	(22-33)
Urea *	15.0	mmol/L	(3.0-8.0)
Creatinine *	0.34	mmol/L	(0.07-0.12)
Total calcium*	1.75	mmol/L	(2.15-2.6)
Phosphate*	2.75	mmol/L	(0.7-1.4)
Albumin	26	G/L	(33-47)
Globulins	35	G/L	(25-45)
Total bilirubin	20	µmol/L	(4-20 µmol/L)
Conjugated bilirubin	4	µmol/L	(1-4 µmol/L)
GGT	6	U/L	(0-50)
ALP	100	U/L	(40-110)
LDH *	3800	U/L	(110-250)
AST *	2100	U/L	(<40)
ALT	100	U/L	(<40)

b) What is the likely cause of this plasma biochemistry?

Rhabdomyolysis from lower limb ischemia

37 candidates (77%) passed this section

25. You are supervising a registrar during the insertion of a central line. He suffers a needle stick injury. Outline your approach to this problem.

- Stop the procedure, ensure patient is safe and you take over care if required.

Advise the registrar of the following:

- Wash the wound immediately with soap and water. Express any blood from the wound
- Alert your supervisor and initiate the injury reporting system used in your workplace.
- Identify the source patient, who may need to be tested for HIV, hepatitis B, or hepatitis C infections.

- Report to employee health services, or other designated treatment facility.
- Get tested immediately and confidentially for HIV, hepatitis B, and hepatitis C infections.
- Document the exposure in detail, for your own records as well as for the employer.
- When the source patient is unknown or tests positive for HIV, hepatitis B, or hepatitis C infection, get postexposure prophylaxis (PEP) in accordance with CDC guidelines. If the patient has HIV, start prophylaxis within two hours of exposure. For possible hepatitis C exposure, no treatment is currently recommended, but you may want to talk to a specialist about experimental postexposure prophylaxis.
- Make sure to follow up with postexposure testing at six weeks, three months, and six months, and depending on the risk, at one year. If PEP is prescribed, you should be monitored regularly for signs and symptoms of toxicity. Take precautions (especially by practicing safe sex) to prevent exposing others until follow-up testing is complete.
- Don't be afraid to seek additional information or a referral to an infectious disease specialist if you have any questions.

Counselling

Whilst definitive testing is essential, counsel the registrar that the risk factors for infection are: deep injury, visible blood on device, needle placement in a vein or an artery, lower risk with a solid suture needle (cf hollow needle) because of as lower inoculum.

Review of technique

33 candidates (69%) passed this question

26. Outline the causes, consequences and management of Vancomycin Resistant Enterococcus in the critically ill patient.

Causes:

1) previous treatment with anti-microbials (especially vancomycin, cephalosporins, and broad-spectrum antibiotics),
2) increased length of stay, renal insufficiency,
3) enteral tube feeding,
4) prevalence of VRE colonised patients in the unit, and
5) residents of long-term care facilities.

Consequences:

1) potential transmission of resistance to Staph aureus
2) are determined by the presence of infection (UTI, bloodstream including endocarditis, and rarely respiratory infection),
3) or just colonisation (main consequence being requirement for isolation and associated factors

Management:

Involves specific antibiotics if infected rather than colonised (depend on sensitivities: regimens may include one or more of ampicillin, tetracyclines, teicoplanin, quinolones, and quinupristin-dalfopristin), infection control related to the patient (isolation [avoiding direct contact], aggressive infection control, limiting broad spectrum antibiotics if possible, surveillance of patient until clear).

30 candidates (63%) passed this question

27. Briefly outline the difficulties encountered in the clinical and laboratory diagnosis of sepsis in the critical care unit.

- Clinical:

a) Fever and other SIRS criteria have low specificity
b) No specific clinical signs of sepsis apart from specific syndromes such as endocarditis
c) Elderly, immunocompromised and malnourished patients- do not manifest typical signs of sepsis
d) Both infective and non infective causes of SIRS may coexist in the same patient and therefore presence of inflammation not always a reliable sign.
e) Deep seated collections difficult to diagnose

- Laboratory
  a) Leukocytosis not specific as it is a marker of stress rather than infection
  b) Reliable diagnosis established by presence of organisms only in blood or in sterile tissues, but tissues may be difficult to obtain
  c) Administration of antibiotics frequently before diagnostic tests limits utility of cultures
  d) Cultures might sometimes take time for positive results to come back
  e) Tests such as PCR might not be universally available
  f) Serology tests frequently non specific
  g) Biomarkers such as procalcitonin and CRP and IL-6 do not have a high sentivity and specificity.
  h) Lack of consensus on criteria regarding what constitutes ventilator associated pneumonia, line sepsis etc.

17 candidates (35%) passed this question

28. List the extrcoporeal therapies used in the critically ill and outline the indications for their use.

1) Dialytic techniques.

Traditional indications used for acute renal failure, are concerns about fluid overload (actual or to facilitate nutritional support), hyperkalaemia or other uncontrolled electrolyte disorders, metabolic acidosis, hyponatraemia, uraemic symptoms or elevated urea (e.g. 30 mmol/L).

2) Dialysis or haemofiltration (e.g. with charcoal filter) can be used to increase the clearance of toxic products from the circulation (e.g. lithium, theophylline, myoglobin).

3) Newer related extracorporeal techniques have also been developed to support liver dysfunction.
4) ECMO – Severe respiratory failure
5) ECCO2 – Severe respiratory failure
6) Extracorporeal ventricular assist device – Severe myocardial dysfunction
7) Plasmapheresis/filtration – meningococal infection, Guilian Barre, ITP

40 candidates (83%) passed this question

29. A 23-year-old previously healthy girl involved in a motor vehicle accident is brought to ICU with multiple rib fractures and laceration of her left forearm. , no acute bleeding, She is haemodynamically stable and there is no evidence of acute bleeding. She has the following coagulation profile:

Test	Result	Normal range
INR	1.1	0.8 – 1.2
Prothrombin time	11	10 – 15
APTT	73	35 – 45
APTT after protamine	69	35 – 45
APTT with 50% normal plasma	53	35 – 45
Fibrinogen	3.4	2.5 – 5

She needs to go to theatre for a debridement of her laceration. The surgeons would like her coagulopathy corrected.

a) What is the likely explanation for the APTT result? Give reasons.

Antiphospholipid antibody syndrome

Reasons:
1) Lack of correction with protamine excludes heparin as a cause of prolonged APTT
2) Lack of correction with normal plasma excludes clotting factor deficiency.
Prolongation despite normal plasma suggests circulating anticoagulant. Normal INR and PT and fibrinogen exclude DIC. In a young woman, antiphospholipid antibody syndrome

b) What further test would you order to confirm the aetiology of the coagulopathy?

Lupus anticoagulant

c) What vascular complication is this patient at risk of?

Recurrent DVT / arterial thrombosis

d) What drugs might be suitable for DVT prophylaxis in this patient?

Short term – aspirin /heparin
Long term – warfarin

27 candidates (56%) passed this question

30. List the potential causes of delayed awakening in a patient after a prolonged stay in Intensive Care and outline how you would determine what factors were contributory.

Potential causes include:

prolonged effects of sedative drugs, metabolic encephalopathy (especially renal or hepatic failure), endocrine problems (especially hypothyroidism), systemic sepsis, and a myriad of specific neurological problems (eg. status epilepticus, raised intracranial pressure, intracranial haemorrhages, severe Guillain Barre, critical illness polyneuropathy). Residual muscular paralysis must be excluded.

Sedative drugs may have a prolonged effect because of altered kinetics (including context sensitive half-time, or decreased biotransformation or excretion eg. renal or hepatic failure) or altered dynamics (potentiation of effect by other drugs or organ failure, sensitivity to effect of usual dosage).

Assessment of contributory factors may be a complex process. Important steps include:

1) Detailed history of neurological state, drugs administered, previous neurological problems
2) Careful examination (in particular neurological, but also for signs of other chronic diseases). Detailed neurological exam should include global CNS assessment (including ability to move eyes or poke out tongue if no other apparent motor responses: locked in syndrome, severe myoneuropathy), and search for focal signs (pupils, tone, movement, reflexes). Nerve stimulator should be used to assess residual paralysis.
3) Biochemical investigations for severity of electrolyte imbalance, creatine kinase, renal and hepatic dysfunction (including ammonia), and to exclude treatable endocrine disorders (including T4/TSH).
4) Consider use of specific reversal agents (eg. naloxone and flumazenil [may need multiple ampoules]).
5) May require other specific investigations (but put into context, and not done as a routine). Such investigations include CT scan of head, MRI, EEG, EMG and lumbar puncture.

34 candidates (71%) passed this question

OSCEs

1: Biochemistry and blood gases.

Data sets provided for interpretation included
a) a combined resp acidosis and a metabolic alkalosis in a post operative patient,
b) an acute respiratory acidosis in a pregnant lady
c) a combination of hyponatremia and hyperkalemia and
d) a patient presenting to the ED whose plasma biochemistry revealed a raised anion and osmolar gaps.

2. Three Chest X-Rays (with brief case histories) were shown. Candidates were required to list findings and answer questions relevant to the findings and history.

a) Trauma with fractured ribs, contusions and hemothorax
b) Trauma with pulmonary contusion, ruptured diaphragm and a widened mediastinum
c) Raised right hemidiaphragm with a prosthetic valve

3. Equipment station consisted of answering questions relating to a conventionan and a reinforced percutaneous tracheostomy tube.

4. Clinical Case History: The following case history was provided:

A previously healthy 34 year old woman is transferred to your hospital with a history of a prolonged generalized tonic-clonic convulsion. She is intubated and ventilated. By the time she arrives she is no longer convulsing but she is deeply unconscious with a GCS of 3, fixed dilated pupils, absent tendon reflexes and bilateral up-going plantar reflexes. She has received no drugs. Blood samples have been collected for a full blood count, biochemistry and a coagulation profile. The results are awaited.

Candidates were required to answer questions relating to the differential diagnoses, CT appearances and comment on a blood picture report and the role of an EEG.

5. CT scan station: Four CT scans (with brief case histories) were shown. Candidates were required to list findings and answer questions relevant to the findings and history.
a) Bilateral subdurals with an old infarct
b) CT-neck with a burst fracture
c) CT-chest showing an acute pneumothorax with underlying chronic bullous disease
d) Acute pancreatitis

6. ECG station. Five ECGs were shown and candidates were required to either report the findings or answer related questions. ECGs included
a) prolonged QT interval
b) Broad complex tachycardia
c) Acute inferior and posterior infarction
d) J- waves
e) Signs of right heart strain.

7. Communication station: The scenario was as follows

'You are the consultant for your intensive care unit. One of the patients, **David Cullen**, had brain death confirmed yesterday by clinical testing performed by two of your colleagues who have gone off duty.

Brain death had complicated a subarachnoid haemorrhage, which occurred two days earlier.

Information handed over to you by your colleague:

- **Sarah Cullen** (David's daughter) is the patient's only living relative;
- She has only just arrived yesterday from England and was informed of the diagnosis by your colleague.
- She was devastated by the news and does not accept the diagnosis.
- She has demanded that everything be done to keep her father "alive".

A nuclear medicine scan, which your colleague organised has just been completed, and it clearly demonstrates the absence of intracranial blood flow.

Sarah is in this room. She is aware that another test was being done today. You are required to explain to her the results of the test and discuss with her David's clinical condition and next steps to be employed.'

8. Procedure station: Candidates were provided the scenario below and and were required to demonstrate their ability with dealing with a blocked ET tube.

You are called urgently to see a 67 year old, 50kg man who is being ventilated in ICU for severe pneumonia. The nurse says his ventilator is constantly high pressure alarming.

Please manage his ventilation problem.

NOTE: the nurse is familiar with the ventilator and can tell you any parameters you wish to know and will adjust the ventilator for you.

VIVA

Viva 1: Management of a multi-trauma patient
Viva 2: Management of snake bite
Viva 3: Paediatric scenario- a 9 moth old baby with suspected intracranial sepsis
Viva 4: HELLP syndrome
Viva 5: Management of status epilepticus
Viva 6: Antibiotic therapy and resistance in the setting of a urinary tract infection

Scenario:

A 16 year old man is hospitalised after crashing a mountain bike into a tree at high speed. Initial observations in the Emergency Department were GCS 15, HR 135/min, BP 130/85, and SpO2 91% on partial non rebreather mask. Obvious injuries included.

1. multiple right sided rib fractures
2. a displaced midshaft fracture of the right femur

3. midshaft fractures of right radius and ulna.

He was intubated and taken to the CT scanner.

1. CT brain and neck were normal.
2. CT chest revealed pulmonary contusions and a small anterior pneumothorax on the right.
3. CT abdomen revealed a grade 2 hepatic injury and a 'burst' right kidney.

Surgeons request conservative management for the abdomen. He is taken to theatre for a Steinmann pin to the right tibia (for traction) and then transferred to the ICU.

What are your immediate priorities in managing this patient?

Viva 2

A 32 year old otherwise fit male from regional New South Wales presents with acute onset of headache, abdominal pain, confusion and agitation. He has been working in the garden all day on a hot summer day. On examination, he was a bit clammy at the extremities. Temp 38.5 C. The rest of the examination was unremarkable. His initial bloods:

Hb	110 G/L	(130-150)
WCC	14.0 X 10^9/L	(4.0-11.0)
Platelets	220	(150-300)
INR	10	(0.8-1.2)
APTT	>120 sec	(34-38)
Fibrinogen	<1 G/L	(1.5-4.0)
Na	144 mmol/L	(135-145)
K	5.7 mmol/L	(3.5-5.0)
Creatinine	180 µmol/L	(40-110)
Urea	20 mmol/L	(4.0-6.0)
Creatinine Kinase	255 U/L	(<50)
Lipase	436 U/L	(<200)
ALT	80 U/L	(<40)
AST	92 U/L	(<40)

What is the differential diagnosis?

Viva 3

A previously healthy nine month old child has been brought in to the emergency department by his parents because he is "unwell". He was initially very irritable, but is now lethargic and not feeding well.

His vital signs are :

BP 95 / 35, HR 175, Respiratory rate 50 / min

He is lethargic
Temp 38.2, His capillary refill is 4 seconds
heart sounds are normal, chest sounds clear. He has a full fontanelle.
Interpret these findings.

Viva 4

A 36 year old Gravida $_2$ Para $_0$ nurse presents at 29 weeks gestation with headaches and nausea.

She has had difficulty conceiving in the past and apart from mild asthma suffers from no other illnesses. The present pregnancy was unremarkable.

Examination reveals an anxious lady with a blood pressure of 170/120. She has generalised tissue oedema. She also has mild right upper quadrant tenderness. Apart from this her examination is unremarkable.

Investigations done on the day of presentation reveal
a) 3+ proteinuria,
b) abnormal liver function tests with a bilirubin 30umol/l (N<17),
c) AST 300 IU/l (N<30)
d) Hb 78 gm/l, (130-150)
e) platelet count 75 x 10^9/l (150-300)
The blood film shows fragmented red cells.

What do you think this patient is suffering from?

Viva 5

A 72 year old man is having a generalized tonic clonic seizure whilst in the Emergency Department. Numerous attempts at intravenous access have been unsuccessful. You are called to assist. Your initial attempt at peripheral access is unsuccessful.

Briefly outline your approach, focusing particularly at stopping the seizure.

Viva 6

A 72 year old diabetic male is admitted to the Intensive Care Unit with a history of loin pain. He is febrile, tachycardic, hypotensive and tachypnoeic but stabilizes after fluid resuscitation and vasopressor infusion.

Describe your approach to the investigation and management of the underlying condition.

Hot Cases

The Hot Case Section was held at both the Liverpool and Nepean hospitals.

The clinical problems which were presented to the candidates included:

a) Aortic dissection and root replacement
b) Cardiogenic shock and chest sepsis
c) Intracranial bleed with a ventricular drain
d) Steven Johnson's syndrome
e) Non resolving community acquired pneumonia
f) Neutropenic sepsis
g) Myasthenia gravis
h) Necrotising fasciitis with long standing TPN – nutritional assessment, multiple resistant organisms
i) Diabetes, staph abscess and renal failure
j) Failure to wean after 3 weeks in intensive care with underlying COPD and lung malignancy.
k) Post cardiac arrest in the cath lab, with IABP, in cardiogenic shock
l) MODS in a patient with a mitral valve repair, CAPD.
m) Traumatic Brain Injury and had had a decompressive craniectomy
n) Subarachnoid haemorrhage
o) Lower limb cellulitis and septic shock

The cold cases included

a) Liver disease
b) Ascites
c) Polycystic kidney disease with transplant kidney
d) Valvular heart disease
e) Peripheral neuropathy
f) Facial palsy

Professor B Venkatesh
Chairman
General Fellowship Examination

Circulation:

Board of Joint Faculty
Supervisors of Intensive Care Training
Regional Education Officers
Panel of Examiners
Course Supervisors
Registered Trainees