

DIPLOMA OF FELLOWSHIP

GENERAL FELLOWSHIP EXAMINATION

Mar/May 2008

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 score at least 50% in the written paper before being eligible to sit the oral part of the exam. The oral exam comprised 8 interactive vivas, (with four interactive stations,) and two separate hot cases.

This was the first examination with the new regulations which came into force in 2008. The main changes to this exam were:

- a) Incorporation of the unmanned part of the OSCE into the written paper. The following were assessed. (Blood gases, Haematology, Coagulation, Clinical methods, Microbiology, Infectious diseases, Clinical Photographs, Equipment, Monitoring, Toxicology, Endocrinology, ECG and Pacemaker)
- b) A minimum mark of 50% in the written paper was required to be invited to the oral section
- c) The procedure and communication stations were incorporated into the vivas
- d) The radiology station was also incorporated into the vivas as a manned station.
- e) The cold cases were not included in the examination
- f) The threshold for a bad fail in the clinical was increased from 30% to 40%.

Overall statistics

Table 1-Overall performance

a)	Total number of candidates presenting for the Examination (b+c+d)	51
b)	Total number of candidates appearing for the written exam	43
c)	Number of candidates carrying the written mark from a previous attempt	5
d)	Number of OTS candidates – eligible to appear for the vivas directly	3
	Breakdown of written exam performance	
e)	Number of candidates scoring > 50%	31

g)	Total number invited to the vivas based on written marks	31
h)	Total number invited to the vivas (c+d+e)	39
i)	Total number approved	25
j)	Pass rate (as a percentage of those presenting for the written + eligible from previous exam – $(i/a*100)$)	49%
k)	Pass rate (as a percentage of those presenting to the vivas $(i/h*100)$)	64%
l)	Pass rate amongst those who scored >50% in the written paper (23/31)	74%

Table 2: Analysis of performance in individual sections

a)	Pass rate in the written paper (31/43)	72%
b)	Pass rate in the viva section (33/39)	85%
c)	Pass rate in the clinical section (18/39)	46%
	Number of candidates passing both hot cases (11/39)	28%

Detailed statistics for the written paper

- 1) Highest aggregate mark in the written paper – 67.5%
- 2) In no question was there a 100% pass rate.
- 3) In 7 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
CROSS TABLE VIVAS		
Viva 1- Neurology	77%	90 %
Viva 2 – Pancreatitis	72%	87%
Viva 3 – Bronchopleural fistula and respiratory failure	54%	90%
Viva 4 – Abdominal trauma	74%	90%

Viva 5- Hepatic failure	85%	88%
Viva 6- Communication	64%	85%
Viva 7 - Radiology	95%	85%
Viva 8 - Procedure	77%	95%
CLINICALS		
Hot Case 1	46%	83%
Hot Case 2	49%	80%

Breakdown of reasons for failure in the examination

Total number of candidates who failed the examination	26
Number of candidates who scored less than 50% in the written paper	12
Number of candidates who failed after presenting to the oral section	14
Reasons for failure in the oral section of the examination	
Proportion of candidates failing to score a total of 50% in the exam overall (2/14)	14%
Proportion of candidates who failed because of failure in > 1 section (1/14)	7%
Proportion of candidates who failed only because of a “bad fail in the clinicals - <40%” (4/14)	28%
Others (<40% in the clinicals + either failure in > 1 section or a total score of <50%) (7/14)	50%

The court 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.

Written section

- Candidates appeared to score well in questions related to data interpretation, but scored poorly on other questions particularly in areas which are currently topical but are not discrete chapters or section in textbooks –
- It is recommended that candidates prepare for this exam with a broad approach and use not only just a text book as the source, but review articles, and editorials etc from appropriate journals.

Clinical Section

The performance in the clinical section continues to raise major concerns.

- The pass rate in the hot cases was < 50% .

- *Trainees are reminded that from Apr 2008, the clinical section in the exam carries a higher mark (30%) and the threshold mark for a severe fail in the clinical section has increased from 30% to 40%.*
- Eleven of the 14 candidates who failed after qualifying for the oral section scored <40% in the clinicals. A pass in the clinical section had a predictive value of 100% for a pass in the entire examination. The importance of performing well in the clinical section of the exam cannot be overstated. *Besides its relative weight in the examination marking scheme, hot cases are integral to our practice and regular practice (practising presentation under exam conditions at least once a week and more frequently as the exam approaches) is recommended.*
- Many candidates had failed to adequately prepare for the clinical examination. Under the pressure of the exam, the deficient clinical skills of poorly prepared candidates' become obvious to the examiners. Candidates should take care to listen to the examiners' instruction and focus their examination, at least initially, towards the questions asked. The best candidates were very specific in what they examined and their discussion presentation revolved around the question asked. Some of the 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
 - e) Many candidates repeated non-essential findings in their discussion, and their examination and presentation were often not targeted to the question.
 - f) Candidates need to be aware of the dangers of confabulation. Manufacturing signs that do not exist is of significant concern.. Candidates should be aware that there may not be many signs to elicit, particularly in hot cases – in fact, the absence of signs may be the most significant finding.
 - g) Whilst it is important to start with a general observation of the patient, pumps, etc, candidates often took too long to get to the patient.

Future candidates need to focus on practising their clinical approach until it becomes efficient and effective and their clinical examination technique is so well entrenched that it can survive the stress of the Fellowship exam!

Candidates are also reminded of the need to have completed a supervised assessment on 4 hot cases and have it documented prior to application for each examination. The spirit of this regulation is to engender a culture of regular clinical presentations, assessments and feedback and it is recommended that candidates continue to present beyond the minimum required number of 4 cases to assist with their preparation.

4) Vivas: Viva stations traditionally are high scoring sections. It was disappointing that in 2 of the 8 stations, the pass rate was only around 60%.

Reasons for failure in the vivas include

Knowledge deficit

Failure to recognise clinically significant issues

QUESTIONS AND ANSWER TEMPLATES**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) Outline the anatomical relations of the cervical trachea relevant to performing a percutaneous tracheostomy.

- Trachea is attached superiorly to the cricoid cartilage, by the cricotracheal membrane
- Trachea is covered anteriorly by skin, superficial fascia, strap muscles (sternohyoid, sternothyroid), and deep (pretracheal) fascia.
- 2nd to 4th rings of the trachea are covered by isthmus of the thyroid anteriorly.
- Branches of the superior thyroid artery run along the superior aspect of the thyroid isthmus, anterior to the trachea.
- Lateral lobes of the thyroid lie between the trachea and the carotid sheath and its contents.
- Oesophagus lies posterior to the trachea.
- Carotid sheath containing carotid artery, jugular vein, and vagus nerve lie posterolateral to the trachea.
- Recurrent laryngeal nerves lie posterolaterally in the groove between the trachea and the oesophagus.
- Anterior jugular veins are often connected by a vein that runs superficially across the lower neck.
- Inferior thyroid veins lie anterior to the lower part of the cervical trachea, posterior to the strap muscles.

Pass rate: 9%

2. Outline the potential roles for the use of ultrasound in the critically ill patient.

Roles include –

Cardiac echo – be it transthoracic or transoesophageal looking at structure, function, relationships between the two ventricles and pericardial effusions. Doppler cardiac output monitoring – oesophageal, transthoracic

Vascular – specifically thoracic aorta – but also abdominal aorta. Other vascular include any accessible artery (eg radial, brachial, femoral, carotid etc), grafts for flow assessment, stenosis, patency. Also veins – for thrombosis/patency

Cranial – monitor cerebral blood flow hyperaemia, ischaemia, brain death, detection of vasospasm, fat and other emboli, stroke related artery reperfusion following thrombolysis.

Other –pleural, diaphragm etc

Diagnostic ultrasound, esp abdomen – identify bladder (urinary retention), biliary anatomy, including gallbladder important to mention acalculous cholecystitis, atelectasis, pneumothorax

Ultrasound assisted interventions (drainage of collections)

Vessel identification for line insertion

Pass rate: 58%

3.1 A 54 year old male presents with a right deep vein thrombosis and haemoptysis. These blood results are from his admission.

Test	Value	Normal range
PT	12 sec	(12-14)
APTT	69 sec	(34-38)
Thrombin time	16 sec	(14-18)
APTT mixing test	60 sec	

a) What is the APTT mixing test and its significance in this patient?

It involves 1 to 1 mixing patients plasma with normal pooled platelet free plasma. If it normalises then the elevated APTT is due to factor deficiency. Partial correction suggests an inhibitor.

The results probably suggest an antiphospholipid syndrome in this patient

3.2 62 year old with a prosthetic mitral valve was noted to have the following coagulation profile

Test	Value	Normal range
PT	101 sec	(12-14)
APTT	45 sec	(34-38)
INR	8.7	(0.8-1.2)

a) What is the likely diagnosis?

Supratherapeutic warfarinisation

b) Outline your management of this patient

If Non-bleeding

Stop warfarin

Vit K low dose iv or oral

Consider FFP if patient has a high risk of bleeding

If bleeding

Resuscitation

stop warfarin

vit K low dose as possible

clotting factor FFP 10 to 15 ml per KG

consider prothrombinex (20 to 25 IU/KG especially if fluid is a problem)

3.3 A 24 year old female has the following haematology and coagulation profile post admission to the intensive care unit following post partum haemorrhage.

Test	Value	Normal range
WCC	5.6	(4.0-11.0)
Hb	60*	(115-165G/L)
Platelets	30*	(150-400 X 10 ⁹ /L)
PT	30.6*	(10.5-13.5 sec)
APTT	>150*	(21-36 sec)
D Dimer	>10*	(<0.4 microgram/ml FEU)
Fibrinogen	0.8*	(1.1-3.2G/L)

a) What is the likely cause of these coagulation abnormalities?

DIC

b) In this context, list 3 likely causes of this coagulation profile.

Pre-eclampsia

AF embolism

Sepsis

Intra-uterine foetal death

Mismatched / massive transfusion

c) What does an elevated D-dimer indicate ?

Tests fibrinolysis. It measures the break down of the X linked fibrin

Pass rate: 81%

4. An anaesthetist from a provincial hospital appears on the video-link seeking advice. He has a 20 year old man with suspected fat embolism syndrome following an isolated femoral fracture that was been repaired earlier that day. He has become increasingly hypoxic and difficult to ventilate, but transfer to a metropolitan centre has been delayed for 12 hours due to bad weather.

His arterial blood gases on SIMV mode of ventilation are as follows: FiO_2 1.0, pH 7.21, PaO_2 65 mm Hg (8.6kPa), PaCO_2 72 mm Hg (9.3kPa), HCO_3 28 mmol/L. He has a four quadrant infiltrate on his Chest X-Ray.

Outline the advice that you would give to help your colleague manage this patient's ventilation.

General

Confirm Diagnosis

- ARDS criteria: CXR, PF ratio, Etiology, no overload

- exclude other etiologies - where is the ETT (not RMB), no pneumothorax, aspiration etc.
- What ventilator is he using, are you familiar with it's modes (such as pressure control, volume control)
- Ventilatory strategy –pressure and volume limitation to minimise barotrauma)
- PEEP increments to effect, ensuring Plateau Pressure < 30 cm H₂O
- Heavy sedation and paralysis to minimize O₂ consumption and CO₂ generation to GCS 3 and no spontaneous ventilation
- Targets for ventilation SpO₂ > 90-95 and PO₂ > 60

- permissive hypercapnia as long as pH > 7.1

- prone position probably not appropriate (if staff not experienced)

- **Fluids**

- CVP only to ~PEEP+2 as maximum

- Consider frusemide if CVP PEEP +5

- Use inotrope to maintain MAP > 60 - suggest noradrenaline

- Transfuse only for Hb approaching 7

- Reassure him and make yourself available for advice

NO, liquid ventilation, surfactant and tracheal gas insufflation – no role in this setting)

Pass rate: 72%

5. Comment on the significance of the following signs in a patient on whom you are performing brain death testing:

- a) a generalised tonic clonic seizure
- b) slow drifting of one eye away from the ear in which cold water is injected during caloric testing
- c) flexion of the arm at the elbow following imposition of a painful stimulus to the nail bed on that side
- d) sitting up during apnoea testing
- e) an increase in pulse from 70 bpm to 110 bpm during apnoea testing

With each of these signs, clearly indicate if they are compatible or not with the diagnosis of brain death and provide a brief explanation for your answer.

- a) **generalised tonic clonic seizure**

the patient must have intact neural connections to have a grand mal fit - brain death can not be present

- b) **slow drifting of one eye away from the ear in which cold water is injected during caloric testing** any eye movement in response to caloric testing signifies the presence of some reflex arc function. Brain death cannot be diagnosed

- c) **flexion of the arm at the elbow following imposition of a painful stimulus to the nail bed on that side**

this may represent a spinal reflex. It does not influence a diagnosis of brain death

- d) **sitting up during apnoea testing**

this represents another spinal reaction to the acidosis which occurs with hypercarbia and is termed the Lazarus sign. It usually really unsettles nursing staff and is inevitably very disturbing to relatives. However it is compatible with a diagnosis of brain death .

- e) **an increase in pulse from 70 bpm to 110 bpm during apnoea testing**

Hypercarbia (which occurs during apnoea testing) results in endogenous adrenaline release. An change in pulse rate and blood pressure is common during apnoea resting and is not incompatible with brain death

Pass rate: 65%

6.1. 16 year old male has been treated all night for diabetic ketoacidosis. In the morning the blood gas printout is as follows:

Barometric pressure	760	mm Hg
FiO ₂	0.21	
pH	7.32	
pO ₂	100	mm Hg (13.2 kPa)
pCO ₂	30	mm Hg (4 kPa)
HCO ₃ ⁻	15.2	mmol/L

Standard base excess	-11.4	mmol/L	
Sodium	136	mmol/L	(135 – 145)
Chloride	105	mmol/L	(100 -110)
Potassium	3.5	mmol/L	(3.2 - 4.5)
Lactate	1.3	mmol/L	(0.2 - 2.5)
Glucose	5.3	mmol/L	(3.6 – 7.7)

a) Describe the acid-base status.

Raised anion gap metabolic acidosis with appropriate respiratory compensation

b) Does he need continuation of insulin therapy over the next 6 hours? Give your reasoning.

The patient will require insulin therapy for the next few hours as the anion gap is raised, indicating ongoing ketoacidosis..

6.2

		Reference
Na+	149	135-145 mmol/L
K+	4.5	3.5-5.0 mmol/L
Cl-	109	100-109 mmol/L
HCO ₃ ⁻	24	22-33 mmol/L
Urea	40	2.7-8.0 mmol/L
Creatinine	140	50-120 micromol/L
Ca ⁺⁺	2.3	2.1-2.6 mmol/L
PO ₄ ⁻	1.4	0.8-1.45 mmol/L
Albumin	34	33-50 mmol/L
Gluc	6.5	3.0-7.8 mmol/L

A) List 3 differential diagnoses of the above plasma biochemistry ?

- A) Dehydration
- B) GIT bleed
- C) Steroid therapy

6.3

Sodium	143	mmol/L	(137-145)
Potassium	2.6	mmol/L	(3.1-4.2)
Chloride	117	mmol/L	(101-109)
Bicarbonate	18	mmol/L	(22-32)
Urea	7.0	mmol/L	(3.0-8.0)
Creatinine	0.08	mmol/L	(0.05-0.12)

List 3 likely causes for the above plasma biochemistry

Drugs:

- 1) RTA 1 or 2
- 2) Ampho B,
- 3) Acetazolamide
- 4) GI losses

Pass rate: 97%

7. List the causes of metabolic alkalosis and explain how you will evaluate a patient with metabolic alkalosis.

Evaluation of causes of metabolic alkalosis requires a systematic approach involving history, examination and some specific investigations. Categories of aetiology include

- loss of hydrogen ions (gastrointestinal, renal)
- intracellular shift of hydrogen ions
- administration of alkali
- contraction alkalosis
 - History and examination will reveal, documented fluid losses
 - (vomiting & gastric losses, laxative induced diarrhoea),
 - signs of volume depletion (loss of bicarbonate free fluids),
 - administered drugs (mineralocorticoids, diuretics, and antacids in renal failure),
- and recent hypercapnia.
- Blood investigations may reveal hypokalemia (with hydrogen shifting into cells), hypochloremia
 - Urinary findings may include excessive potassium excretion (reabsorbing hydrogen), alkaline pH (increased bicarbonate) and inappropriately elevated chloride excretion (diuretic therapy, hypokalaemia).
 - Using Stewart's physicochemical approach, an isolated increase in Strong ion difference (SID) seen with the use of solutions such as plasmalyte or NaHCO_3 or a reduction in A_{TOT} seen with hypoalbuminemia can lead to metabolic alkalosis.

Pass rate: 30%

8. Outline the advantages and disadvantages of the various techniques used in the diagnosis and monitoring for vasospasm secondary to aneurysmal subarachnoid haemorrhage.

Techniques that have proven or demonstrated potential in the diagnosis and monitoring of vasospasm include:

Clinical; in the conscious patient, may be detected clinically by new focal neurology or a drop in GCS.

Major disadvantage is lack of specificity often necessitating CT/angiography.

EEG; May provide prognostic information, focal areas of slowing correlate with angiographic vasospasm and a decrease in alpha to delta ratio strongly correlates with ischaemia. Sensitivity and specificity for detecting vasospasm is high.

Disadvantage: Not readily available however and there may be issues with interpretation.

Conventional 4 vessel DSA angiography-

- remains the gold standard for diagnosis of DIND
- may allow therapeutic intervention (angioplasty) at the time.

Disadvantages -invasive, risks of bleeding, embolism, radiation/contrast exposure and transport. Requires skilled interventional radiology and therefore resource heavy.

Transcranial Doppler (TCD):

- It is low risk, performed at the bedside, non invasive and able to be repeated daily enabling trend analysis.

Disadvantages:

- The technique is however operator dependent and there is a high inter observer variability.
- Debate exists regarding correlation of flow velocity and vasospasm and although high velocities (> 200cm/sec) are predictive, lower velocity may not be as good.
- The technique may be more accurate when MCA velocity is indexed to the ipsilateral extracranial carotid artery (Lindegaard index, >3 strongly predictive).
- Colour coded TCD may offer greater accuracy than plain TCD alone.

CTA/MRI: may be combined with perfusion allowing characterisation of both vascular anatomy and associated perfusion abnormalities.

Image clarity will be affected by clip/coil and contrast related issues need consideration. The overall diagnostic capability of this modality however remains unclear until further prospective studies are performed. MR diffusion weighted imaging accurately identifies brain tissue at high risk of infarction; perfusion weighted imaging reveals asymmetries in regional perfusion. Both methods show correlation with DIND

SPECT/PET:

-can be used to obtain a picture of brain perfusion and metabolism and have shown variable correlation with vasospasm as assessed by more conventional methods.

Disadvantages: They are resource heavy not easily available, radiation exposure, patient transport are issues.

The use of measures of tissue oxygenation using parenchymal sensors and microdialysis for monitoring biochemical indices of ischaemia are largely research tools.

Pass rate: 46%

9.1. A 34 year old lady who is 34 weeks pregnant presents with acute onset epigastric pain. The plasma biochemistry and the haematology report are provided.

Test		Normal Range
Sodium	138 mmol/L	135-145
Potassium	4.4 mmol/L	3.2-4.5
Chloride	102 mmol/L	100-110
Bicarbonate	27 mmol/L	17-28
Anion Gap	9 mmol/L	5-15
Creatinine	66 micromol/L	50-100
Urea	4.3 mmol/L	1.0-5.0
Tot Protein	76H g/L	55-75
Albumin	36 g/L	28-38
Calcium	2.35 mmol/L	2.00-2.50
Ca Alb Cor	2.53H mmol/L	2.00-2.50
Phosphate	1.03 mmol/L	0.7-1.4
Magnesium	0.8 mmol/L	0.7-1.0
Glucose	4.7 mmol/L	3.6-7.7
CK Total	71 U/L	<160
LD	748H U/L	100-200
AST	241H U/L	10-45
ALT	189H U/L	5-45
GGT	45 U/L	10-70
ALP	185H U/L	65-180
Bilirubin Total	40 micromol/L	<20
WCC	12.4 ^{^9} /L	4.0-15.0
Hb	88 g/L	110-160
Plat	64L x10 ^{^9} /L	150-400

1. What is the most likely diagnosis?

HELLP

2. What 2 additional tests will support your diagnosis?

Haptoglobins : low

Blood film showing evidence of hemolysis

3. List 4 treatment options

Delivery of baby

Steroids

Antihypertensives

Magnesium sulphate

Plasma exchange

9.2 A 52 year old woman was admitted the previous night with an altered level of consciousness which improved rapidly with administration of glucose. She is referred to ICU the next day with confusion, ataxia and a worsening level of consciousness. Her CT head was normal.

The blood sugar level in the morning is 8 mmol/l on a 5% Dextrose infusion at 80 ml/hr. Her full blood count from the previous night is available.

Test	Value	Normal Range
Hb	88	130-180 g/l
WCC	$7.4 \times 10^9 /l$	$4.5 - 11 \times 10^9 /l$
Platelets	$88 \times 10^9 /l$	$150 - 400 \times 10^9 /l$
MCV	110 fl	80 - 98 fl
MCH	30 pg	27 - 33 pg
MCHC	320 g/l	310 - 360 g/l
PT	12 sec	(12-18)
APTT	36	32-38

1. What is the likely cause of her confusional state?

Wernickes encephalopathy

2. What specific treatment would you institute for resolution of her mental status?

Thiamine 100 mg IV

9.3. A 54 year old lady presented to the emergency department after having been unwell for 4 days. Her Full Blood Count (FBC) report is provided below.

Hb		* 128 g/L	(130 – 180)
WBC		* 56.51 X10 ⁹ /L	(3.50 - 11.00)
Platelet		347 X10 ⁹ /L	(150 - 450)
RBC		5.27 X10 ¹² /L	(4.50 - 6.50)
HCT		0.414	(0.40 - 0.54)
MCV		82.6 fL	(80 – 100)
MCH		* 26.3 pg	(26.5 - 33.0)
MCHC		310 g/L	(310 – 360)
NEUTROPHIL	(96.3 %)	* 54.40 X10 ⁹ /L	(1.7 - 7.0)
LYMPHOCYTE	(2.8 %)	1.60 X10 ⁹ /L	(1.5 - 4.0)
MONOCYTE	(0.7 %)	0.44 X10 ⁹ /L	(0.1 - 0.8)
EOSINOPHIL	(0.1 %)	0.05 X10 ⁹ /L	(0.04 - 0.44)
BASOPHIL	(0.1 %)	0.02 X10 ⁹ /L	(0.00 - 0.20)

Moderate rouleaux. Marked neutrophilia.,Dohle bodies present, toxic granulation present

a. What likely haematological process is revealed by the abnormal white cell and neutrophil count ?

1) A leukemoid reaction.

b. Cite 3 features on this FBC which support your answer in (a)

>50000 cells

Normal basophil and eosinophil count.

Presence of Döhle bodies

Presence of toxic granulation

Pass rate: 70%

10. A 56 year old woman 1 hr post cardiac surgery has a high blood pressure in the ICU. Give likely causes for her high blood pressure and the potential complications this may cause in the early post operative period.

Causes:

Previous hypertension

Pain

Inadequate analgesia or sedation vs paralysis

Measurement error

Hypercarbia

Endotracheal tube intolerance

Wrong dosing of inotropes/vasopressors
 Blocked IDC
 Post AVR for AS

Potential complications:

Bleeding
 Generalised ooze
 From aortic cannulation site
 Heart failure
 Myocardial ischaemia
 Arrhythmias
 Graft dislodgement
 Extension of a dissection
 Hypertensive crises
 CVA

Pass rate: 62%

11. A 57 yr old male with Type 2 Diabetes Mellitus presents to Emergency with an acute abdomen and signs of shock. CT scan reveals intra-abdominal fluid. At operation, faecal peritonitis is found. Following definitive surgery, the patient is admitted to the ICU. He is oliguric. Initial investigations reveal a blood urea of 24.2 mmol/L and a creatinine of 385 micromol/L. The rest of the plasma biochemistry was unremarkable.

a) List the possible causes of renal impairment in this patient?

Pre-renal

Hypoperfusion due to hypovolemia, sepsis/vasodilation/Ileus
 Myocardial dysfunction/silent infarct in Diabetic

Renal

Pre-existing diabetic renal dysfunction
 Possible drug toxicity eg metformin or contrast load

Post Renal

Obstruction
 Surgical mal-adventure
 Abdominal compartment syndrome

B) What initial interventions, monitoring and investigations would you perform on admission of the patient to ICU

Interventions

Assess airway, breathing, circulation while receiving handover
 Flush catheter
 Assess for signs of hypovolaemia and fluid challenge prn
 Stop all nephrotoxins
 Check intra-abdominal pressure

Monitoring

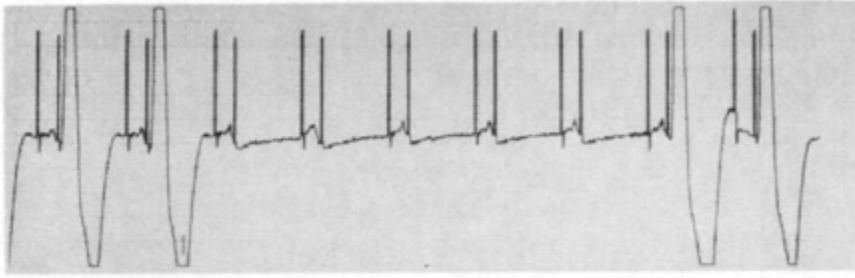
invasive blood pressure monitoring
 Measure preload -CVP
 Consider cardiac output monitoring/echocardiogram

Investigations

CXR, ECG
 Check gentamicin level if this has been administered ?
 CBC, coags and troponin, ELFT
 Ultrasound kidneys (probably not if CT was done and no evidence obstruction)

Pass rate: 86%

12.1. This ECG trace was taken from a 68 year old man, one hour following aortic valve replacement for aortic stenosis. Atrial and ventricular epicardial pacing wires are in place, and the pacing mode is DDD.



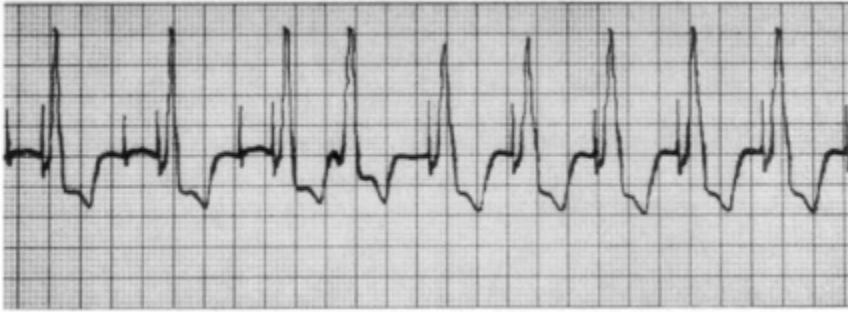
a) . What problem is demonstrated?

- Intermittent failure of ventricular capture.
-

b). Outline the steps that you could take to address the problem.

- Increase the ventricular output
- Check the connections to the pacemaker and pacing connector leads
- Reverse the polarity of the pacing to the ventricle
- Replace pacemaker box and pacing connector leads
- Unipolar pacing, with a cutaneous pacing stitch. This may fix the problem if one lead is faulty.
- Chronotropic therapy eg isoprenaline
- Alternative pacing method: transcutaneous, transvenous
- Open the chest and replace the epicardial wires

The problem is resolved, and normal DDD pacing resumes. One hour later another ECG trace is taken.



- c). What problem is demonstrated?
- Pacemaker mediated tachycardia
- d). What precipitated the problem?
- A ventricular ectopic
- e). Outline the pathophysiological mechanism of this problem
- The dual chamber pacemaker is forming part of a re-entry circuit. A ventricular ectopic has triggered retrograde conduction along the patient's conducting system. The resulting P-wave has been sensed by the atrial lead of the pacemaker, and this has triggered ventricular pacing. The paced ventricular impulse has triggered retrograde conduction along the patient's normal conducting system, and the cycle continues.

Pass rate: 26%

13.1 You are asked to assess a 78 year old non-smoker admitted with progressive exertional breathlessness. On examination, he has a respiratory rate of 28/min. BP 100/70 mm Hg. The JVP is elevated 8 cm above the sternal angle. The apical impulse is thrusting in nature and localized to the 6th left intercostal space, lateral to the mid-axillary line. On auscultation, there is an ejection systolic murmur, which is heard over the left second intercostal space and conducted to the root of the neck. There were bibasal crackles on auscultation of the lungs.

- a) What is the likely diagnosis of his cardiovascular condition?

Aortic stenosis

Mention of HOCM or subaortic stenosis ? 2.5 mark

Mention of any other valvular lesion should not score any marks for this question.

- b) List 4 clinical signs which may indicate that the nature of his condition is severe.

Plateau pulse

Aortic thrill

S4

Paradoxical splitting of second heart sound

Length and the harshness of the murmur

LV failure – a late sign

13.2 On clinical examination of patient with abdominal pain, you find a mass in the left hypochondrium. List 4 clinical features will you use to distinguish between a palpable spleen and the left kidney?

Presence of a notch – spleen

Spleen moves inferomedially on inspiration

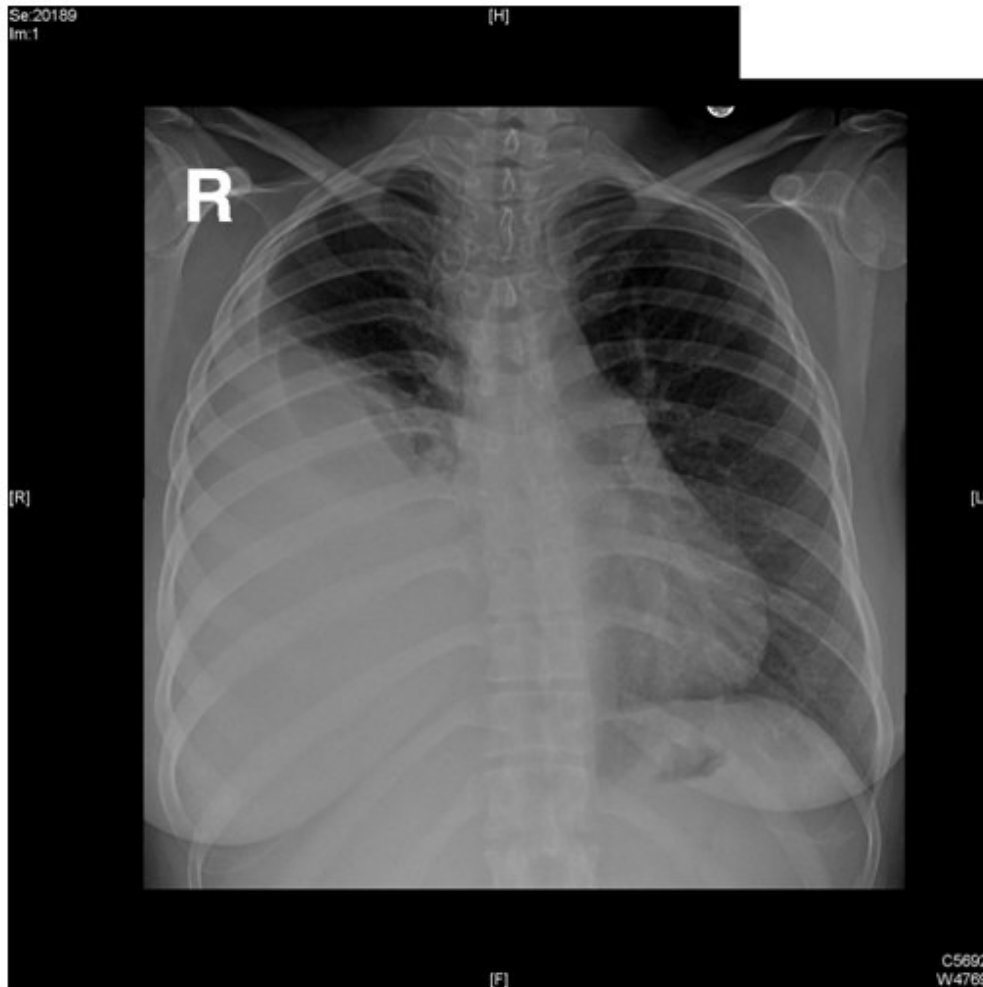
Not ballotable or bimanually palpable

Usually no band of resonance over splenic mass

Spleen has no palpable upper border

Dullness over ribs 9,10, 11

13.3 .List 4 clinical signs typically found on chest examination that will fit with the findings on this chest X-Ray?



Tachypnoea
 Decreased chest expansion
 Dull percussion note on R
 Decreased VR
 Absent breath sounds R. base / Whispering pectoriloquy above level of effusion
 Apical impulse shift to left

Pass rate: 65%

14.1

A 58 year old farmer with a history of depression was found collapsed in his shed. On arrival at the Emergency Department, his GCS was 10 (E2, V3, M5), respiratory rate was 23, and mouth ulceration was noted with a green coloured substance staining his lips, hands and clothes.

His arterial blood gas and biochemistry on admission were as follows:

FiO₂	0.5	
pH	7.29	
PCO₂ (mmHg)	35 (4.6 kPa)	
PaO₂	68 (9.0 kPa)	
HCO₃ (mmol/L)	16	(24-28)
Base Excess (mmol/L)	-9	(-2.0 to +2.0)
Sodium (mmol/L)	140	(135-145)
Potassium (mmol/L)	4.3	(3.5-5.0)
Chloride (mmol/L)	111	(95-105)
Glucose (mmol/L)	7.2	(4.0-6.0)
Lactate (mmol/L)	5.2	<2.5 mmol/L
Haemoglobin (g/L)	162	(130-160)
Creatinine micromole/L)	230	(60-120)

a. What is the likely diagnosis?

Paraquat ingestion

b. How can you confirm this?

Serum paraquat levels
 History of exposure

c. List 4 important principles of management specific to this condition.

1) Risk assessment based on estimate of quantity of Paraquat ingested

- 2) Gastrointestinal decontamination with diatomaceous earths, activated charcoal or sodium resin
- 3) Monitoring for organ dysfunction (respiratory, CVS, renal, GIT, adrenal, hepatic, CNS)
- 4) Avoid high FiO₂

14.2 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,
Iron	Desferrioxamine
Methanol, Ethylene glycol	Ethanol, 4 -methylpyruvate
Methemoglobinemia	Ascorbic acid, methylene blue
Organophosphate	Atropine, pralidoxime
Opiates	Naloxone
Paracetamol	N-Acetylcysteine

Pass rate: 98%

15.1 You are asked to review an 80 year old woman in the emergency department who has presented with a depressed conscious state. She has ischaemic heart disease and paroxysmal atrial fibrillation. Her medication includes aspirin, metoprolol, and amiodarone. On examination she has a temperature of 34.5° C she is drowsy with a GCS of 10, with a pulse of 50 bpm and a BP 90/40mmHg. CT brain scan shows age related atrophy. The blood results are shown.

Sodium	120	mmol/L	(137 -145)
Potassium	4	mmol/L	(3.5 – 5.0)
Urea	6	mmol/L	(2.5 – 7.5)
Creatinine	90	micromol/L	(50 - 100)
Measured Osmolality	255	mmol/kg	(280 - 300)
Glucose	3	mmol/L	3.5 – 6.0
CK	1000	U/L	(20 - 200)
Cholesterol	7.2	mmol/L	(3.0-5.5)

a. What is the likely diagnosis and cause to account for all these blood results?

- Hypothyroidism
- Amiodarone

b. List 4 measures essential for the specific management of this patient.

- Commence thyroxine, probably low dose (50-100ug/day and slowly increase) or administer T3 orally or intravenously
- Commence on glucocorticoids (Hydrocortisone 50mg 6 hourly)
- Correct the hypoglycaemia with intravenous glucose
- Correct the hyponatraemia very slowly with hypertonic saline to a sodium 130mmol/L (no more than 2 mmol/L per hour)

15.2

A 50 year old lady is admitted to the coronary care unit for investigation of resistant hypertension and chest pain. A cardiac arrest call is put out because she drops her blood pressure to 60/30mmHg, upon your arrival she is pale, diaphoretic, tremulous with a pulse of 130 bpm and a BP 300/120mmHg. No medications have been administered to account for the hypertension. A similar episode had occurred the previous day.

a. What diagnosis is likely?

- Pheochromocytoma

b. List 5 treatment measures for the management of the haemodynamic instability associated with this condition.

- Admit to the intensive care unit for invasive monitoring
- SNP/GTN for HT crisis
- Alpha Blockade followed by beta blockade,
- Intravenous magnesium has been shown to have an effective role in this situation
- Hypotension with fluids / Adrenaline/noradrenaline

15.3

You are asked to see a 24 year old man in the emergency department for hypotension (80/40 mmHg) and hypoglycaemia (2.2mmol/L) with associated drowsiness. He has a long-standing history of insulin dependant diabetes mellitus (IDDM) which has been well controlled until recently, when he was admitted for a short stay in hospital with diabetic keto acidosis (DKA).

a. List 4 likely causes of hypoglycaemia in this patient.

- Accidental or non accidental overdose of long acting insulin
- Sepsis
- Glucocorticoid deficiency
- Hypothyroidism
- Insulin secreting tumour
- Less likely: severe liver disease

Pass rate: 63%

16. List the causes, and features of rhabdomyolysis, and outline the principles of management .

Aetiology: consider trauma and muscle compression (including immobility), exertional rhabdomyolysis (eg. heat stroke, grand mal seizures), drugs and toxins (via coma/immobility, agitation/hyperthermia, myotoxins eg. HMG-CoA reductase inhibitors, myonecrosis secondary to non-depolarising neuromuscular blockers), infections, inflammatory myopathies (eg. polymyositis), electrolyte abnormalities (esp. hypokalaemia and hypophosphataemia), hyperthermia (eg. malignant hyperpyrexia and neuroleptic malignant syndrome), metabolic myopathies.

Presentation: Consider history of exertion, fitting, drug exposure (including illicit), immobility, family history, and previous episodes. Patient may complain of painful or weak muscles, and pigmented urine. Investigations reveal markedly elevated muscle enzymes (especially CK), acute oliguric renal failure, and electrolyte abnormalities (hyperkalaemia, hyperphosphataemia, hypocalcaemia, hyperuricaemia and metabolic acidosis).

Principles of management: consider general supportive care, adequate fluid resuscitation, forced alkaline diuresis (including mannitol), specific treatment of underlying cause (eg. dantrolene, phosphate replacement, cooling, removal of precipitants, treatment of infection, fasciotomies etc), and correction of electrolyte abnormalities.

Pass rate: 88%

17. Compare the use of propofol and dexmedetomidine when used for sedation in the mechanically ventilated patient with specific reference to

A) pharmacodynamics

B) indications

C) complications

for each of the drugs. (You may tabulate your answer)

Propofol

Pharmacodynamics

- GABA receptor action, though different from benzodiazepine receptor
- Hydrophobic with high lipid solubility that allows it to cross blood brain barrier rapidly. Lipid solubility allows rapid redistribution to tissues so duration of action is only a few minutes.

B) Indications

- Sedation in ICU for ventilation
- Sedation for procedures such as ETT, endoscopy, TOE etc
- Sedation for transport
- Effective anticonvulsant.

C) Complications

- Cardiovascular: hypotension from preload reduction due to dilation of venous capacitance vessels & mild myocardial depression.
- Hyperlipidaemia possible: monitor triglyceride levels. Adjust TPN accordingly
- Propofol infusion syndrome: dysrhythmias, heart failure, metabolic acidosis, hyperkalaemia, rhabdomyolysis. Beware of high doses (> 80 microg/kg/min) and/or higher concentrations (2% vs 1%).

Dexmedetomidine

A)

Selective alpha-2 agonist with both sedative and analgesic properties.

B) Indications

Patients are sedated when undisturbed but they arouse easily with minimal stimulation, allowing frequent neurologic examinations. Useful in the agitated, ventilated patient.

- Analgesic sparing in post operative patients.
- Results in less delirium compared to benzodiazepines.

C) Complications

- Cardiovascular: bradycardia & hypotension. (Vasoconstriction & hypertension have been reported with higher doses)
- Not well studied for long term administration to critically ill, mechanically ventilated patients. Licensed for use in Australia for 24 hours only, though utilised in trials for up to 120 hours.

Pass rate: 60%

18.1 A photograph of an oxygen cylinder was shown**a) What gas is delivered through this cylinder shown in the photograph?**

Oxygen

b) When this gas is delivered in the ICU through the wall outlet, what is the pressure at the wall outlet?

The Australian Standards are 415 kPa static pressure in pipeline, which is allowed to fall to by a maximum of 50 kPa under some conditions. Therefore any answer between 365 and 415 kPa was acceptable.

c) What is the pressure of the gas in a full cylinder?

Whilst it varies from cylinder to cylinder, any answer between 12 to 17 megapascals (12000-17000kPa) , is acceptable.

18.2. A photograph of a cuffed endotracheal tube with a connector was shown.

a) What is the diameter of the connector (shown by the arrow)?

15 mm

b) List 2 factors which predispose to obstruction of this tube in intensive care?

Lack of humidification

Infrequent physio/suctioning

Patients with large volumes of secretions

c) List 3 design features of this device which improve its safety.

- i. Clear non-toxic plastic
- ii. Low profile, high volume low pressure cuff
- iii. Radio-opaque line for identification of tip on xray
- iv. Murphy's eye
- v. Left bevelled atraumatic tip

d) Write down the formula to determine the size of the endotracheal tube required in children 1-10 yrs of age?

$(\text{Age in yrs}/4) + 4$ (Some use 4.25 or even 4.5 in the denominator and they are acceptable.)

18.3 A photograph of a Sengstaken-Blakemore tube was shown.

- a. Identify this piece of equipment
 - i. SBT
- b. List one indication for its use
 - i. Variceal bleed
- c. List 3 contraindications to the use of this device
 - i. Known Oesophageal stricture
 - ii. Unidentified source of bleeding
 - iii. Unprotected airway
- d. List 3 complications associated with its use
 - i. Aspiration pneumonia
 - ii. Cardiac arhythmias
 - iii. Oesophageal perforation
 - iv. Acute upper airway obstruction

Pass rate: 98%

19. Outline the information that may be useful in determining the prognosis of a comatose survivor of a cardiac arrest.

- Diagnosis of the underlying cause of the cardiac arrest ... (eg drug overdose vs cerebral metastatic adenocarcinoma) and any serious comorbidities that may be present.
- Time to ROSC < 10 min
- Bystander CPR
- Rhythm VF better than asystole
- Neurological status (assessed at 24-72 hours)
 - requires absence of sedation or neuromuscular blocking agents
 - Pupillary response to light – absent is poor prognostic sign
 - Best motor response – absent or extensor motor response is a poor prognostic sign
- Biochemical evidence of neurological damage
 - Neurone specific enolase
 - S-100 neuroprotein
- Electrophysiological evidence of neurological damage
 - Somatosensory evoked potentials
- Cardiac status
 - Successful revascularisation if STEMI is underlying cause
 - Ejection fraction on ECHO

Pass rate: 33%

20. Compare and contrast the advantages and disadvantages of enteral feeding via a nasogastric tube, a PEG and a percutaneous feeding jejunostomy.

Nasogastric tube: simple, commonly used, cheap, can assess and retrieve residual gastric contents (depends on tube size), advantages of gastric feeding (tolerant of bolus and continuous feeds, buffers gastric acids, bactericidal action of acid, gastric pepsin and lipase facilitate absorption of most feeds) **BUT** aesthetic appearance, potential trauma of insertion, potential misplacement during insertion (especially critically ill), requires radiological confirmation of placement, easily dislodged, sinusitis, increase aspiration risk (less competence gastro-oesophageal sphincter), potential for gastric distension, tolerance of feeding susceptible to gastroparesis (emesis, regurgitation).

PEG: avoids nose/mouth issues, better tolerated than nasogastric, less likely to be displaced than nasogastric, can assess and retrieve gastric contents (if large bore and in stomach), advantages of gastric feeding (see above), avoids interfering with gastro-oesophageal sphincter **BUT** more complex to insert, less commonly performed, more

expensive tube, requires endoscopy (with associated complications), percutaneous wound, often larger bore tube with potential for trauma and displacement, potential for gastric distension, tolerance of feeding susceptible to gastroparesis (emesis, regurgitation).

Percutaneous feeding jejunostomy: avoids nose/mouth issues, better tolerated than nasogastric, less likely to be displaced than others, avoids interfering with gastro-oesophageal sphincter, bypasses stomach and allows earlier feeding (avoids gastric distension and problems of gastroparesis), theoretically better for pancreatitis (less pancreatic exocrine secretion) **BUT** more complex to insert, less commonly performed, more expensive tube, requires endoscopy &/or surgery (with associated complications), percutaneous wound, small bore tube with potential for displacement and blockage (eg. with enteral drugs), less tolerant of bolus or high volume infusions.

Pass rate: 81%

21.. A 77 year old woman presents 6 months after elective coronary artery bypass grafting and aortic valve replacement feeling unwell over a few days with fever and rigors. You suspect infective endocarditis. The results of a septic screen are awaited.

a. List 5 clinical findings you may encounter when you examine her

- i. New murmur
- ii. Skin rash
- iii. Osler's nodes – Tender nodules on pulps of fingers and toes
- iv. Janeway lesions – non-tender haemorrhagic macules in the peripheries
- v. Roth spots – Retinal haemorrhages with a pale centre
- vi. Splenomegaly
- vii. New neurological signs
- viii. Tender and swollen joints

b. List 3 organisms that are commonly implicated

- i. Coagulase negative Staphylococcal sp. (CONS) / S. Epidermidis
- ii. S. Aureus (MSSA/MRSA)
- iii. Streptococci (Viridans)
- iv. HACEK organisms

Haemophilus aphrophilus, Haemophilus parainfluenzae and Haemophilus paraphrophilus

Actinobacillus actinomycetemcomitans

Cardiobacterium hominis

Eikenella corrodens

Kingella kingae

c. What antibiotic would you choose in this patient?)

AB guidelines suggest Vanc + gent only. Additional cephalosporin +/- quinolone, acceptable

Further therapy governed by MIC/cultures\

Over the next few days she develops progressive worsening of renal function. Her serum creatinine is twice baseline

d. Outline the causes for his worsening renal function

Dehydration
 Cardiac failure
 Nephrotoxic agents
 Sepsis
 Immune mediated Glomerulonephritis

e. What are the indications for valve replacement in prosthetic valve endocarditis?

Hemodynamic instability
 Recurrent emboli
 Root abscess

Pass rate: 81%

22. Outline the evidence for the role of glucocorticoids in ARDS and septic shock and the current controversies surrounding their use in these conditions

ARDS – ARDS part of the sepsis inflammatory response, fibroproliferative phase associated with laying down of collagen, hence use of steroids to reduce the extent of these processes.

Lines of evidence: a) Meduri study (JAMA) cross over trial showed a reduction in lung injury score and improved mortality (small sample). (Candidates not expected to name authors, if they do get bonus marks)

b) Recent Meduri study : Reduction in LIS, length of stay and duration of IPPV

c) Recent ARDS net study: the use of steroids was not associated with any benefit and there was an increased incidence of reintubation. Improves oxygenation faster, more ventilator and shock free days, but higher complications such as weakness, reintubation – no mortality advantage

Septic shock –

- one of the most controversial areas,
- Basis thought to be relative adrenal insufficiency (RAI)
- Basis of RAI diagnosis questionable, -doubts about validity of using plasma cortisol and the synacthen test.
- Shown to be of benefit in meningitis

- In septic shock – high dose steroids (30 mg/Kg) clearly increase mortality
- Low dose steroids improve shock reversal – only one RCT study showed improvement (ANNANE) but study limitations- trial design, use of etomidate
- A recent multicentre-study (CORTICUS) demonstrated a lack of benefit with steroids, although the study was underpowered.

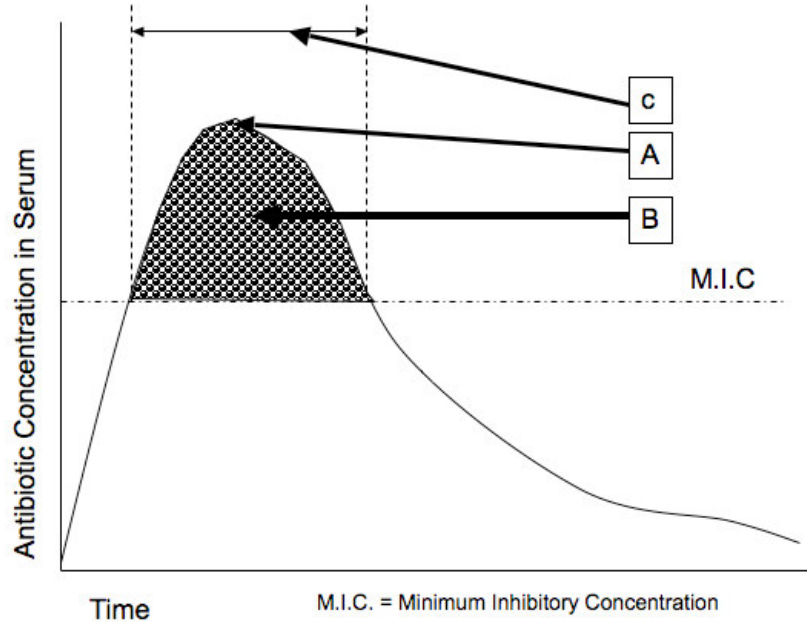
Pass rate: 58%

23. A large bore catheter for renal replacement therapy has been accidentally inserted into the carotid artery of a man with multiple organ failure (including a coagulopathy) due to systemic sepsis. The location of the catheter was only discovered after it had been sutured in place. List the potential complications, and outline how you are going to deal with this problem.

Arterial puncture is a well recognised but uncommon complication of central venous catheter insertion. The potential complications include all those associated with venous/arterial puncture, as well as specific ones associated with the large hole in the artery. Damage to associated structures (nerves [eg. vagus], pleura, oesophagus and trachea!) can result in specific problems (either directly or indirectly from compression [eg. haematoma]). A large bore catheter in a blood vessel can result in air embolus (worse if arterial) or even embolus of atheromatous material (stroke risk). Specific problems related to the arterial site include: toxicity of inadvertently administered drugs (before actual position recognised), higher risk of significant haematoma and blood loss (augmented by coagulopathy especially if removed/dislodged). Referral to surgeons with vascular experience is essential to facilitate definitive management because of the size of the hole in the artery (suture repair, patch repair etc). If surgical repair is not considered indicated, prolonged pressure for haemostasis has associated potential problems (carotid body, distal flow), and haematoma formation likely.

Pass rate: 91%

24.1 With regards to antibiotic dosing, look at these drug concentration versus time curves for antibiotics and answer the questions below:



- a) **What does “A” represents, name one antibiotic for which this is important with regards to dosing?**

C_{MAX} : Maximum concentration
Aminoglycosides

- b) **What does “B” represents, name one antibiotic for which this is important with regards to dosing?**

$AUC > MIC$: Area under the curved where drug concentration is greater than MIC
Quinolones

- c) **What does “C” represents, name one antibiotic for which this is important with regards to dosing?**

$T > AUC$ above MIC: Time greater than Area under the curved where concentration is greater than MIC
Penicillins, Carbenepenems

24.2. A patient who has sepsis and renal impairment, secondary to intraabdominal collections has them drained, the early microbiology report is given below

Proteus mirabilis has been identified from the intra-abdominal pus sample.

Antibiotic sensitivities as follows [Full report to follow]

<i>Antibiotic</i>	<i>Sensitivity</i>
Penicillin	R
Oxacillin	R
Cefotaxime	S
Ceftriaxone	S
Gentamicin	S
Vancomycin	R

What antibiotic would you choose to cover this organism?)

Third generation cephalosporins although sensitive in vitro often will become resistant in vivo early – so should be avoided

Although not reported the empiric antibiotics of choice are (any of the following):

Quinilone

Pipercacillin / Tazobactam

Ticarcillin and Clavulanate

Imipenem / Meropenem

Gentamicin may worsen renal impairment, consider avoiding it. A single dose is acceptable

24..3 Name the organisms that makeup the ESCAPPM group of organisms

Enterobacter spp.,

Serratia spp.,

Citrobacter freundii,

Acinetobacter spp.,

Proteus vulgaris,

Providencia spp. and

Morganella morganii.

Pass rate: 84%

25. Outline causes and consequences of altered sleep in the ICU patient. List strategies for improvement of sleep quality in these patients.

Causes:

1) Environment: Noise, light, Patient care activities (monitoring, positioning, suction etc)
(These only account for 30%)

2) Pharamacological – use of benzodiazepines and narcotics

3) Gravity of illness

4) IPPV

5) Any pre-existing cause of sleep disturbance

In a large proportion, cause of disordered sleep unknown

Consequences:

- 1) Delirium (this has an adverse effect on long term outcome).

Treatment

- 1) Minimising noise (ear plugs)
- 2) Cut down lights
- 3) Optimal ventilatory parameters to avoid non-triggered breaths, avoiding apnoeas and episodes of desaturation
- 4) Atypical antipsychotics
- 5) Role of melatonin – needs evaluation

Pass rate: 61%

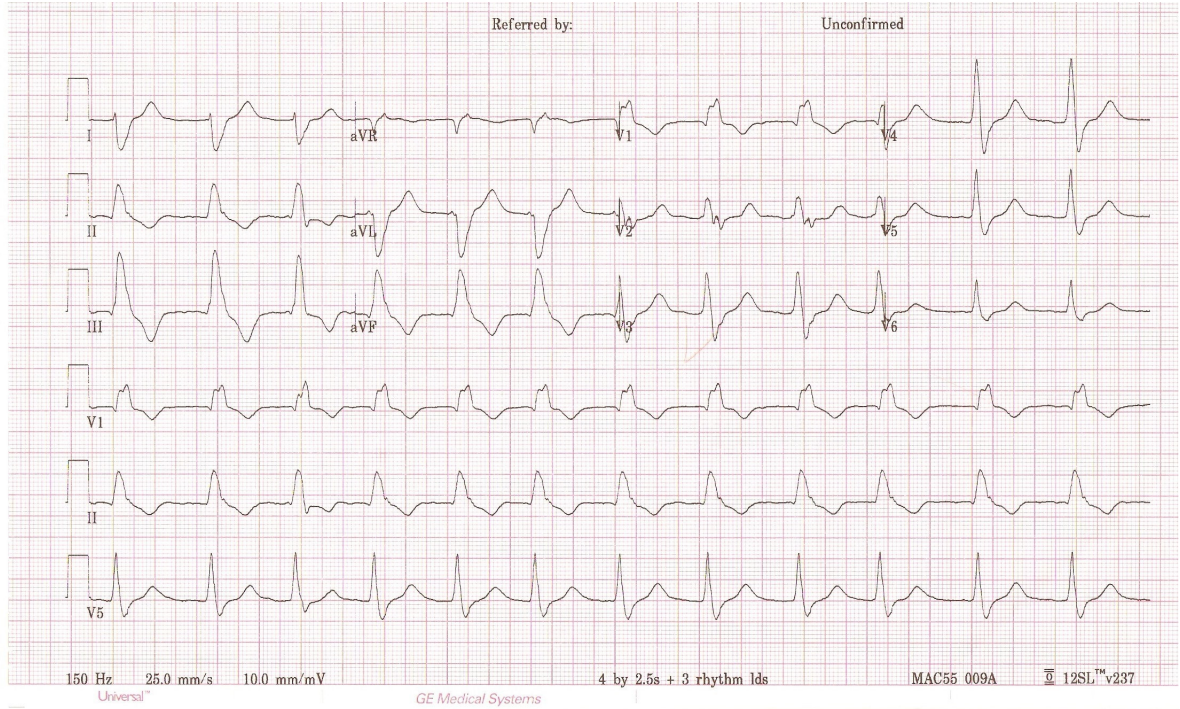
26.1 A 50 year old man was admitted with severe dyspnoea and hypotension. Clinical examination revealed a tachypnoeic patient with a HR of 130/min, SR and a blood pressure of 90/60 mm Hg. On CVS examination, the JVP was raised, and a cardiac murmur was audible although because of the tachycardia, it could not be timed with certainty. Hemodynamic monitoring revealed the following:

CVP	14 mmHg,
Pulmonary artery	48/24 mmHg,
PAOP	22 mmHg.

List 3 likely causes for the above clinical and hemodynamic presentation.

1. Left ventricular failure/cardiogenic shock
2. Mitral regurgitation
3. Acute aortic incompetence

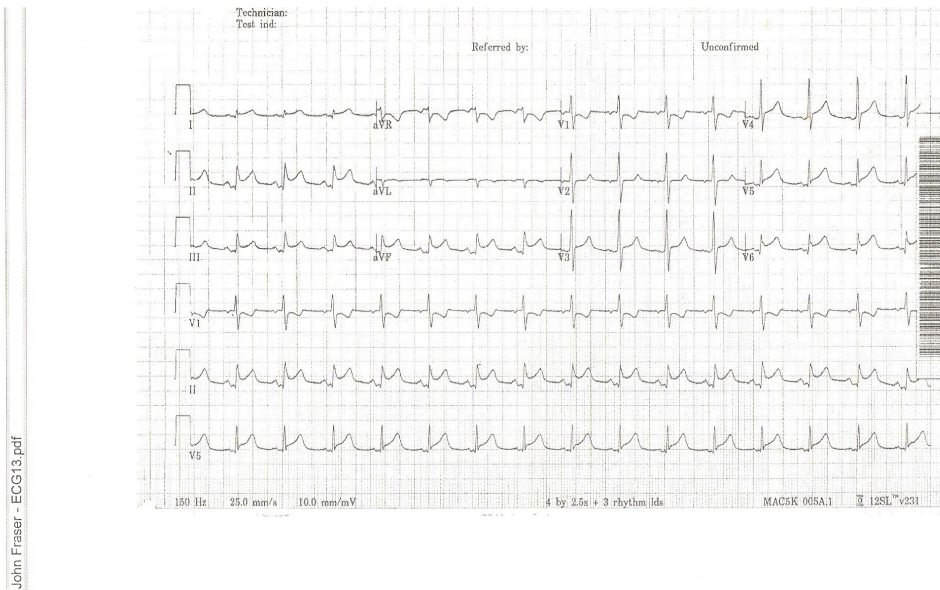
26.2. This is the ECG of a 74 year old man who had an out of hospital cardiac arrest.



Describe the ECG.

- 1 Irregular rhythm right bundle branch block left posterior fascicular (or right axis deviation) block
- 2 Rhythm possibly junctional

26.3 Examine the ECG shown below.



1. Describe the ECG as shown.
2. Which coronary artery territory may be involved in the pathophysiology of this case?
 - 1 Sinus rhythm of 92 bpm. ST elevation of >2mm in II, III AVF and V5,6 with reciprocal changes in V1 and AVR. Consistent with myocardial infarction .
 - 2 Right coronary artery territory or LCx if dominant left system.

Pass rate: 63%

27.1 A 56 year old female with septic shock and multiple organ failure is admitted to intensive care. She is endotracheally intubated and ventilated. A central venous catheter is inserted into her right subclavian vein, a Vas Cath is inserted into her right femoral vein and a pulmonary artery catheter is inserted via her left subclavian vein.

a) Blood gas samples are simultaneously taken from all three catheters. The oxygen saturations are as follows:

50%

60%

67%

State which site each of the blood gas samples is taken from and justify your answer:

60% = pulmonary artery catheter - pooled blood from SVC and IVC

67% = subclavian vein (superior vena cava) - in sepsis, cerebral blood flow relatively maintained initially

50% = femoral vein (inferior vena cava) - in sepsis, regional O₂ consumption and extraction in gut/splanchnic circulation increases

27.2. Examine the photograph below. (Photograph of an external ventricular drain)

a) List the indications for the use of this device in traumatic brain injury. ?

1. Intracranial pressure monitoring in patients with traumatic brain injury associated with an initial non-sedated Glasgow Coma Score ≤ 8 prior to non-surgical resuscitation
 - a. AND an abnormal CT scan associated with trauma:
 - i. Diffuse axonal injury grade II – IV or
 - ii. Mass lesions with midline shift > 5mm
 - b. AND in the following patients with a normal CT Scan
 - i. Age >40
 - ii. Lateralising signs

- iii. Hypotension
- iv. Significant extra-cranial trauma

b) List 3 important principles of measurement/management of this device

1. Attached flushed transducer to fluid-filled catheter – do not inject
2. Set transducer to reference level (EAM or aortic root)
3. Attach drainage manometer and set at 10-20 cm H₂O at level of EAM.
4. Monitor ICP continuously with intermittent drainage (hourly) unless clinically indicated, for which drainage may be increased in frequency or continuously.
5. Septic surveillance of CSF daily.

Pass rate: 26%

28. You have been asked to review a six week old infant in the emergency department with a presumptive diagnosis of bronchiolitis.

- (a) Outline your approach to the assessment and
(b) management of this baby.**

(a) Assessment

Important points include:

- a) Past medical history. Premature delivery, neonatal ventilation, any previous respiratory disease, congenital heart disease or other syndromes (eg trisomy 21). All of these worsen the prognosis, and increase the likelihood of the need for respiratory support.
- b) Diagnosis: must exclude undiagnosed congenital cardiac condition; is this RSV bronchiolitis? PCR analysis of the naso-pharyngeal aspirate is the usual way of making this diagnosis. Other differentials include pertussis and influenza, both of which have the potential to be worse.
Length of history of this illness. In the normal child, RSV bronchiolitis runs a course of 7 – 10 days. So a severe presentation in the first 3 days is more serious than the fifth or sixth day, although a biphasic disease suggests possible secondary infection (Staphylococcus or Streptococcus) .
- c) Current observation. Pulse and respiratory rate, severity of respiratory distress, and history of apnoeas requiring resuscitation.

d) If the child has very significant respiratory distress, has had more than one significant apnoea, has very high pulse or respiratory rate, is desaturating despite significant oxygen therapy (such as >60% FiO₂), or presence of exhaustion –then ICU/HDU admission is indicated and consideration of transfer to a paediatric facility.

(b) Management includes

- 1) oxygen therapy,
- 2) Minimal handling with grouped cares
- 3) consideration of IV fluids and fasting whilst under assessment.

- 4) If ventilatory support is required this can be with CPAP via N/P tube/ bubble CPAP/high flow nasal prong oxygen or face mask BIPAP.
- 5) Antibiotics are indicated if there are grounds for suspecting a superadded bacterial infection.
- 6) Aminophylline or Caffeine may be useful in reducing the number of apnoeas if the child has been premature.
- 7) A few children, usually in the high risk groups above, will need mechanical ventilation or if there is consideration of transportation/retrieval. Comment that intubation and ventilation will prolong the PICU course by 2- 3 days.

Could also mention other advocated therapies

Eg nebulized adrenaline/salbutamol/heliox /Ribavarin– and comment that these therapies have not been proven to be effective in all cases but a few may respond.

Pass rate: 23%

29.1

A Phase III study of a drug was undertaken to determine if it improved mortality in severe sepsis. The study design was a randomized, double-blind, placebo-controlled, multicenter trial (n=1200). The mortality rates in the placebo arm and the trial drug arm were 32% and 26% respectively. There were no adverse effects noted in relation to the trial drug.

a) What do you understand by the term Phase III.?

Phase III trials compare new treatments with the best currently available treatment (the standard treatment). Much larger sample sizes than Phase II and are usually randomised. They are aimed at being the definitive assessment of how effective the drug is, in comparison with current 'gold standard' treatment.

b) What was the absolute risk reduction?

6%

c) What was the relative risk reduction?

18.75%

d) Calculate the “number needed to treat”?

16.66

29.2 You have been approached by a company which has developed a new biomarker of sepsis. They would like it tested in a cohort of critically ill septic patients. You test this biomarker in a cohort of 100 patients with proven bacteremia. You also test this biomarker in a cohort of 100 patients with drug overdose whom you use as a control. In the bacteremic group 70 patients had

abnormal biomarker results. In the control group 60 patients had an abnormal biomarker results.

Calculate

- a) Sensitivity**
- b) specificity**
- c) Positive predictive value**
- d) Negative predictive value**

Values below expressed as a percentage .

- a) 70/100
- b) 40/100
- c) 70/130
- d) 40/70

Pass rate: 70%

30 .1 (A clinical photograph)

- a) Describe four (4) abnormalities visible in this patient's hand.**
 - Ulnar deviation
 - Wasting of dorsal interosseous muscles
 - Boutonniere deformity of index and middle finger
 - Subluxation at metacarpal-phalangeal joints
 - Z-deformity of thumb
- b) What is the most likely diagnosis?**
 - Rheumatoid arthritis
- c) List three (3) associated abnormalities that may complicate intubation in patient's with this condition?**
 - Arthritis of temporo-mandibular joint -> limited mouth opening
 - Atlanto-axial subluxation -> spinal cord injury possible
 - Degenerative arthritis in C-spine -> difficult visualisation of larynx
 - Laryngeal arthritis -> poor vocal cord opening
 - Pulmonary fibrosis -> poor respiratory reserve

30.2 A previously well 54 year old man presents with confusion. On examination a rash is noted (a clinical photograph provided). Temperature 37.1 The initial blood results are provided below.

Venous biochemistry

Na	135	mmol/L	(135-145)	
K	3.8	mmol/L	(3.5-4.5)	
Urea	18	mmol/L	(2.9-8.2)	*
Cr	177	µmol/L	(70-120)	*
Bilirubin	45	µmol/L	(<20)	*

Haematology

Hb	99	g/L	(135-180)	*
WBC	10.8	x 10 ⁹ /L	(4.0-11.0)	
Plt	26	x 10 ⁹ /L	(140-400)	*
Blood film:	Schistocytes			

Coagulation

PT	10	s	(9-12)
APTT	29	s	(24-39)
Fibrinogen	3.0	g/L	(1.7-4.5)

30.2

- a) **What is the most likely diagnosis?**
Thrombotic thrombocytopenic purpura
- b) **What treatment needs to be instituted urgently?**
- Plasmapheresis

Pass rate: 88%

VIVAS**VIVA 1**

You are asked to review a 23-year old female in the Emergency Department who has presented via ambulance with her first seizure. She was still fitting after being given 5mg of diazepam IV by the ambulance officers and a further 20mg of midazolam by the staff in the Emergency Department. She was then intubated and taken for a head CT scan, which is reported as normal.

She is currently intubated, sedated with fentanyl and midazolam, has been paralysed with vecuronium, with a BP 140/80, HR 98, O₂ saturation 100%, temp 37.8°C.

What will you look for on initial assessment as she arrives in the ICU?

The rest of the questions focused on the causes of seizures in a young patient, monitoring (including role of EEG) during status and management of status

Viva 2

A 54 year old woman was referred to the emergency department by her GP with a 3 day history of vomiting accompanied by upper abdominal pain. On examination she was obese, appeared restless and confused, GCS 13, febrile 38.6 C, heart rate of 90 min, BP 150/100. She has SpO₂ of 88% on oxygen via a non-rebreather bag. There was diffuse abdominal tenderness on palpation in particular in the upper abdomen. Bowel sounds were sluggish. Blood tests taken in a private laboratory the preceding day had revealed a lipase of 860 U/l (< 70).

What are the differential diagnoses of this patient's presentation?

The rest of the questions focused on management of pancreatitis including controversies such as antibiotic therapy, surgical management and the role of biomarkers.

VIVA 3

A previously well 17 year old male is admitted to your intensive care with severe respiratory distress. He had influenza diagnosed 1 week ago and now presents pyrexial 39.5⁰C, hypotensive with bilateral patchy infiltrates on the Chest X-Ray. You suspect a secondary bacterial infection.

What are the most likely causative organisms in this patient?

The rest of the questions focussed on the management of severe respiratory failure including the management of bronchopleural fistula and the role of ECMO.

VIVA 4

A 45 year old man is brought to the Emergency Department following a motor vehicle accident. He was the driver in a frontal collision. The other occupant of the car is dead. There is no history of loss of consciousness and he is fully conscious on presentation to the Emergency Department. His airway is patent. Respiratory rate 26/min. BP 70/45 mm Hg, HR 110/min. He has two 14G IV cannulae in situ. Chest expansion is symmetrical but he has seatbelt abrasion across his chest.

Describe your initial management.

The rest of the questions focused on the management of severe trauma, recognition of abdominal injuries, damage control surgery, and management of ongoing hypotension, and oliguria.

VIVA 5

A 25-year-old female presents with a 2-day history of nausea and upper abdominal pain. She is a previously well lady with no significant medical history. However, she has had a severe toothache for 1 week and has been taking painkillers for 1 week.

Examination reveals that she is slightly jaundiced. Her blood pressure is 80/50 mm Hg, HR 105, GCS 15. Temperature 37.5

Blood tests reveal the following results

Na	138 mmol/l	(135 – 145)
K	3.9 mmol/l	(3.5 – 5)
Cl	108 mmol/l	(97 -109)
Bicarbonate	20 mmol/l	(24-32)
Urea	2.6 mmol/l	(3 – 8)
Creat	130 micromol/l	(50 – 90)
Bilirubin	80micromol/l	(0-18)
Albumin	38 g/l	(36-48)
ALP	81 U/L	(30 – 130)
ALT	1840 U/l	(5 – 55)
AST	1220 U/l	(5 – 55)

What abnormalities do these investigations show and what are the possible causes?

The rest of the questions focussed on the management of subacute/chronic paracetamol toxicity.

VIVA 6

You are the intensivist on duty in the Intensive Care Unit where a 15 year old boy (John) is critically ill having been a pedestrian hit by a motor vehicle.

- He has sustained severe chest injuries complicated by significant blood loss.
- It is now day 3 into his admission, he is sedated and mechanically ventilated.
- The patient and his parents are Jehovah's Witnesses and his parents have refused administration of blood products to their son during this admission.
- He has re-commenced bleeding from one of his chest drains, and needs to go to the operating theatre. His current haemoglobin is 23g/L.
- Despite all you have done to cope without blood products it is your opinion in conjunction with the surgeons that blood products are required to save his life.
- Your legal standing on this matter has been clarified: you are allowed to transfuse this child without consent in order to save his life.

Please enter this room where his parent is situated, update him/her on the condition of their son and the necessity for a blood transfusion.

VIVA7

Radiology station.

Six sets of X-Rays were shown to the candidates and required to identify major radiological findings.

VIVA 8

Procedure Station

You have determined a patient requires urgent cardiac pacing.

What are the indications for temporary cardiac pacing?

CLINICAL SECTION

Case 1: A 77 yr old man admitted headache, blurred vision and left sided weakness. Patient had had a previous prosthetic mitral valve replacement.

Candidates were asked to make a neurological assessment and proceed with general examination as required.

Case 2: A 73 year old man with MODS following a recent staphylococcal bacteremia. Other findings included evidence of a septic circulation on a PA catheter, PPM, fluid overload, and evidence of multi-organ dysfunction.

Case 3: A 71 year old man post major abdominal vascular surgery, still ventilated and evidence of impaired gas exchange, renal dysfunction, increased lung water and multi-organ dysfunction.

Case 4: A 50 year old man with a background h/o of Hodgkin's disease for which he received radiation therapy, was admitted following a cardiac arrest. Recently, prior to present admission, he was in ICY for a month following a cardiac surgical procedure. The problem presented was difficulty in weaning.

Findings included – poor respiratory compliance, pericardiostomy scar, anuric renal failure, tracheostomy, and pleural effusions evident on CT chest.

Case 5: A 77 year old man with a history of DM and myasthenia gravis was found collapsed at home. He was presented a patient who is now slow to wean.

Findings included evidence of global muscle weakness, pulmonary hypertension on a PAC, moderate TR, inotrope requirement, and dialysis dependent renal failure.

Case 6: A 74 year old lady was presented as a failure to wean after admission to ICU following a collapse.

Findings included: a prosthetic AVR, Rt. Pleural effusion, and global muscle weakness.

Case 7: A 33 year old man with a history of schizophrenia was found unresponsive at home in a pool of vomit and faeces. He has been slow to wake up.

Findings: A ventilated patient, low GCS, pressure areas, biochemical features of rhabdomyolysis and an old infarct on a CT scan.

Case 8: A 42 yr old male post intracerebral hemorrhage due to untreated hypertension. Directed to examine as per normal daily ward round.

Findings: EVD, blood stained CSF, hemiparesis, LLL collapse on CXR, morbid obesity and febrile

Case 9: A 32 yr old lady with vertebral artery dissection and SAH. Candidates were asked to perform a neurological examination.

Case 10: A 64 year old male with GB syndrome in ICU for 2 months, ventilator dependant. Candidates were asked to examine and determine diagnosis and problems related to long term ICU stay.

Case 11. 71 yr old admitted 10 days ago admitted with acute respiratory failure. Assess suitability for weaning.

Case 12: A 64 yr old man with cardiogenic shock following a cardiac arrest. Findings included a dilated L.pupil, raised A-a gradient, CRRT and a broad complex rhythm.

Case 13: A 42 yr old female following an MVA and chest trauma. Patient presented with hypotension and respiratory difficulty. Candidates asked to assess cardio respiratory system.

Case 14: A 32 yr old lady admitted with isolated head injury and candidates asked to assess neurology.