Exam Report Oct 2009

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 and two separate hot cases.

This is the fourth examination with the new regulations which came into force in 2008. The tables below provide an overall statistical analysis as well as information regarding performance in the individual sections. A comparison with April 2008, October 2008 and April 2009 data is also provided.

Examiner comments

Written paper

1) Lack of specificity and precision in the answers.

2) Poor pass rate on clinical methods questions – suggests that candidates are not taking clinical examination seriously and they will need to read books like Talley and O'Connor thoroughly.

3) Candidates seem to score well largely on Data interpretation / OSCE type questions. The inability to score well on other questions reflects a general lack of preparation and knowledge even of common topics in intensive care.

Candidates who scored more than 50% in the written section and were invited to the oral section passed an average of 21 questions in the written paper as opposed to an average of only 12 questions passed by those who failed the written paper.

Hot Cases

The performance in this section was improved compared to the previous examination. A detailed feedback is provided on the areas of weaknesses under the Hot Case Section. The major reason for failure of candidates in this exam was poor performance in Hot Cases. It cannot be emphasised enough that a good performance in hot cases is vital to pass the exam and that repeated hot case examination and presentation to consultant colleagues under exam conditions during training and preparation is essential. Candidates are again advised not to postpone practising hot cases till after the written results are announced.

From October 2010, the JFICM Board has passed a new regulation mandating that all candidates presenting for the exam from October 2010 must not only have four (4) Hot Cases signed off by their supervisor before they apply but they must all have satisfactory assessments before being eligible to sit the examination. A note will be sent to all trainees and supervisors to this regard.

Vivas

Whilst the performance in the vivas was comparable to the October 2008 exam, the viva stations represent an opportunity to score marks and make up for any deficits in the clinical exam. Again, considerable deficiencies in knowledge were noted in mainstream topics.

Overall statistics

Table 1: Overall performance

		Oct 09	**Apr 09**	**Oct 08**	**Apr 08**
a)	Total number of candidates presenting for the Examination (b+c+d)	68	49	66	51
b)	Total number of candidates appearing for the written exam	50	38	53	43
c)	Number of candidates carrying the written mark from a previous attempt	14	9	10	5
d)	Number of OTS candidates – eligible to appear for the vivas directly	4	2	3	3
Breakdown of written exam performance					
e)	Number of candidates scoring > 50%	36	25	39	31
g)	Total number invited to the vivas based on written marks	36	25	39	31
h)	Total number invited to the vivas (c+d+e)	54	36	52	39
i)	Total number approved	46	18	42	25
j)	Pass rate (as a percentage of those presenting for the written + eligible from previous exam – (i/a*100)	68%	37%	64%	49%
k)	Pass rate (as a percentage of those presenting to the vivas (i/h*100)	85%	50%	81%	64%
l)	Pass rate amongst those who scored >50% in the written paper (31/36)	86%	68%	85%	74%

Table 2: Analysis of performance in individual sections (comparative data provided for previous exams)

		Oct 09	May 09	Oct 08	Apr 08
a)	**Pass rate** in the written paper (36/50)	**72%**	**64%**	**74%**	**72%**
b)	**Pass rate** in the viva section (47/54)	**87%**	**78%**	**90%**	**85%**
c)	**Pass rate** in the clinical section (34/54)	**63%**	**42%**	**60%**	**46%**
	Number of candidates passing both hot cases (18/54)	**33%**	**22%**	**40%**	**28%**

Detailed statistics for the written paper

1) Highest aggregate mark in the written paper – 72%
2) In no question was there a 100% pass rate.
3) In 12 of the 30 questions, the pass rate was < 50%.

Detailed statistics for the clinical / oral component (Comparative pass rates for the previous exam are also provided)

May 09			Oct 08	
Station	**Pass rate**	**Highest individual mark for the station**	**Station**	**Pass rate**
CROSS TABLE VIVAS			**CROSS TABLE VIVAS**	
Viva 1- DVT prophylaxis	76%	95%	Viva 1- Burns	83%
Viva 2 – Evaluation of fever	69%	85%	Viva 2 – Transfusion medicine	58%
Viva 3 – Aortic dissection	86%	98%	Viva 3 – Ventilator graphics	44%
Viva 4 – Postpartum encephalopathy	78%	95%	Viva 4 – Fluid responsiveness	69%
Viva 5- Renal failure and RRT	85%	98%	Viva 5- Sedation /analgesia	78%
Viva 6- Communication	76%	95%	Viva 6- Communication	56%
Viva 7 - Radiology	59%	91%	Viva 7 - Radiology	56%
Viva 8 - Procedure	78%	100%	Viva 8 - Procedure	83%
CLINICALS			**CLINICALS**	
Hot Case 1	57%	93%	Hot Case 1	42%
Hot Case 2	61%	93%	Hot Case 2	42%

Breakdown of reasons for failure in the examination (comparative data provided for previous exams)

	Oct 09	May 09	Oct 08
Total number of candidates who failed the examination	22	31	24
Number of candidates who scored less than 50% in the written paper	14	13	14
Number of candidates who failed after presenting to the oral section	8	18	10
Reasons for failure in the oral section of the examination			
Proportion of candidates failing to score a total of 50% in the exam overall (6/8)	75%	89%	70%
Proportion of candidates who failed because of failure in > 1 section (5/8)	63%	39%	40%
Proportion of candidates who scored a "bad fail in the clinicals -<40%)" (6/8)	75%	67%	30%

Written Section: SAQ Paper 1

1. Define cerebral perfusion pressure (CPP). List the advantages and limitations of using CPP as a therapeutic target in the management of traumatic brain injury

Definiton : CPP = MAP-ICP
Advantages: Easily monitored
Can be monitored continuously
Nursing staff familiar
BTF guidelines endorse use of CPP at 60

Limitations: Used as a surrogate for CBF
CVR is variable and therefore changes in CBF not detected by CPP
Does not allow for differential autoregulation in the normal and injured brain.
Therapy to maintain CPP can result in lung injury
No Class I data to support use
Poor correlation between CPP and indices of brain oxygenation

2. You are asked to review a 27 year old girl, a known diabetic, admitted following a 48-hour illness characterised by nausea, vomiting and shortness of breath. She has been unable to eat or drink and has not taken her regular insulin. On examination she has a heart rate 137 /min, respiratory rate 36 breaths /min, O_2 saturation is 99% on room air, blood pressure 92/34 mm Hg. She weighs 80kg and her blood sugar level is 32 mmol/l. Outline your plan of management for the first 24 hours.

This young lady most probably has diabetic ketoacidosis and is critically unwell.
She requires:-

1. Resuscitation:
May need supplemental oxygen
Peripheral iv access
Commence iv fluids (hartmanns, plasmalyte, n/saline or colloid)
- 500ml to 1 litre stat then reassess BP/HR/RR/ blood test and ABG should be available to adjust fluid therapy
- Maintenance IV fluids with N.Saline, 0.45% saline
- Start 5% dextrose when BSL <15mmol/L

Monitoring:
- ECG, pulse oximetry, NIBP
- Early Art line and CVC
- Bloods for
- EUC (Na+, Creat, Urea),Mg++, Phos-, Ca++, FBC, LFTs, BSL
- Urine dipstick
- IDC
- Confirmation of diagnosis: Blood gases, a raised AG metabolic acidosis, ketones in urine/blood

2. Insulin therapy:

Insulin infusion - short acting insulin (actrapid)
Infusion Dose (candidate should provide a dosing regimen and rationale)
- 0.01 to 0.1units/kg/hr (max)
- Daily dose /24 as units per hour

Titrate to decrease in BSL 1-2 mmol/L/hr
Continue until metabolic disturbance is corrected (acidaemia and ketosis) rather than correction of BSL. May need dextrose infusion if BSL drops below normal range

3. Electrolyte replacement:

Potassium:- Start replacement when plasma K^+ <5mmol/L as insulin therapy and correction of acidaemia may lead to precipitous fall and arrhythmias
Sodium:- May need to correct Na+ for BSL. Need to take care to avoid large shifts in Na as it may predispose to cerebral oedema
Bicarbonate:- almost no indication for bicarbonate therapy.
Phosphate and Mg++ likely to need replacement
**Need very regular (Q2-4h) ABG and EUC for 1st 24 hours to avoid large electrolyte and BSL changes. Need regular urine dipstick q4-6h for ketones.

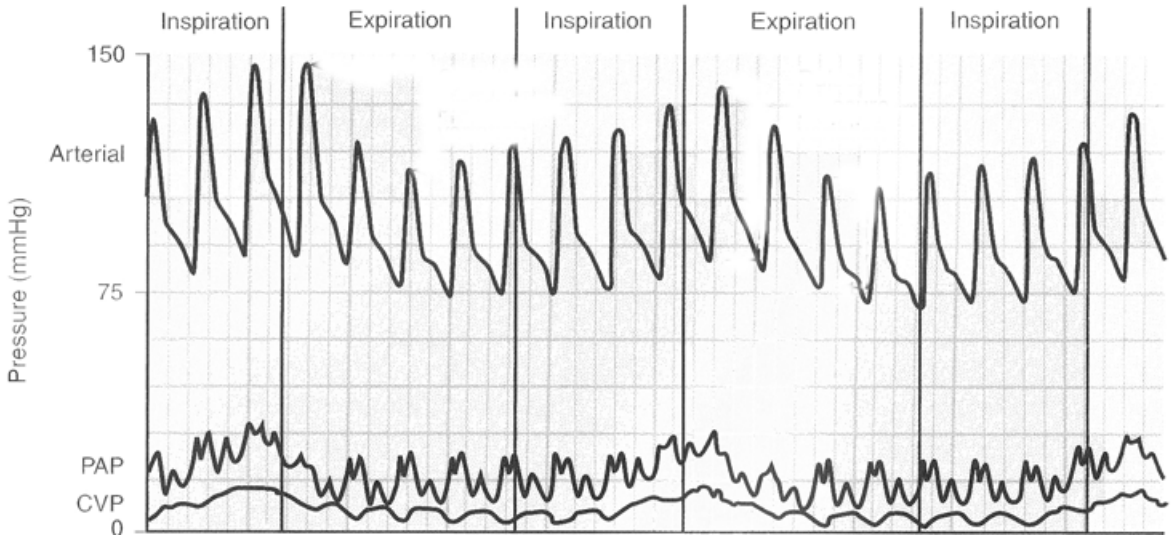
4. Identify and treat precipitant:

Common precipitants to consider include;
Non compliance and psycho-social issues
Infection:- gastroenteritis, UTI, respiratory tract, cholecystitis, meningitis, cellulitis
Ischaemia:- AMI, stroke, peripheral vascular disease, mesenteric ` ischaemia
Pregnancy

5. Prevention of expected complications:

Hypoglycaemia (q1h BSL, decrease insulin infusion, dextrose infusion)
Hyponatraemia (regular electrolyte monitoring)
Hypokalaemia (regular electrolyte monitoring)
Hypomagnasaemia and hypophosphataemia (regular electrolyte monitoring)
Venous thromboembolism (sci heparin/LMWH)
Hyperchloraemic acidosis (avoid N/saline when able)
Complications of critical illness (upper GIT bleeding, ARDS..)

3. 1. The haemodynamic data of a mechanically ventilated patient is illustrated below.



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

Systolic pressure variation > 10 mm Hg
Pulse pressure variation

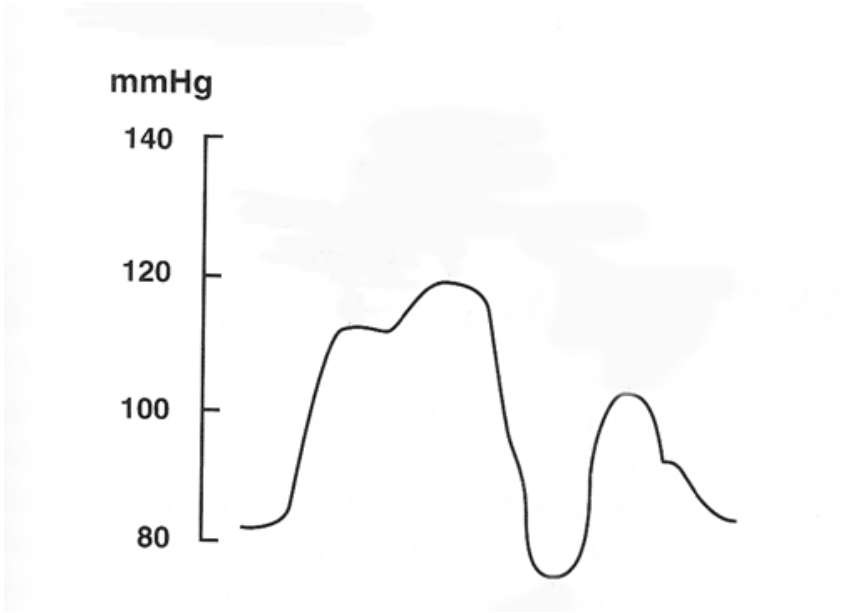
b) What is the clinical significance of the abnormality illustrated above?

Often implies a degree of fluid responsiveness

c) List 3 conditions in which such a scenario can occur.

Hypovolaemia, tamponade, bronchospasm, pneumothorax, raised intra-abdo pressure, raised intra-thoracic pressure, LV dysfunction, Dynamic hyperinflation

3.2 A 65 year old man is admitted to your ICU following emergency percutaneous coronary stenting after an anterior STEMI complicated by cardiogenic shock.



a) Comment on the arterial waveform and describe your reasoning.

Arterial waveform from IABP
Early inflation of balloon (augmentation occurs before dicrotic notch)
Early deflation –

b) What are the physiologic consequences of this?

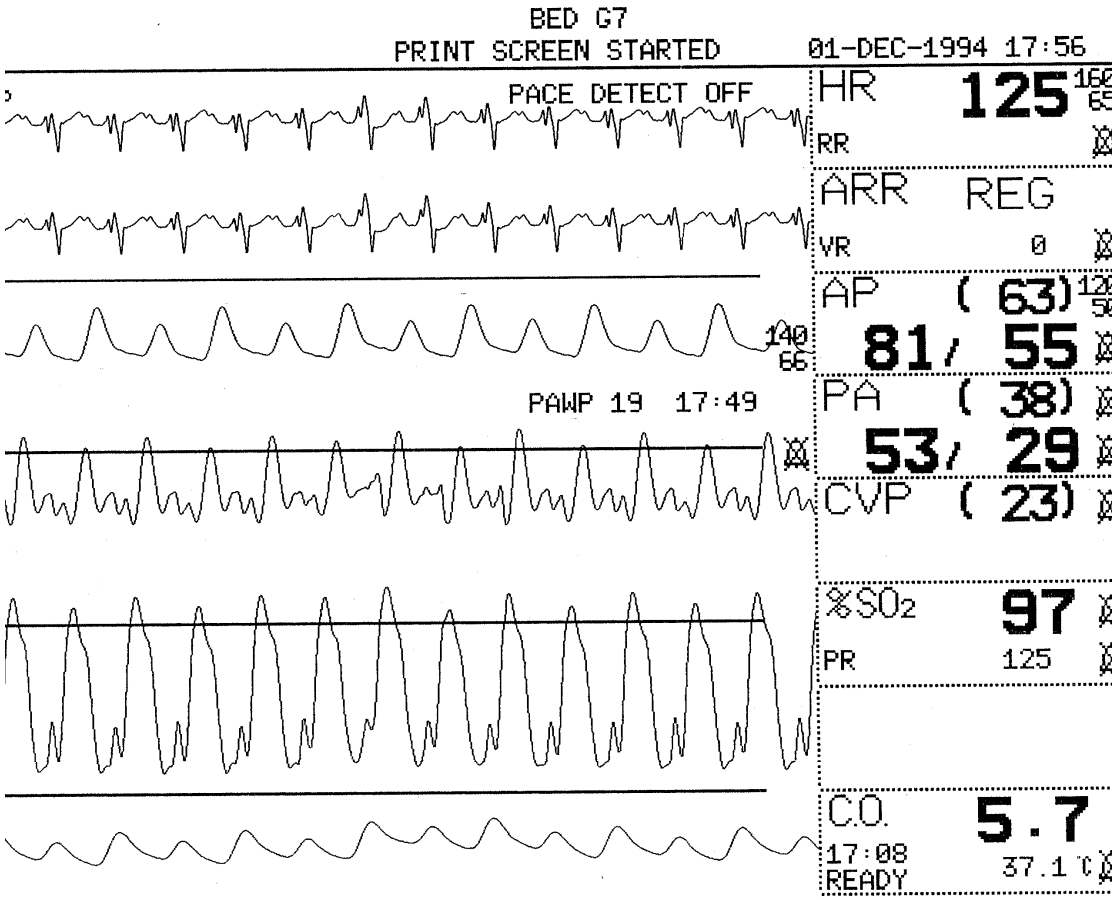
Incr LV wall stress, incr myocardial 02 consumption, incr LVEDV & LVEDP, worsening of mitral regurgitation, worsening of pulmonary oedema.

3.3 This is the monitor strip of a 40 year old man 5 hours post Aortic Valve Replacement for severe Aortic Incompetence. Six waveforms are shown.

From top to bottom:

a) **The top two traces are the ECG waveforms.**
b) **The third trace is an arterial waveform, (scale: 50-150 mm Hg)**
c) **the fourth trace is a pulmonary artery waveform (scale: 0 - 60 mm Hg),**
d) **the fifth trace is a CVP waveform (scale: 5-30 mm Hg) and**
e) **the sixth trace is a pulse oximetry waveform**

What haemodynamic abnormalities are illustrated in the above data set?



The abnormalities are Pulsus Alternans, pulmonary hypertension, systolic hypotension, tricuspid incompetence (large v waves).

4.1 Outline the potential effects of an intercostal catheter inserted into the left chest and attached to an underwater seal drain following a left pneumonectomy. The drain is unclamped and attached to an underwater seal drain.

Using an underwater seal drain is inappropriate following a pneumonectomy.
A drain attached to an underwater seal will cause air to be removed from the left chest. There is no lung to expand to fill the space so the mediastinum will move to the left. This results in rapid distortion of major veins and reduced venous return. This causes reduced cardiac output and hypotension.

4.2 Explain how you would manage this situation.

The situation can be prevented by immediate clamping or when mediastinal shift has occurred letting air back into the chest (by disconnecting the UWSD) resolves the situation or consider active injection of air / intermittent unclamping. It would also be necessary to contact the surgeon to ascertain how the UWSD had come to be attached.

5. A patient presents to the ICU with haemoptysis. He has been intubated and a bronchoscopy is planned to isolate the source of the bleeding. He has just been diagnosed as having pulmonary tuberculosis on the basis of a positive smear and has not received any treatment. Discuss the precautions to prevent your staff being infected with TB and the rationale for each.

- The patient has smear positive untreated TB and is therefore highly infectious

- The infection risk is greatly magnified by bronchoscopy which generates aerosols. It is therefore important to review the need for bronchoscopy .

- Regardless of whether a bronchoscopy is carried out the following precautions should be taken:

- Nurse in a single room with negative pressure ventilation and 12 air changes per hour
- Bacterial filter in ventilator circuit and closed suction
- All staff entering room should take personal respiratory precautions including fit tested N95/100 mask.

- Infection warning signs
- If bronchoscopy is undertaken:

- Minimize generation of aerosols:

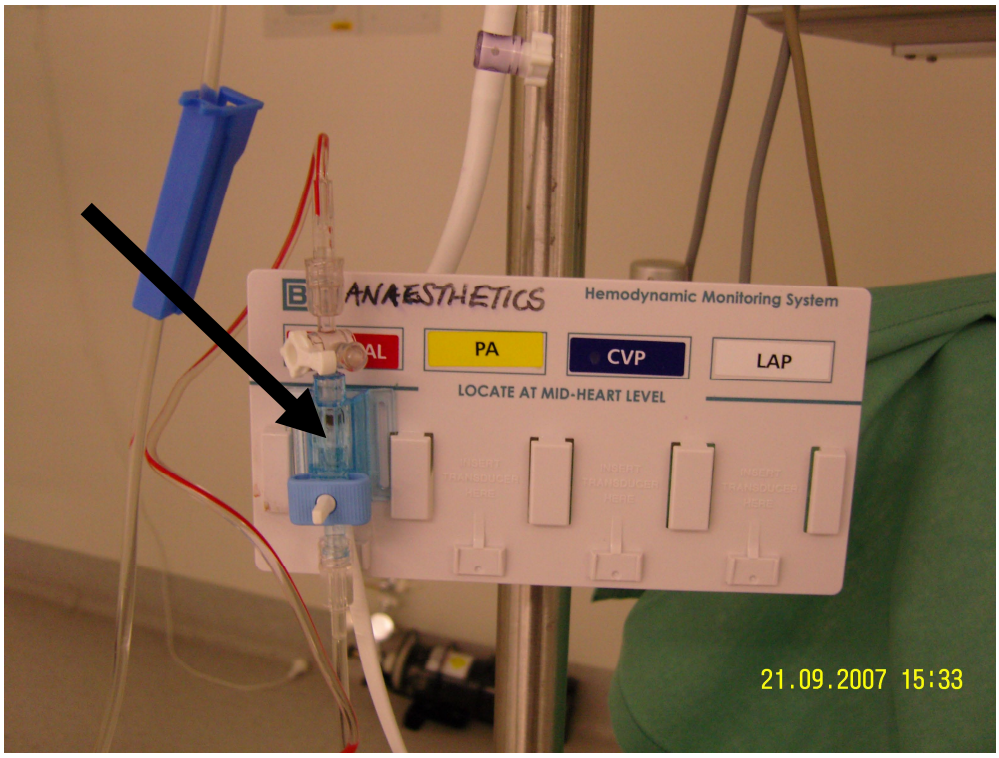
  Prevent coughing (muscle relaxant)
  Consider apnoeic oxygenation during bronchoscopy

- Consider use of powered air purifying respirator if available and staff have been appropriately trained

  Staff screen – In the event of accidental exposure during the procedure, consideration for a CXR, mantoux baseline and at 2 months.
  Advice and help of the Occupational Health and Infectious diseases team should also be sought.

6. 1 a) What is the item shown by the arrow (Figure 1)?

Figure 1:



Answer: Pressure transducer

b) What is the principle of operation of this device?

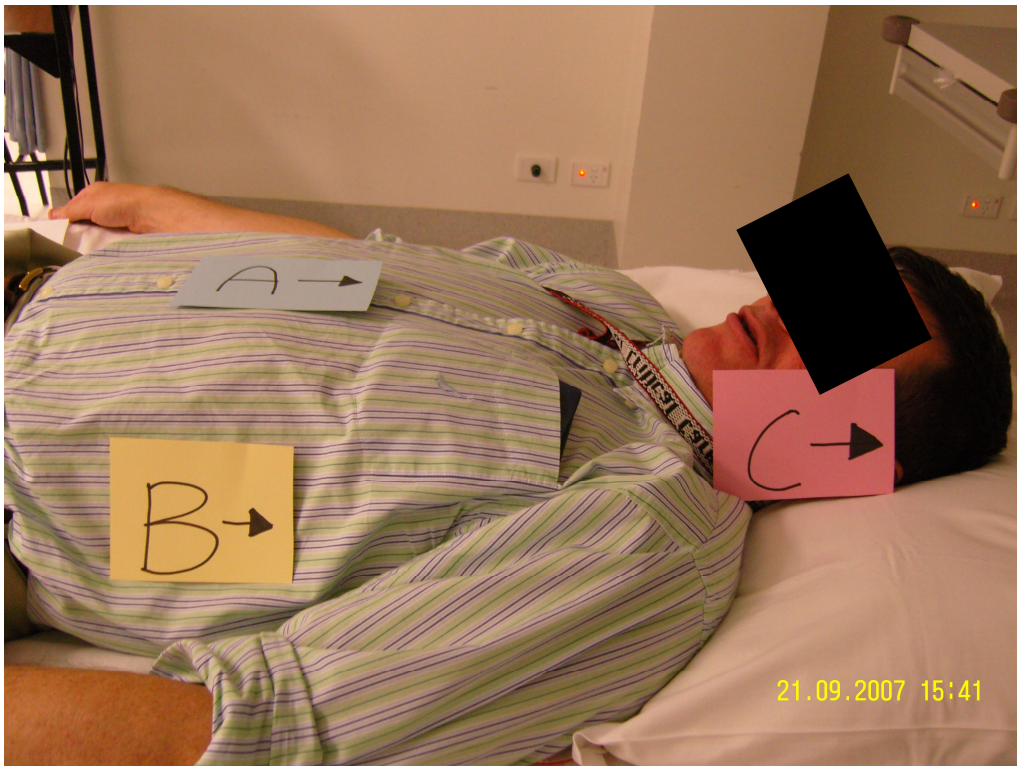
Transduces pressure (via strain) to electrical resistance

c) Name the associated electrical circuit configuration.

Answer: Wheatstone bridge

6.2 a) Look at the photo below (Figure 2), where is the zero point?

Figure 2:



For haemodynamic measurements? A, B, or C?

Answer B

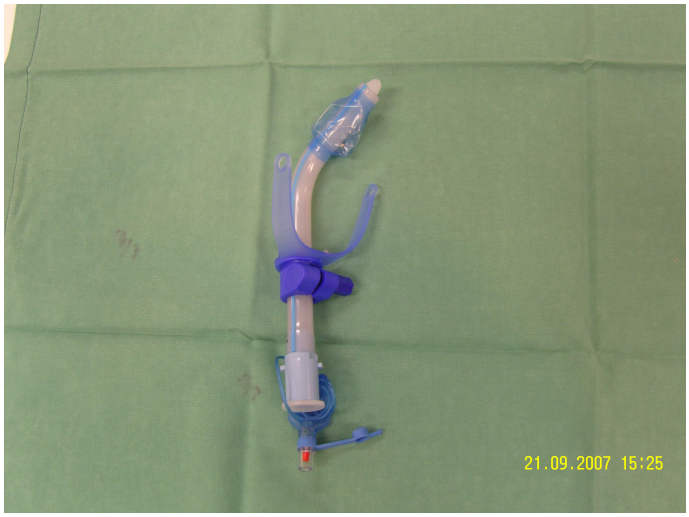
For intracranial pressure measurement? A, B, or C?

Answer C

6.2 b) Assuming the item is correctly set-up and integrated within the appropriate system - how will the displayed value change if the device is raised by 13cm relative to the zero point?

Fall in displayed pressure by 10 mmHg.

6.3 a) What is the item shown in the photograph below?



Answer: Adjustable flange tracheostomy tube

6.3 b) List the specific design features of Item a, which make it suitable for use.

Adjustable flange allows variability of tracheostomy length
Softer tube enables more flexible curvature
Reinforced tubing prevents kinking
High volume, low pressure cuff
Radio-opaque due to reinforced tubing
Able to be inserted via percutaneous technique

6.4 List two parameters, other than pressures, that can be directly measured using a pulmonary artery catheter.

1. Cardiac output
2. Central blood temperature
3. Mixed venous oxygen saturation

6.5 List three serious complications, relating to the pulmonary circulation that can be directly attributed to the use of a pulmonary artery catheter.

1. Pulmonary infarction
2. Pulmonary artery rupture
3. Right ventricular perforation

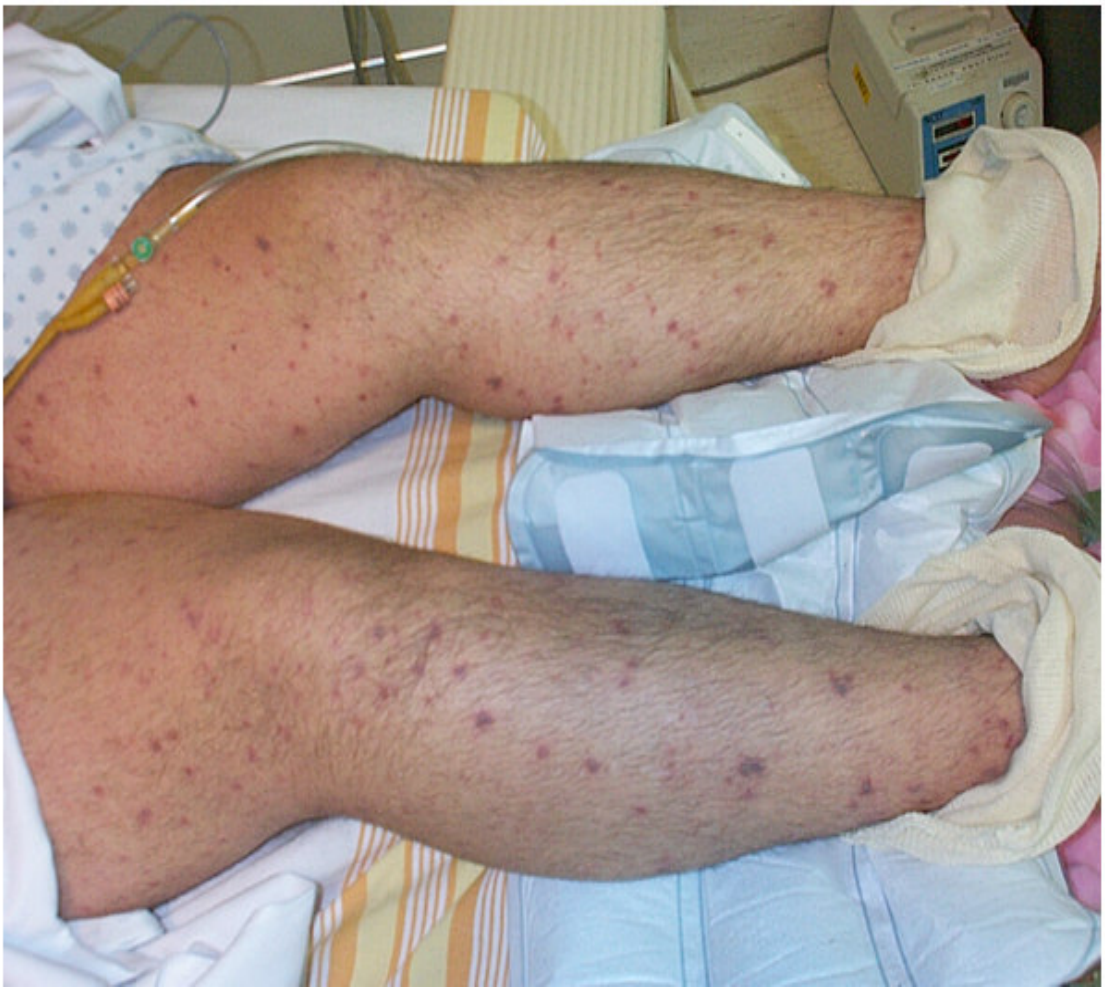
7.1. a) What types of ECMO (extracorporeal membrane oxygenation) are available and what are their indications?

Veno-Arterial: Cardiogenic shock
Veno-Venous; Respiratory failure

b) List three (3) complications of ECMO.

Bleeding, thromboembolism, infection, trauma to vesels

7.2. A previously well 54 year old man presents with confusion. On examination a rash is noted (see photograph below). Temperature is 37.1^0 C. The initial blood results are provided on the next page.



Venous biochemistry		
Test	**Value**	**Normal Range**
Sodium	135 mmol/L	135 -145
Potassium	3.8 mmol/L	3.5 - 4.5
Urea*	18 mmol/L	2.9 - 8.2
Creatinine*	177 µmol/L	70 -120
Bilirubin*	45 µmol/L	<20

Haematology		
Test	**Value**	**Normal Range**
Hb*	99 G/L	135 -180
WBC	10.8 x 10^9/L	4.0 -11.0
Platelets*	26 x 10^9/L	140 - 400
Blood film: Schistocytes		

Coagulation		
Test	**Value**	**Normal Range**
PT	10 sec	9 -12
APTT	29 sec	24 - 39
Fibrinogen	3.0 G/L	1.7 - 4.5

a) What is the most likely diagnosis? Provide 3 reasons.

TTP

Reasons: Low platelets, renal dysfunction, presence of schistocytes suggestive of MAHA and neurological symptoms.

b) What definitive treatment needs to be instituted urgently?

Plasma exchange

8. A 40 year old male, with no significant past medical history, has a severe head injury following a motor vehicle accident one week previously. It is deemed that he has a non survivable injury, although he is not brain dead. The wife has raised the possibility of organ donation post cardiac death (DCD). In your conversation with his wife about donation after cardiac death, outline the important discussion points about DCD.

DCD issues
Details of the process of treatment withdrawal, including the available locations, and ability for the family to be present until shortly after the time of death.

That organ retrieval needs to begin without delay after death in order to minimise the effect of warm ischaemia. This allows family members very little time with their loved one after death has been declared.

That anxiolytics and analgesics will be given, as necessary, until the moment of death.

That predicting the time from treatment withdrawal to death is difficult. If this interval is greater than the maximum that allows organ retrieval for transplantation, organ donation will not be possible. Tissue donation may still occur if suitable and the family consents.

The organs that may be suitable for transplantation and the effect on this of the time from treatment withdrawal to death.

That if organ donation is not possible, care for the patient will be continued in the ICU or another suitable location. That consenting to donation will usually result in a significant delay in the time that treatment may be withdrawn, due to the complex logistics associated with arranging donation and transplantation. The family must be prepared for and consent to this.

That blood is taken for serology and tissue typing before treatment is withdrawn.

That the family's permission will be sought for the administration of drugs (e.g. IV heparin) and procedures (e.g. bronchoscopy) to facilitate organ donation.

That pre-operative assessment or organ removal surgery may reveal medical reasons why donation may not proceed.

That the circumstances of the death may need to be reported to the coroner and a coronial post-mortem examination may occur. This is independent of the donation process.

That families may change their minds and withdraw consent at any time.

9. A 63 year old woman was admitted to the Intensive Care Unit 4 days ago following an out of hospital cardiac arrest. She was treated with urgent cardiac angiography and stenting of a significant left main coronary artery lesion.

On moderate sedation, she has started to obey commands this morning. She is still intubated and ventilated. Currently on an FiO2 of 0.6, she has a PaO2 of 120 mm Hg (16kPa). She has a right internal jugular central line, left radial arterial line, and a right cephalic vein peripheral IV line – all inserted on admission. She is being treated with clopidogrel, ranitidine and intravenous heparin. She has been in atrial fibrillation since admission and this morning she developed a temperature of 38.8^0 C.

9.1 What are the likely causes of fever in this woman?

a. Infectious
   - Chest
   - Line sepsis (peripheral and central lines)
   - Urinary sepsis
   - Sinusitis
   - Angiography site infection

b. Non-infectious
   - Intra-abdominal conditions
     1. Mesenteric Ischaemia
     2. Acalculous cholecystitis

- Haematoma secondary to anticoagulation
  1. Groin following angiogram
  2. Retroperitoneal

- Pericarditis / Dressler's (a bit too early)

c. Drug fever
   - Heparin

9.2 On examination, she has marked right upper quadrant tenderness and her bilirubin is 100 micromol/L (N < 17 micromol/L). What are the likely causes of her abdominal tenderness?

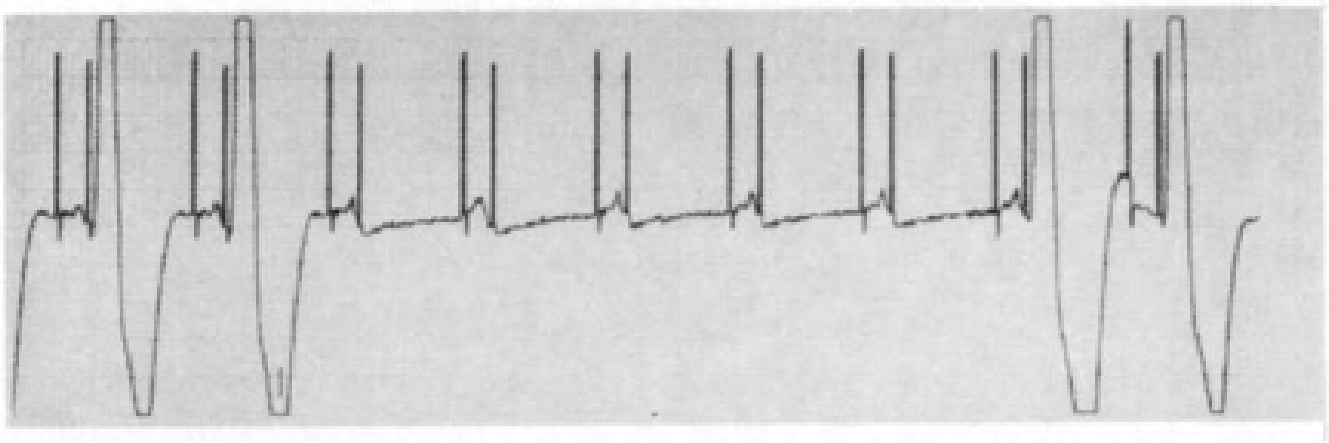
Possible diagnosis of acalculous cholecystitis

Also consider
1. right heart failure/ischemic hepatitis
2. pancreatitis
3. perforated viscus
4. calculous cholecystitis

9.3 Investigations do not reveal any intra-abdominal pathology. She continues to have fever and a septic screen is negative. List 4 biochemical (plasma) markers of sepsis which have been suggested to help differentiate infectious from non-infectious causes of fever.

1. CRP
2. Procalcitonin
3. Lipopolysaccharide binding protein (LBP)
4. Soluble triggering receptor expressed on myeloid cells-1 (sTREM-1)

10.1 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?

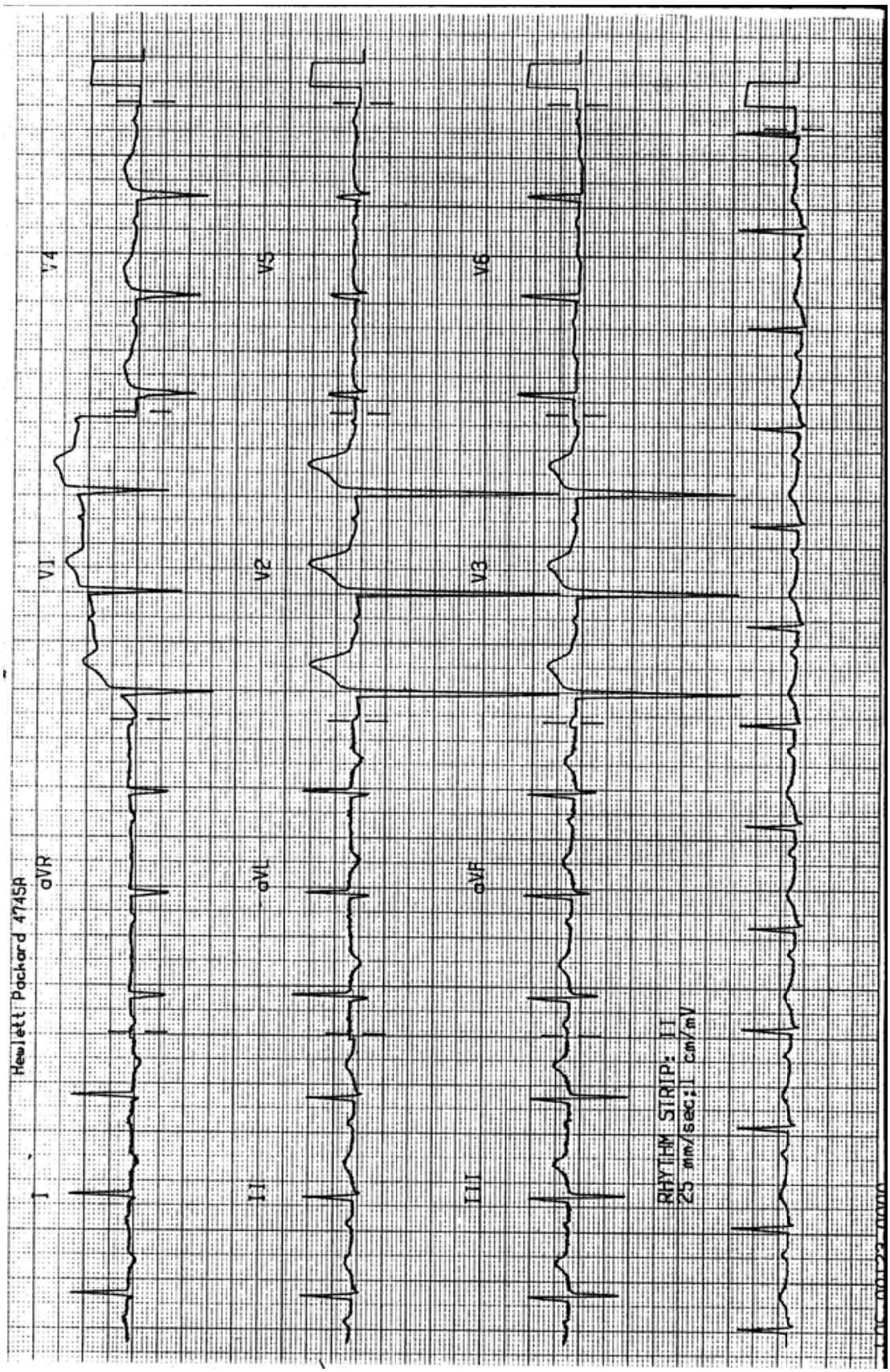
Intermittent failure of ventricular capture.

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

10.2 This is the preoperative ECG of a patient. There has been no recent chest pain or enzyme rise. What are the prominent features of this ECG? (Photo supplied on the next page)

What is the most likely diagnosis based on the ECG?



SR at 75/min, normal axis, LVH, Q waves in V1-V3, ST elevation ant leads (V1-V4), inv T I, flattened T waves V4-V6)
LV aneurysm, old ant MI +/- new silent MI???

11. You are asked to assess a 54 year old man scheduled for an urgent laparotomy for a suspected perforated duodenal ulcer. He has recently developed symptoms of double vision, ptosis, dysarthria and generalised muscle weakness. He was due to be reviewed by a neurologist next week. The anaesthetist asks for a post-op bed in ICU. The patient has a 25-pack year history of smoking but ceased smoking 3 months ago.

11.1 What are your differential diagnoses for his weakness?

Gullian-Barre syndrome
Myasthenia gravis
Motor neurone disease
Paraneoplastic syndrome – Eaton Lambert
(Myotonic dystrophy)
Periodic paralysis
Botulism
(Endocrine & metabolic myopathies)
(Drug induced myopathies)

11.2 The above patient is admitted to ICU post-op. A perforated DU was oversewn in theatre.

a) What are the essential pieces of information you would expect from the anaesthetist at handover upon the patient's admission to ICU?

Specific:
GA drugs used – esp muscle relaxants; muscle relaxation in response to sux (if used)
Findings on nerve stimulator NMJ monitoring
Reasons extubation could not be attempted

General:
Operative findings
Haemodynamic stability
Antibiotics used

11.3 What investigations could help you establish the diagnosis for his weakness?

Edrophonium or neostigmine test (with atropine cover)
ACh receptor Abs
EMG
NCS –
Muscle biopsy
LP – CSF protein
Neurological review

12.1 List 3 causes of an irregularly irregular pulse.

1. AF
2. Multiple VEs
3. Atrial flutter with varying block

12.2 List 4 clinical signs of portal hypertension.

1. Splenomegaly
2. Ascites
3. Caput medusae
4. Haemorrhoids

12.3 List 5 clinical signs of fractured base of skull following a motor vehicle accident.

1. Raccon eyes
2. Battle's sign
3. CSf rhinorrhoea
4. CSF otorrhoea
5. Hemotympanum
6. Lower cranial nerve palsies

12.4 List 4 clinical signs, (not involving the limbs) of cerebellar dysfunction.

1. Nystagmus
2. Titubation (head bobbing)
3. Truncal ataxia
4. Staccato speech
5. Dysarthria
6. Hypotonia
7. Kinetic tremor

13. A 45 year old previously healthy man was admitted to your ICU five (5) days ago after a motor vehicle accident with chest and abdominal injuries. He is currently intubated and ventilated, is on 100% oxygen and PEEP of 10cm water. He is deeply sedated and on noradrenaline and adrenaline infusions at 10mcg/min each. He has become oliguric.

His blood biochemistry, haematology and arterial blood gases are as follows:

Venous biochemistry		
Test	**Value**	**Normal Range**
Sodium	138 mmol/L	135 -145
Potassium*	7.1 mmol/L	3.5 - 4.5
Chloride	104 mmol/L	95 -105
Urea*	27 mmol/L	2.9 - 8.2
Creatinine*	260 µmol/L	70 -120

Haematology		
Test	**Value**	**Normal Range**
Hb*	120 G/L	135 -180
WBC*	12.8 x 10^9/L	4.0 -11.0
Platelets*	42 x 10^9/L	140 - 400

Arterial blood gases		
Test	**Value**	**Normal Range**
pH*	7.01	7.35 – 7.45
PCO_{2*}	45 mm Hg (6 kPa)	40 - 44
PO_2*	70 mm Hg (9.3 kPa)	80 - 100
Bicarbonate*	11 mmol/L	22 - 26
Base Excess*	-19 mmol/L	-2.0 to +2.0
Glucose*	7.5 mmol/L	4 - 6
Lactate*	13 mmol/L	<2.0

13.1 Summarise the findings of the blood tests.

- High anion gap metabolic acidosis (with apparent normal SID). Note AG 33 which is NOT adequately explained just by a lactate of 13 mmol
- Inadequate or inappropriate respiratory compensation
- Hypoxaemia (P/F ratio 70)
- Acute renal failure (note urea:creatinine ratio).
- Hyperkalaemia

13.2 What are the likely underlying causes of the lactic acidosis?

- Sepsis with shock
- Ongoing hypovolaemia
- Hypoperfusion eg septic cardiomyopathy; abdominal compartment syndrome
- Possible gut ischemia
- Perhaps adrenaline (also seen with other catecholamines – unpredictable

13.3 What are your management priorities at this point?

- Optimise cardiovascular function. Urgent echocardiogram. Volume replacement if possible. Measure continuous cardiac output (PiCCO or PAC). Measure SvO2 or ScvO2. Exclude abdominal compartment syndrome
- Optimise ventilation. Exclude pneumothorax. Probably needs more PEEP after some volume. Minimise airway prtessures, limit tidal volume, tolerate hypercarbia (though concerned about pH < 7!!!)
- Rationalise inotropes. Stop adrenaline, use noradrenaline as required
- Emergency management of hyperkalaemia with calcium, bicarbonate, insulin, dextrose and then haemodialysis!
- Urgent CRRT – for both potassium and acidosis use of hemosol buffer
- Broad spectrum IV antibiotics (rational answer required)

14.1 Outline briefly the difficulties associated with the diagnosis of sepsis during pregnancy and labour.

Applying SIRS criteria to pregnancy may be problematic as there is:

1) Leukocytosis
2) Body temperature is raised during pregnancy and labour
3) Tachycardia and tachypnoea are seen during normal labour

14.2 List the leading causes of sepsis in pregnant patients.

1) Pyelonephritis
2) Chorioamnionits
3) Septic abortion
4) Episiotomy infections
5) Necrotising fasciitis
6) Septic thrombophlebitis
7) Aspiration pneumonia

14.3 What are the common pathogens encountered in pregnancy related sepsis?

Gram negative more common than Gram positive agents
E.Coli one of the common pathogens
Can also be polymicrobial – E.coli, Klebsiella

14.4 List 2 antibiotics contraindicated during pregnancy.

Tetracyclines
Chloramphenicol

15. The following blood gases obtained at 8am and 10 am from a patient admitted to the ICU with Grade V Subarachnoid hemorrhage. Between the two sets of arterial blood gases a procedure was performed. Changes in gas tensions were not accompanied by changes in haemodynamic parameters.

Time	8 AM	10 AM
FiO_2	0.3	1.0
pH	7.41	7.06
PCO_2	39 mm Hg (5.2 kPa)	108 mm Hg (14.4 kPa)
PO_2	103 mm Hg (13.7 (kPa)	425 mm Hg (56.6 kPa)
Peak airway pressure	24 cm water	0 cm water
Tidal volume	650 ml	0 ml

15.1 What procedure was performed? Give reasons.

Apnoea test (as peak pressure has dropped to zero and there is no recordable TV. Not likely to be bronchoscopy as peak pressures are high during bronchoscopy

15.2 A 41 year old man is admitted to your Emergency Department, unconscious, with the first set of blood results. The second set of blood gases are taken 1 hour later.

Parameter	Initial values	1 hour later	Normal range
pH	7.05*	7.35	7.35 – 7.45
$PaCO_2$	34 mmHg (4.6 kPa)	39 mmHg (5.2 kPa)	35 – 45 (4.7-6.0 kPa)
PaO_2	203 mmHg (33.6 kPa)	94 mmHg (12.5 kPa)	75 – 98 (10.0-13.0 kPa)
Actual bicarbonate	9 mmol/l*	21 mmol/l	22 – 26
Sodium	137 mmol/l		134 –145
Potassium	4.2 mmol/l		3.5 – 5.1
Glucose*	11.2 mmol/l		4 – 6
Ionised Calcium	1.21 mmol/l		1.15 – 1.35
Chloride	105 mmol/L		95 – 105

a) Describe the initial acid-base disturbance.

The initial acid-base disturbance is a mixed metabolic and respiratory acidosis with a raised anion gap.

b) List 3 clinical scenarios which may produce such a pattern of arterial blood gas derangement?

Seizures
Resuscitated cardiac arrest
Near drowning
Near hanging

15.3 A 48 year old diabetic with a history of alcohol abuse is admitted with abdominal pain and the following results:

Parameter	Value	Normal range
pH*	6.87	7.35 - 7.45
$PaCO_2$*	8 mmHg (1.1 kPa)	35 - 45 (4.7-6.0 kPa)
PaO_2	149 mmHg (20 kPa)	75 - 98 (10.0-13.0 kPa)
Actual bicarbonate*	1.4 mmol/l	22 - 26
Lactate*	16 mmol/l	<2
Sodium	142 mmol/l	134 -145
Potassium	4.7 mmol/l	3.5 - 5.1
Chloride*	107 mmol/L	95 - 105
Urea*	14 mmol/l	3.4 - 8.9
Creatinine*	170 micromol/L	60 - 110
AST*	60	<40 U/L
ALT*	70	<40 U/L
LDH*	1400	50 - 150 U/L
Total bilirubin	20 micromol/L	4 - 25
Glucose*	6.5 mmol/l	4 - 6
Serum osmolality*	314 mOsm/kg	275 - 295

a) Give the three most likely diagnoses.

Diagnoses: 3 ischaemic bowel, 2 metformin induced lactic acidosis, thiamine deficiency, pancreatitis

b) List two additional investigations that you would perform based on the above information.

Two of the following investigations: Diagnostic laparoscopy or laparotomy, CT abdomen, red cell transketolase, lipase

Written Section: SAQ Paper 2

16. Outline the methods available to estimate fluid balance in the critically ill patient and briefly discuss their advantages and limitations. (You may tabulate your answer).

Method	Advantages	Limitations
Clinical – oedema, JVP, skin turgor, hydration of tongue	Simple, easily done by the bedside, not time consuming	Lack specificity
Intake–output chart	Simple method, reasonably accurate in most patients	Labour intensive, Insensible water losses not factored in, Losses through leaks in bed, drain disconnections and in the case of burns patients, severe evaporative water losses not taken inot account
Body-weight	May be useful in uncomplicated critically ill patients	Not routinely used in all ICUs, time consuming, labour intensive, difficult in the ventilated patient, (zeroing has to be done properly with sheets and pillows), addition of moisture from perspiration and spills can change baseline weight Correlation with I-O charts not high.
CVP/ PCWP/Echo	Used to predict intravascular status	Significant limitations
EVLW	Shown to be of value in a trial comparing it with PAC	Invasive technique
Research methods include Bioelectrical impedance, determination of total body water and plasma volume using radionuclide techniques		Research tools, do not lend themselves to serial measurements

17. Outline the advantages and limitations of the various therapeutic options available for the treatment of right ventricular dysfunction.

Therapy	Advantages	Disadvantages
Volume	Effective, as RV needs a higher filling pressure. A PA catheter may be useful in guiding volume therapy.	Determination of preload is problematic, RA pressure may be high in chronic right heart failure and may not be a predictor of volume response. Functional parameters of volume responsiveness not useful in right heart failure
Inotropes and vasopressors	-May be of benefit in RV infarction where they may increase coronary perfusion pressure - Some suggestion that levosimendan may improve RV afterload in ARDS	No large scale published data on any specific inotrope or pressor in isolated RV failure
Afterload manipulation - Control of hypoxia and hypercapnia and acidosis	reduce PA pressures	Optimal target levels unclear.
Prostaglandins	Reduce pulmonary pressures	May cause systemic hypotension, flushing
NO	Improves VQ matching, improves oxygenation	Met Hb, platelet dysfunction, requires special delivery systems, not shown to improve mortality
Bosentan	Reduce pulmonary pressures	No large scale data
Phosphodiesterase inhibitors - sildefanil	Reduce pulmonary pressures	No large scale data
Pacing to improve A-V synchrony	Improves preload	
Mechanical ventilation	May improve oxygenation and CO2 transfer and may reduce pulmonary hypertension	Deleterious effects of IPPV

18. A two year old boy is suspected of ingesting iron tablets.

a) List three clinical signs of iron poisoning.

Clinical sign	**Cause**
Nausea / vomiting/ haematemesis	Acute gastritis, ischaemia
Diarrhoea	
Abdominal pain	
Melaena	
Tachypnoea	Metabolic acidosis
Coma/ seizures	
Shock/ hypotension	Myocardial depression
Oliguria	Capillary leak
Jaundice / coagulopathy	Hepatic necrosis

b) List two investigations which would support the diagnosis of iron poisoning.

Iron Level > 300 microgm/dL, or 63 micromol/L	
Abdominal XR:	Shows iron tablets
Blood gas	Metabolic acidosis
Hyperglycaemia	
Coagulopathy	Interference with coagulation cascade/ hepatic failure
Deranged liver enzymes	From hepatic necrosis
Raised white cell count	

c) Which blood gas (a or b or c) would be most consistent with iron poisoning? Justify your choice of answer.

	a)	b)	c)
pH	7.1	7.55	7.45
pCO2	34 mmHg (4.5 kPa)	30 mmHg (4.5 kPa)	34 mmHg (4.5 kPa)
pO2	75 mmHg (10 kPa)	90 mmHg (12 kPa)	70 mmHg (9.3 kPa)
BE	-18 mmol/L	+4 (mmol/L)	-0.1 mmo/L

Answer: Metabolic acidosis due to uncoupling of oxidative phosphorylation.

d) List three treatments specific for iron poisoning and their mechanisms of action.

Desferrioxamine	(Binds intravenous iron to form water soluble ferrioxamine that is renally excreted)
Whole bowel irrigation	(Polyethylene glycol: works with minimal complications, aim for clear rectal effluent and absence of tablets on AXR)
Exchange transfusion with plasmapheresis.	
Surgical/ endoscopic removal of tablets	(If seen on AXR).
Treat coagulopathy	
Treat hyperglycaemia	
Aggressive volume resuscitation (as capillary leak a feature)	
Dialysis	But limited efficacy
Gastric Lavage with HCO3	(Controversial)

Note: Charcoal is ineffective.

e) List one serious long term complication of iron poisoning.

1. Bowel obstruction (esp gastric outlet)
2. GI strictures

19. A 73 year old man, body mass index 17.5 kg/m^2, is commenced on total parenteral nutrition (TPN) following surgery for a gastric malignancy. Four days later he develops increasing breathlessness and hypotension. Blood results are as follows:

Test	Value	Normal Range
Haemoglobin*	109 G/L	135 – 180
White Cell Count*	13.6 x 10^9/L	4.0 – 11.0
Platelets	178 x 10^9/L	150 – 400
Urea*	10.3 mmol/L	3.0 – 8.0
Creatinine	84 µmol/L	45 – 90
Sodium	145 mmol/L	134 – 146
Potassium*	1.8 mmol/L	3.4 – 5.0
Chloride*	115 mmol/l	98 – 108
Bicarbonate*	14 mmol/L	22 – 32
Calcium (albumin adjusted)*	1.82 mmol/L	2.15 – 2.6
Albumin*	26 G/L	35 – 50
Magnesium*	0.41 mmol/L	0.7 – 1.1
Phosphate inorganic*	0.26 mmol/L	0.8 – 1.5
Glucose*	18.6 mmol/L	3.0 – 5.4

a) What is the likely diagnosis? Provide 4 reasons which support your answer.

Refeeding syndrome (Nutritional recovery syndrome)
Clinical history, Low Po4, K 1.8 and Mg

b) Give 5 associated complications.

Respiratory
Respiratory failure
Respiratory muscle weakness

Cardiac
Cardiac failure / Cardiomyopathy
Hypotension
Arrhythmias

Neurologic
Altered mental state
Paraesthesiae
Seizures

Renal
Acute tubular necrosis

Skeletal
Rhabdomyolysis
Weakness

Endocrine
Insulin resistance
Osteomalacia

Haematologic
White cell dysfunction
Thrombocytopenia / decreased platelet function
Haemolytic anaemia

Immune function
Sepsis

20. What are the clinical features of severe falciparum malaria in adults? Briefly outline its treatment.

The clinical features include:
History of recent travel to a malaria endemic zone
Impaired conscious state
Convulsions
Respiratory distress and ARDS
Shock and circulatory collapse
Jaundice
Severe hemoglobinuria
Severe anaemia

Treatment:
Two classes of drugs are available: Cinchona alkaloids and the artemisinin derivatives (latter may be superior in adults). Initially commenced as parenteral and switched to oral for a total of 7 days. Doxycycline is added to non-pregnant adults. If pregnant, then clindamycin is given in addition.

Supportive therapy of organ dysfunction

Specific other treatments:
a) No proven role for exchange transfusion in severe parasitemia, although used
b) risk of hypoglycemia with quinine

21.1 A 77 year old male undergoing transurethral prostatic resection under spinal anaesthesia becomes restless and agitated. He is intubated and ventilated in OT, the surgery is expedited, and he is transferred to ICU. His initial biochemistry profile is as follows:

Test	Value	Normal Range
Sodium*	113 mmol/L	135 – 145
Chloride*	87 mmol/L	100 -110
Potassium	4.5 mmol/L	3.2 - 4.5
Glucose	5.1 mmol/L	3.6 – 7.7
Urea	5.0 mmol/L	3.0 – 8.0
Osmolality (measured)	280 mOsm/kg	280 – 300

a) Describe the important biochemical abnormalities.

Severe normotonic hyponatraemia. The osmolar gap is increased to > 40 mOsm/kg (51 mosm/kg using 1.86*(Na + K) + urea + glucose, or 44 mOsm/kg using 2*Na + urea + glucose).

b) What is the likely cause of this confusional state?

Absorption of glycine / water irrigation solution causing glycine neurotoxicity. Glycine is an inhibitory neurotransmitter. Increased plasma ammonia may contribute, but the encephalopathy is not due to a primary increase in brain water.

c) What transient neurological disturbance is likely in this clinical setting?

Visual impairment, blindness, sometimes fixed pupils. Should completely resolve in a few hours

d) List two confirmatory biochemical features (other than those from the table above).

Hyperammonaemia, hyperglycinaemia, hyperserinaemia, metabolic acidosis.

e) Do you believe hypertonic saline is indicated? Explain your reasoning.

None. The osmolality is normal. Hypertonic saline should only be considered if measured osmolality < 260 mOsm/kg (TE Oh p 967)

21.2 Simultaneous arterial blood gas analysis is as follows:

Test	Value
FiO_2	0.3
pH	7.33
pO_2	93 mm Hg (7.4 kPa)
pCO_2	33 mm Hg (4.4 kPa)
HCO_3^{-*}	16 mmol/L
Standard base excess*	-9.5 mEq/L

a) Describe the acid- base status.

Compensated metabolic acidosis – normal anion gap

b) What is the mechanism of this disturbance?

Water absorption (SID zero) reducing extracellular SID (in excess of A_{TOT} dilution).

21.3 After 7 hours, the biochemical profile is as follows:

Test	Value	Normal Range
Sodium*	130 mmol/L	135 – 145
Chloride	103 mmol/L	100 -110
Potassium	3.7 mmol/L	3.2 - 4.5
Glucose	5.5 mmol/L	3.6 – 7.7
Urea*	10.6 mmol/L	3.0 – 8.0
Osmolality (measured)	281 mOsm/kg	280 – 300

a) What important changes have occurred since the initial profile, and how should they be interpreted?

Osmolar gap now greatly reduced (to 16 mOsm/kg, or to 5 mOsm/kg using simple formula), indicating rapid glycine elimination. Sodium rapidly normalising, but plasma still normotonic

b) Your registrar is concerned that the sodium is correcting too rapidly. Is there a basis for this concern, and what should be done?

Rapid sodium correction is to be expected during glycine elimination, and is safe provided no sudden changes in osmolality.

22. Outline the role of vasopressin and its analogues in the critically ill patient.

- Vasopressin - Septic shock – Improves blood pressure, No evidence of mortality benefit- NEJM study, some benefit in the less sick population
- Terlipressin - Hepatorenal syndrome
- Diabetes insipidus – Desmopressin improves polyuria, restores serum Na concentrations
- Pitressin - Variceal bleed
- Vasopressin - Cardiopulmonary resuscitation
- Desmopressin - Post cardiopulmonary bypass bleeding – 20 units improves platetet dysfunction related bleed but may cause myocardial ischemia
- Von Willebrands's

23.1 List 5 likely causes for the following coagulation profile.

Test	Value	Normal Range
PT*	35.4 Sec	12.0 - 15.0
INR*	3.5	0.8 - 1.1
APTT*	>170.0 Sec	25.0 - 37.0
FIBRINOGEN*	0.9 G/L	2.20 - 4.30

1) DIC
2) Primary fibrinolysis
3) Dilutional coagulopathy from massive transfusion
4) Post thrombolysis
5) Snake bite

23.2 Examine the coagulation profile from a patient in intensive care.

Test	Value	Normal Range
Prothrombin ratio (INR)	1.0	0.8 -1.2
APTT*	65 sec	24 -39
Platelets	240 x 10^9/L	150 - 400
Bleeding time	4 min	2 - 8
Fibrinogen	2.8 G/L	1.5 - 4.0
FDPs	<10 mg/L	0 -10

a) List 4 possible causes of this picture.

1) Heparin
2) Hemophilia A
3) Hemophilia B
4) Lupus anticoagulant

b) List 4 further tests which you will perform to identify the cause of the coagulopathy in question 23.2.

1) Thrombin time
2) Factor assay
3) Anti-phospholipid antibody
4) Reptilase test
5) Mixing test

24. What is a receiver operating characteristic plot (ROC curve) as applied to a diagnostic test? What are its advantages?

An ROC plot is a graphical representation of sensitivity vs. 1- specificity for all the observed data values for a given diagnostic test.

Advantages:

- Simple and graphical
- Represents accuracy over the entire range of the test
- It is independent of prevalence
- Tests may be compared on the same scale
- Allows comparison of accuracy between several tests.

How it may be used:

- Can give a visual assessment of test accuracy
- May be used to generate decision thresholds or "cut off" values
- Can be used to generate confidence intervals for sensitivity and specificity and likelihood ratios.

25. An 82 year old woman presents with fever, seizures and a history of anorexia, diarrhoea and vomiting.

25.1 List three (3) clinical features which would indicate the need for a brain CT scan prior to lumbar puncture in this patient?

1. New onset seizures
2. Immunocompromised state
3. Moderate to severe impaired level of consciousness
4. Focal neurological signs (signs suspicious of a space occupying lesion)

25.2 In the above patient, a lumbar puncture is performed following a normal CT scan of head. The immediate results are as follows:

CSF slightly turbid in appearance
300 polymorphs /mm^3, 240 monocytes/mm^3
Glucose 2.5mmol/L
Protein 0.6 g/l (0.2-0.4 G/L).

a) What is the likely diagnosis?

Bacterial Meningitis./ meningoencephalitis.

b) The microbiologist rings to inform you that the gram stain demonstrates numerous small non-branching Gram-positive bacilli. What is the likely diagnosis?

Listeria monocytogenes infection

c) What are the appropriate antibiotics for this organism?

Ampicillin or Penicillin G.

d) You discover the patient is allergic to your choice of antibiotic. Suggest an alternative antibiotic.

IV Bactrim (cotrimoxazole, trimethoprim/sulphamethoxazole)./ Meropenem/ Linezolid-Rifamp combination

25.3. A 56 year old patient who has been on meropenem and fluconazole for six days for intra-abdominal sepsis has developed new fevers and grown a Gram negative organism in the blood. The sensitivities are given below:

	Gentamicin	**Tobramycin**	**Ampicillin**	**Imipenem**	**Ciprofloxacin**	**Ticarcillin**
Gram negative rods	**R**	**R**	**R**	**R**	**R**	**R**

List three likely causative organisms of the new sepsis. What is an appropriate antibiotic for each of the listed organisms?

1. Stenotrophomonas maltophilia - Bactrim
2. Multi-resistant Acinetobacter – Amikacin/colistin
3. Multi-resistant pseudomonas / Burkholderia - Amikacin
4. Enterobacter/proteus – Amikacin

25.4 A 36 year old cattle farmer was admitted to hospital with a flu like illness. 3 days after admission he developed arthralgia and progressive shortness of breath. There was a soft systolic murmur over the precordium. Chest X-Ray showed bilateral infiltrates.

ECG showed non-specific ST-T changes. Troponin raised.
Echo revealed decreased LV function.
Hb 90 G/L, reticulocytes 4%.

List 5 differential diagnoses for his presentation.

1. Viral pneumonia
2. Legionella
3. Pneumococcal
4. Q fever
5. Mycoplasma
6. Infective endocarditis
7. Vasculitis (unlikely)

26. A 78 year old woman ventilated in intensive care suddenly develops surgical emphysema over her chest, neck and face. Describe your management.

Key Features:

Resuscitation if required. Is airway OK, is she being ventilated adequately, Is circulation intact?

Work out reason: Is it ventilator, tubing or patient. ie barotrauma, new tracheostomy or CVC, pneumothorax,

So, examine patients, get urgent CXR, insert chest drain if required, consider new ventilation strategy.

27 a) Draw and label the pressure time curve for a patient with normal lungs being ventilated with constant flow volume controlled ventilation with a respiratory rate of 20 an inspiratory to expiratory ratio of 1:2, PEEP 5 cm water.

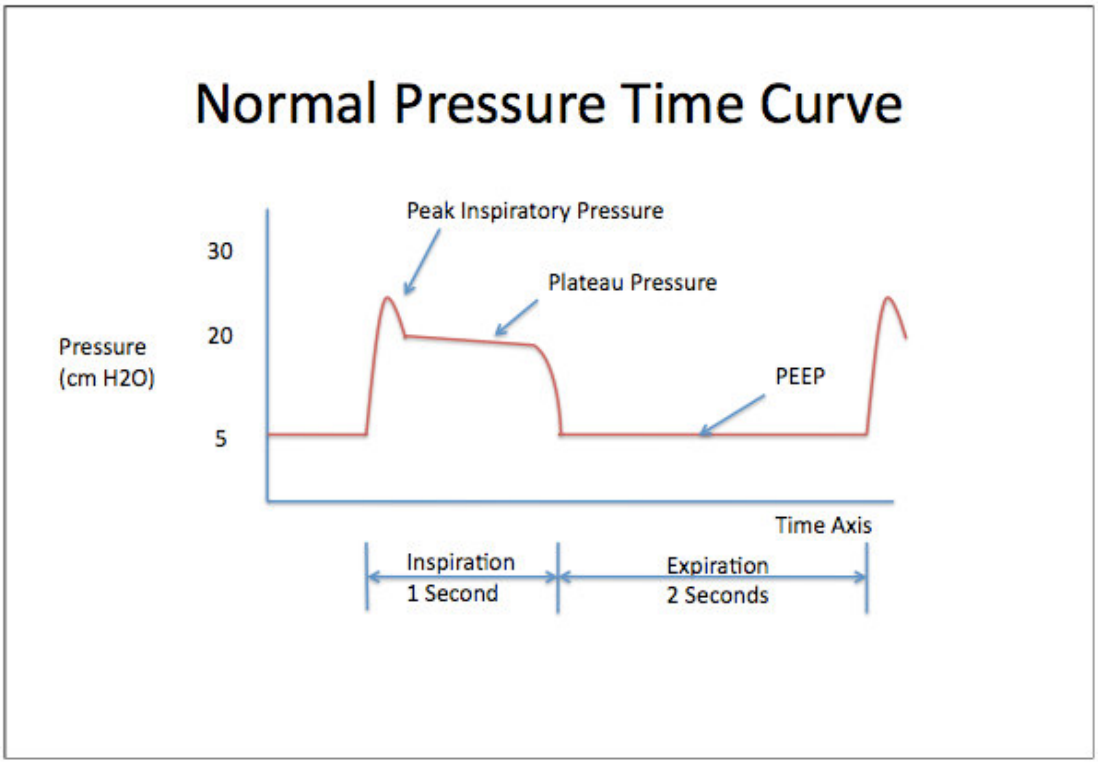
b) Using the same scale, and assuming the same ventilator settings, draw a representative pressure time curve for a patient with acute severe asthma.

c) Briefly, explain the basis for any changes that you have represented.

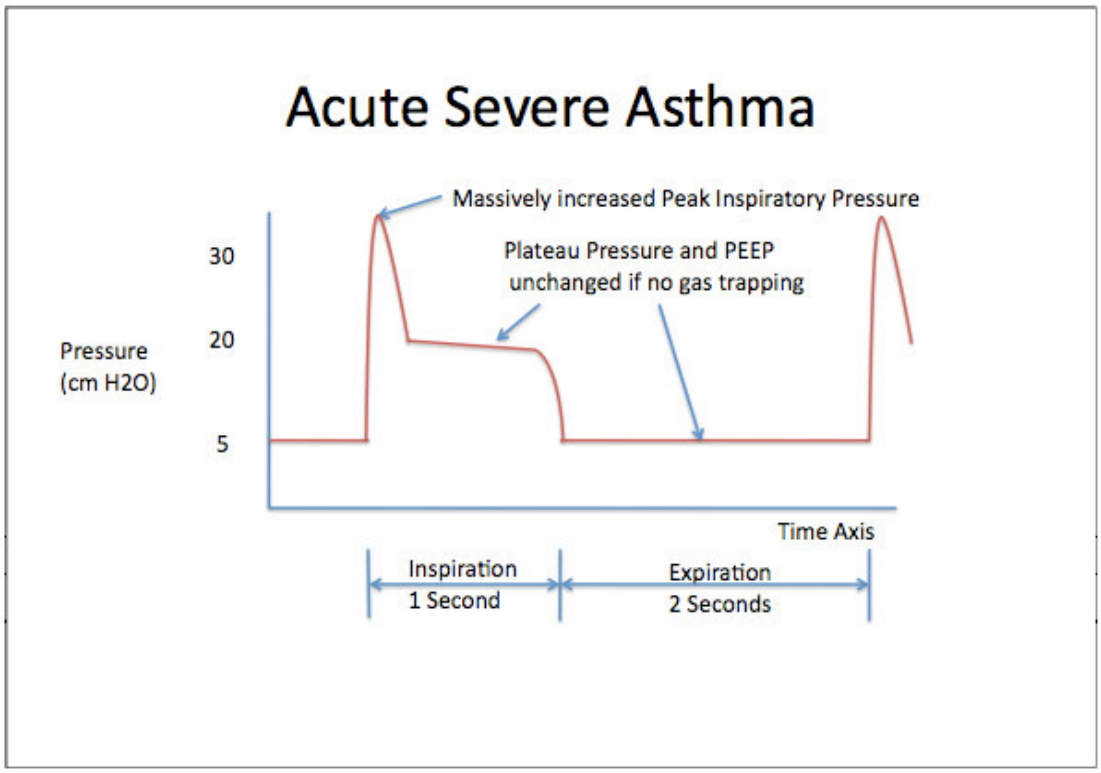
Normal Pressure Time Curve should include the following:

Baseline pressure above zero equals PEEP
Peak Inspiratory pressure (PIP)
Plateau pressure should be included with the long inspiratory time (1second) from rate 20 and I:E 1:2 described in the question
Return of pressure to baseline PEEP
Time axis should have seconds, 1 second in inspiration, 2 in expiration

Plateau Pressure of 15-20 cm H2O and PIP less than 30 cm H20 as patient described as having normal lungs.



Acute Severe Asthma :



Changes: Raised PIP with unchanged Plateau pressure, but accepting that PEEP and plateau pressure may be increased with successive breaths if illustrated (due to gas trapping / auto peep)
Basis: increase in inspiratory airflow resistance but not lung or chest wall compliance, unless significant gas trapping with ensuing AutoPEEP

28.1 List an antidote (one (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
Bupivacaine	Intralipid
Cyanide	Cyanocbalamin/ Sodium thiosulphate
Digoxin	Fab
Ethylene glycol	Ethanol, Fomepizole
Isoniazid	Pyridoxine
Methanol,	Ethylalcohol
Methemoglobinemia	Methylene blue
Organophosphate	Atropine
Opiates	Naloxone
Lead	Dimercaprol, BAL
Valproate	Carnitine

28.2. Briefly outline the mechanism of effectiveness of sodium bicarbonate in the management of tricyclic antidepressant overdose.

Increased serum pH, TCAs are weak bases and therefore increasing serum pH will increase the proportion of non-ionised drug thus causing a greater proportion of drug to be distributed throughout the body away from the heart.
Increased serum Na also overcomes the Na receptor blockade
Alkalinisation also accelerates recovery of sodium channels by neutralizing the protonation of the drug receptor complex.

29.1 Define delirium.

A disturbance of consciousness with inattention accompanied by a change in cognition or perceptual disturbance that develops over a short period of time and fluctuates over time. DSM4. Inattention is one of the hallmarks and pivotal features of delirium.

29.2 What is the prevalence of delirium in the critically ill?

Reported as being greater that 8 out of 10 (An answer suggesting that it is highly prevalent should get some credit.

29.3 What is its prognostic significance?

The presence of delirium has been assoc with increased mortality, prolonged ICU and hospital stay, greater dependency on community services and care on discharge and higher nursing home placement rates.

29.4 Briefly outline how you will manage delirium in the critically ill patient.

Treatment of Delirium (marks) – Early recognition
Identify etiology (metabolic, infective, drugs, drug withdrawal, alcohol etc) and treat this
Non Pharmacologic treatment i.e. recurrent orientation of patients, early mobilization, early removal of catheters etc
Pharmacologic-
Benzodiazepines
Thiamine
Haloperidol
decrease analgesics sedatives and anticholinergic drugs. NOTE there are NO FDA drugs approved for the treatment of delirium.

30. You are asked to review a 64 year old man who has been brought to the emergency department having been burned in a house fire. There is no coherent history available from the patient and you observe that he is drowsy and confused, and, has a persistent cough. His heart rate is 120 bpm, blood pressure 88/52 mmHg, respiratory rate 28 and oxygen saturations are 94 % on high flow oxygen via a non re-breather mask.

30.1 List the initial priorities in management.

1) Resuscitation including primary and secondary survey
2) Assessment and management of potential airway burn injury – mention consideration of early intubation, not cutting ET tubes and avoiding nasal tubes.
3) Obtain large bore iv access and administration of fluid bolus (20mls/kg) for probable hypovolaemic shock- mention that groins are usually spared in burns and are a good site for clean skin vas cath access.
4) Look for signs of traumatic injury and assess extent of body surface area and depth of burn
5) Awareness of risk of hypothermia
6) Seek collateral history for past medical history and medication history and history of acute events

30.2 What features on history and examination would suggest a significant airway injury?

1. Burns occurring in a closed space
2. Cough, stridor, hoarseness of voice
3. Burns to face, lips, mouth, pharynx or nasal mucosa
4. Soot in sputum, nose or mouth
5. Hypoxaemia or dyspnoea
6. Carboxyhaemoglobin levels > 2%
7. Acute confusional state or depressed level of consciousness

30.3 Give a differential diagnosis for his conscious level.

1. Traumatic brain injury
2. Carbon monoxide / CN - poisoning
3. Alcohol intoxication/drug overdose
4. Other pathology precipitating loss of consciousness eg stroke, intracranial haemorrhage, seizure-related, hypoglycaemia

Vivas

VIVA 1

A 30 year old man has been admitted to hospital with severe multiple injuries following a motor vehicle accident.

On day 2, his intracranial pressure has stabilised and his head CT shows scattered punctate haemorrhage with subarachnoid blood, with no mass lesion requiring evacuation. His pelvic fracture and right tibial/fibula fracture have been managed with external fixation and a left leg femoral fracture has undergone open reduction and internal fixation.

He has been in good health, but had a DVT 3 years ago and is not on any regular medication.

Outline your approach to prophylaxis for venous thrombo-embolism in this patient.

The other questions focussed on priniciples of DVT prophylaxis, use of various agents in a variety of clinical situations, HITTS and management of DVT prophylaxis in TBI.

VIVA 2

You are reviewing an intubated and ventilated 35 year old 4 days following traumatic subarachnoid haemorrhage. Overnight he has developed a temperature of 39.3 and has developed a new tachycardia of 130 beats/minute and has been commenced on noradrenaline for a low blood pressure (90 mm Hg systolic).

What could be the causes of fever in this man?

The rest of the viva focussed on evaluation of sepsis in a critically ill patient, interpretation of CSF results and biomarkers of sepsis.

VIVA 3

A 65 year old previously healthy man has presented to the Emergency Department with chest pain and shortness of breath. Vital signs are Glasgow Coma Score 15, respiratory rate 30 breaths/minute, oxygen saturation 96% on 8 L O_2 via nasal prongs, heart rate 120 bpm and BP 180/130 mmHg.

He has an established IV access.

You are requested by the ED physician to review him and possibly take over his care.

Outline your initial plan of management

The rest of the viva focussed on approach to the evaluation of chest pain and management of aortic dissection and its complications.

VIVA 4

A 26 year old lady presents from home confused with a low-grade fever. Her blood pressure is 160/100. She has no gross motor deficits. Ten days ago she had an emergency termination of pregnancy for an intrauterine death that was complicated by disseminated intravascular coagulation. She was 32 weeks gestation and had been on labetalol for a pregnancy-induced hypertension. Her discharge medications included paracetamol, tramadol and a selective serotonin reuptake inhibitor. She has a 6-year history of uncomplicated Hepatitis C.

What would you include in your differential diagnosis for her confusion and temperature?

The rest of the viva focussed on the evaluation and management of encephalopathy and DIC in the pregnant patient. .

Areas of weakness identified by examiners:

- Candidates were confused about the concept of fluid responsiveness, and frequently equated fluid responsiveness to a low CVP. They could not explain why CVP was not a reliable measure of fluid status or responsiveness.
- Many candidates were not familiar with the VISEP study (candidates were not required to know the name of the study but an awareness of a large RCT on starches and their potential problems was important).
- Many were unaware of the composition and associated drawbacks of Compound Sodium Lactate solution

VIVA 5

A 68 year old man had both legs trapped under a heavy concrete slab for 4 hours. He has just been admitted to the ICU, 8 hours post injury, following adequate resuscitation and definitive operative wound debridement. His observations are that he is, fully conscious, his blood pressure is 110/70 mmHg, pulse 86 beats/min and respiratory rate 24 breaths/min. He is anuric, and has been for the past 3 hours.

Relevant blood results at that time are:

Venous biochemistry		
Test	**Value**	**Normal Range**
Sodium	138 mmol/L	135 -145
Potassium*	7.1 mmol/L	3.5 - 4.5
Chloride	100 mmol/L	95 -105
Bicarbonate*	11 mmol/L	22 - 26
Urea*	29 mmol/L	2.9 - 8.2
Creatinine*	310 µmol/L	70 -120
Calcium*	1.71 mmol/L	2.10 – 2.55
Phosphate*	4.31 mmol/L	0.65 – 1.45
Creatine Kinase*	> 80,000 U/L	0 - 270

In reference to the above results, what process would the creatine kinase be reflective of and how would this affect the kidney?

Areas of weakness identified by examiners:

Few candidates seemed to have a structured approach and some were not familiar with dexmedetomidine and the recent trial data. No broad overview of sedation and analgesia agents with reference to the above patient considering the simplicity of the question. Many not familiar with dexmedetomidine pharmacology regardless of practical experience with the drug

VIVA 6

You are the Intensivist on call, working with a new ICU Registrar who is in the first year of Advanced Training. This is your first shift with this trainee but your colleagues have found him/her to be competent. A 72-year-old lady, Mrs May Brown, has been admitted following a Medical Emergency Team call to the ward. On arrival of the MET team, May was deemed to be close to respiratory arrest and she was intubated by the ICU Registrar. Intubation was followed by cardiac arrest. After 10 minutes of unsuccessful resuscitation, a senior nurse questioned the position of the endotracheal tube and it was discovered to be in the oesophagus. The tube was re-positioned correctly and after a further 10 minutes of resuscitation, return of spontaneous circulation was achieved and May was transferred to the ICU. She is currently requiring ventilation with Fi02 1.0, she is haemodynamically unstable on an adrenaline infusion at 1 mcg/kg/min and she has myoclonic jerks.

The ICU Registrar has been waiting for you to arrive to talk to you.

Areas of weakness identified by examiners:

This station was not well performed by the candidates.

- Candidates on the one hand were giving reassurance to the next of kin about likely patient recovery and in the next breath went on to discuss brain death and organ donation
- Lack of empathy on the part of some of the candidates was mentioned by the actors
- Few candidates expressed regret and sorry over the turn of events although things happened outside the ICU.

VIVA 7

Radiology station: 6 radiographs were shown including chest X-rays, and CT scans of head, chest and abdomen.

Areas of weakness identified by examiners:

- Failure to identifiy common pathologies
- Diagnosing PE on a CT chest where contrast had not been given.
- Candidates did not always use the information given to them about each Xray eg CT abdomen post rectal contrast
- Candidates did not recognise significant free intraperitoneal air on abdo CT.

VIVA 8

Procedure station was about management of an obstructed airway.

Areas of weakness identified by examiners:

- Inability to clearly describe anatomical relationships

HOT CASES

Royal Prince Alfred Hospital

1) A 76 year old man who presented with unstable angina and had an urgent CABG 4 days ago.

Bedisde findings were:

a) Sternotomy and saphenous venotomy scars
b) Raised A-a gradient
c) PAFC
d) Haemodynamic data
e) CVVHDF on citrate anticoagulation
f) High dose inotrope requirement

Current issues were:
a) vasodilatory shock
b) Discussion of hypoxia
c) ARF – causes and management

2) A 73 year old man with chronic bronchiectasis and a left lower lobectomy, admitted to ICU post lung biopsy for diagnosis of BOOP. Findings: clubbing, tracheal deviation to left, stony dullness, poor chest compliance. Issues for discussion: Septic shock, difficult to ventilate, poor nutrition, discussion of PFT

3) A 54 year old lady admitted following a collapse secondary to an intracranial bleed. Findings: Left hemiparesis, EVD, fluctutating sensorium, CT scan showing hydrocephalus. Discussion issues: Managmeent of hydrocephalus, EVD infection, respiratory wean

4) A 64 year old man with previous Parkinsoniian features following a traumatic brain injury admitted to ICU with decreased conscious level. Discussion topics: Parkinsoinian features, septic encephalopathy, prognostication, management of wean.

5) A 61 year old lady admitted following an MVA. Current issues: Traumatic brain injury, pelvic lumbar and LL fractures, renal impairment with single kidney, persistently low Hb, rising Na.

6) A 68 year old man who had been in ICU for about a week, admitted with septic shock. Past history of TB meningitis, and DM and SLE. Current issues: Septic shock, disseminated cryptococcal disease, ARF on CVVHDF, poor nutritional state, liposomal amphotericin

7) A 56 year old man admitted with sepsis, shock and encephalopathy in the setting of a recent diarrhoeal illness. Current issues: Findings of liver disease, decompensated chronic liver disease, encephalopathy, spontaneous bacterial peritonitis,

8) A 58 year old male admitted to ICU after aspiration in recovery post laparotomy. Current issues: Failed trial of ECMO wean, worsening lung infiltrates, barotraumas, multi organ failure and hypothermia.

9) A 50 year old man admitted with GI bleed. Current issues: Linton tube, signs of chronic liver disease, TIPS procedure.

St George Hospital

1) Head and face trauma age 62. Sub-dural haematoma. IVD/craniotomy
Poor waking. Not fit to extubate. Discussion of medium/long term plan including tracheostomy.

2) Community pneumonia + flu in a man with longstanding weakness due to polio. Multiple issues contributing to difficult wean – barrel chest, scoliosis, abdominal distension, bleeding tracheostomy, weak cough, pulmonary hypertension. Discussion of long term ventilatory support options.

3) Bilateral traumatic leg amputation + head injury following ingestion of illicit drug. Discussion of the causes and management of fever.

4) Post elective CAGS in an 83 year old man who had experienced early complications and slow progress. Ongoing inotrope requirement, marked oedema in the face of intravascular volume depletion. Significant sedation. Marked transaminitis. Candidates asked to outline a plan of management.

Prince of Wales hospital

1) 67 year old male ptresents with increasing shortness of breath and difficulty in swallowing. Issues for discussion: Respiratory assessment, discussion of findings of CREST syndrome, CXR (patchy pneumonitis), antibiotic and weaning management.

2) 65 year old male with T4 paraplegia following trauma. Issues for discussion: Respiratory management, weaning, nutrition, feeding, antibiotic therapy.

3) 65 year old obese patient with ischaemic heart disease presenting with urosepsis, shock and MODS. Issues for discussion: Managememnt of shock, nephrostomy, CRRT, inotrope therapy, weaning plan.

4) 81 year old male with OSA and CCF presents with respiratory failure. Issues for discussion: Management of heart failure, BIPAP, OSA, interpretation of CXR and ABG.

Royal North Shore Hospital

1) A 70 year old male with COPD, who has been unwell for a week with fever and became progressively weak 2 days ago. He is cyrrently intubated. Sedation has now been ceased and candidates asked to determine if he is suitable for extubation. Findings of C5/6 quadriparesis.

2) A young man 11 days post severe TBI making poort neurological progress. His family want a meeting to discuss withdrawal of care. Candidates asked to examine him and discuss how they would approach this case.

3) A 76 year old gentleman who had had cardiac surgery 3 weeks ago, has had a complicated post op course. Candidates asked to assess him and provide a plan of management.

4) A 43 year old lady with GBS, ongoing respiratory failure, and slow respiratory wean

5) A 40 year old man with TBI 3 months ago was sent to rehab unit where his tracheostomy was decannulated and developed severe respiratory distress resulting in a readmission. Candidates asked to examine his neurology and other a systemic examination and formulate a plan.

6) An 89 year old male post laparotomy for ischemic gut and candidates asked to assess suitability for extubation.

7) A 61 yr old male found unconscious after going on a "binge". He was admitted 5 days ago with intracerebral bleed and the neurosurgeons want to wake him up and extubate him. Candidates asked to assess suitability for extubation.

Areas of weaknesses identified by examiners

CNS examination:
Inability to perform a proper CNS examination
Not being able to state a clear GCS
Missing the presence of an EVD
Inability to summarise the neurology and formulate a management plan including a realistic view of the prognosis for discussion with the family.
Several candidates failed to identify UMN signs in the lower limbs including clonus, upgoing plantars and pathologically brisk reflexes.
When shown a CXR with bilateral infiltrates, inability to comment on the possibility of aspiration or sputum retention as possible cause of readmission
Failure to outline complications of quadriplegia
Poor CT interpretation

Respiratory:
Missed clear bronchial breathing
Poor interpretation of CXR
Inability to interpret pulmonary function tests
Inablity to state what the arterial PO2 should be for a given FiO2
No coherent approach to a failure to wean case
Candidates commented on tracheostomy decannulation without establishing clearly the presence of a cough reflex.

CVS:
Missing Grade 5 murmurs
Failure to examine neurology in a complicated post cardiac surgical patient

Abdomen:
Missing a large ascites

General:
Excessive exposure of patient when not required
Performing plantar reflexes when it is clearly painful to the patient
Poor discussion of differential diagnoses
Slow to get to the differential of hyponatraemia
Taking a long time to examine with little time for discussion.
Failure to identify multiplicity of problems
Lack of clear management plan
Lack of clear antibiotic plan
Candidates failed to clearly state how they would investigate new sepsis

Circulation:

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Panel of Examiners
Supervisors of Intensive Care Training
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