

## REPORT OF GENERAL FELLOWSHIP EXAMINATION

APRIL/MAY 2005

*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.*

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This was the first exam under the modified format. Specific changes introduced for this exam included two 2.5 hour written papers comprising of 15 ten-minute short answer questions each, which allowed inclusion of more written investigation type questions (previously included in the OSCE). Candidates were required to perform at a satisfactory level in the written before being eligible to sit the oral part of the exam. For the first time two cold cases were included in the OSCE, resulting this time in four interactive stations. This exam also saw the introduction of two independent hot cases, allocated 20 minutes each.

Thirty-four candidates presented for this examination. Nineteen were successful.

### **WRITTEN SECTIONS**

(Nineteen out of the thirty-one candidates required to sit the written passed this overall section.)

It is imperative that candidates answer the specific question asked. A structured, orderly response considering all aspects of management is required. Writing should be legible to allow candidates to gain optimal marks.

This guide below is meant to be an information resource and the views of a practising intensivist. It is not written under exam conditions and does not provide ideal answers, but it does include the type of material that should be included in a good answer. Some references of interest are also provided.

Comments documented about performance in the written sections suggested common problems encountered related to factual knowledge, ability to recognize clinically significant issues, ability to prioritise, and exam technique.

The following "Glossary of terms" was provided for the candidates

<b>Critically evaluate:</b>	Evaluate the evidence available to support the hypothesis.
<b>Outline:</b>	Provide a summary of the important points.
<b>List:</b>	Provide a list.
<b>Compare and contrast:</b>	Provide a description of similarities and differences, (eg. Table form).

## **Short Answer Question Paper 1**

1. *List the problems associated with massive transfusion in the critically ill. Outline your principles of management for each.*

Massive transfusion (eg. replacement of more than 50% of blood volume in 12 to 24 hours, or one circulation blood volume in 24 hrs [T Oh]) is associated with many potential problems which are related to a number of factors including the volume of resuscitation, factors related to the storage blood, and many other related issues. Problems include:

- Volume overload (careful monitoring of filling pressure, response to volume, diuresis)
- Over-transfusion (monitor Hb regularly, titrate according to needs)
- Hypothermia (use of fluid warmers and general measures to minimise heat loss)
- Dilutional coagulopathy of both clotting factors and platelets (regular and early monitoring of coagulation, and involvement of haematology for replacement therapy [better than according to protocol])
- Transfusion related lung injury (consider use of filters, leukodepletion)
- Excessive citrate causing metabolic alkalosis and hypocalcemia (monitor pH and ionised calcium, replace calcium as necessary)
- Hyperkalaemia (use of “younger” blood, monitor regularly, may require specific therapy)
- Disease transmission (use of products on as needed basis only, standard blood banking precautions)
- Distractions resulting in not controlling source of haemorrhage, and risks of hurried cross-checking and incompatibility (allocation of sufficient resources and personnel, standard programs in place to facilitate process and anticipate needs)
- Other problems include loss of identity (cross matching issues, loss of baseline haematological information etc.)

Twenty-two out of thirty-one candidates passed this question.

2. *Critically evaluate the role of EEG and Evoked Potentials in the critically ill.*

The Electro-EncephaloGram is the recording of brain electrical activity from standard sites on the scalp. It is commonly used in ICU to evaluate patients with abnormal movements or neurological impairment. Studies have not been directed at the use or not of EEGs and their effect on outcome except for prognostication (eg. after cardiac arrests). The EEG is useful to distinguish between potential causes of encephalopathy (eg. metabolic or drug induced) and to establish the presence of and guide therapy for potential epileptiform activity (eg. generalised or focal). More recent applications include prognostication (eg. after cardiac arrests) where it still has significant limitations regarding sensitivity and specificity. The more widespread and successful use of BiSpectral monitoring in anaesthesia to limit the incidence of awareness in high risk patients (“B-Aware” Myles Lancet 2004), may have relevance for some components of ICU practice.

Somato-Sensory Evoked Potentials (SSEP) are the averaged electrical responses in the CNS to somatic stimulation (usually from median nerve at the wrist, or nerves in the leg). The predominant use in Intensive Care has been to evaluate patients after cerebral hypoxic insult (eg cardiac arrest). In this setting median nerve SSEPs (eg. Bilateral absence of the N20 component) have been used in normothermic patients, comatose for at least 72 hours after cardiac arrest, to predict poor outcome with 100% specificity (see metanalysis: Zandbergen Lancet 1998).

Nine out of thirty-one candidates passed this question.

3. ***Outline the anatomical structures relevant to the insertion of a femoral venous catheter.***

The femoral vein lies in the intermediate compartment of the femoral sheath. It is usually accessed just inferior to the inguinal ligament. The inguinal ligament can be defined by the surface anatomy of a line between the pubic tubercle and the anterior superior iliac spine. The mid point of the inguinal ligament is the site of the internal ring. A needle inserted through the skin will pass through subcutaneous tissue, and the fascia of the femoral sheath before entering the femoral vein. Posterior to the femoral vein is the posterior fascia of the femoral sheath, and the pectineus. Lateral to the femoral vein is the fibrous septum separating the intermediate compartment of the femoral sheath from the lateral compartment (containing the femoral artery). Further lateral to this is the femoral nerve. Medial to the femoral vein is the medial compartment of the femoral sheath (femoral canal), which contains lymph vessels, nodes and fatty tissue.

Eighteen out of thirty one candidates passed this question.

4. ***Critically evaluate the risks versus benefits for the monitoring of Intra-Cranial Pressure in a patient with a closed head injury.***

The benefits of monitoring ICP in closed head injury are still debated. Standard guidelines have been published but no prospective studies have demonstrated clear outcome benefits. The main purpose of monitoring the ICP is to allow the clinician to either guide therapy (add or remove) based on the ICP or CPP, or to alert the clinician to changes which may require further investigation. The lowest risk patients are least likely to benefit, so most criteria are based on a combination of patient characteristics and CT abnormalities.

Some risks (eg. haemorrhage) are related to insertion, and others (especially infection) are more likely with longer times in situ. Additional risks are associated with incorrect readings (abnormally high or low leading to the risk inappropriate/un-necessary interventions or investigations. Risks (and additional benefits) associated with ICP monitoring are largely dependent on the type of monitoring device.

Intraventricular catheters are more difficult to place, and are associated with a higher risk of haemorrhage during insertion, and subsequent infection (which increases in incidence with longer time in situ). These catheters have the additional advantage of being able to drain CSF (potentially therapeutic) and sample CSF (monitoring for infection and bleeding).

Intraparenchymal devices (eg. fiberoptic Camino system) are easier to insert and are associated with a lower risk of haemorrhage and infection. Unfortunately, the transducer cannot be recalibrated, so reliability becomes a problem.

Less commonly used devices include: subarachnoid bolts which often clog with debris, and epidural catheters which are often inaccurate.

Nineteen out of thirty-one candidates passed this question.

5. ***Critically evaluate the role of plasmapheresis in Intensive Care patients.***

Plasmapheresis is used for a wide variety of conditions but predominantly immunologic, neurologic or haemopoietic diseases. It is used to remove large molecules unable to be removed by less expensive techniques (eg. autoantibodies, immune complexes etc.), that are thought sufficiently toxic to require immediate removal. Replacement for plasma removal is either using large volumes of plasma (eg. especially in Thrombotic Thrombocytopenic Purpura [TTP]) and/or albumin. Plasmapheresis is associated with a variety of potential problems including those related to the procedure (eg. hypotension, dyspnoea, dilutional coagulopathy, immuno-suppression and infection), the replacement fluid (eg. hypocalcaemia, metabolic alkalosis), and the access catheters (eg. mechanical and infective).

Adverse reactions are more common using plasma as a replacement fluid (including paraesthesia, muscle cramps, and allergic reactions). These risks must be balanced against any potential/purported advantages.

The American Association of Blood Banks (AABB) and the American Society For Apheresis have published acceptable evidence based indications (Smith Transfusion 2003). Category I indications are defined as “conditions where plasmapheresis is standard and acceptable, either as primary therapy or as a first-line adjunct to other initial therapies. Efficacy is based on controlled or well-designed clinical trials or a broad base of published experience”. Relevant Category one conditions in ICU include: Guillain-Barre and Acute and chronic inflammatory demyelinating polyradiculoneuropathy, Anti-GBM disease (Goodpasture’s syndrome), TTP and post-transfusion purpura.

Fifteen out of thirty-one candidates passed this question.

**6. *Critically evaluate the role of cardioversion in Intensive Care practice.***

Cardioversion is the delivery of energy that is synchronised with the QRS complex in an attempt to revert an abnormal rhythm. Defibrillation is the non-synchronised (ie. random) delivery of energy and is used in unstable rhythms (eg. pulseless VT or VF).

The potential benefits (correction of the underlying rhythm) need to be balanced against the potential risks, especially in the critically ill, and should not be undertaken lightly.

Success rates vary with the characteristics of the underlying rhythm (highest in SVT and atrial flutter, and lower in AF [inversely related to left atrial size, duration of AF, and precipitating cause still being present {eg. hyperadrenergic state secondary to sepsis}]), and the energy delivered (often deliver 150 to 200J biphasic, lower with atrial flutter). Potential risks include:

- Failure of cardioversion (insufficient energy delivered, technical factors, misdiagnosis of rhythm [eg. sinus tachycardia!])
- Requirement for some degree of sedation and analgesia; potential for awareness
- Hypotension
- Myocardial damage (ST changes and myocardial dysfunction usually short term; minimal elevation in troponins)
- Arrhythmias (eg. SVT, non-sustained VT, rarely more malignant [more likely if digoxin toxic and hypokalaemic])
- Conduction abnormalities (bradycardia, and heart block common; occasionally needing temporary pacing)
- Embolisation (especially if AF present > 48 hrs and not anticoagulated; strategy may include TOE)
- Damage to permanent pacemaker (if not careful with electrode placement)
- Others include pulmonary oedema, skin burns and risk of sparking/fire.

Nine out of thirty-one candidates passed this question.

**7. *Compare and contrast the pharmacology of adrenaline, dopamine and dobutamine when used by infusion for the treatment of septic shock.***

No human clinical trials have demonstrated any benefit to any particular vasoactive drug or combination in sepsis.

Adrenaline: endogenous adrenergic agonist, opaque ampoule (usually 1:1000 solution), administered diluted as infusion, rapidly inactivated by liver (Catechol O-Methyl Transferase and Mono-Amine Oxidase), duration of action minutes, activates alpha-1,

alpha-2, beta-1 and beta-2 receptors. Causes initial dose dependent increase in heart rate, cardiac output. Blood pressure may not increase initially (beta-2 effects: smooth muscle vasodilatation, but also propensity for hypokalaemia, hypophosphataemia, hyperglycemia and increased lactate). In higher doses vasoconstriction predominates. May cause pulmonary arterial vasoconstriction. Dose range is unit dependant (eg. 1-30 microgram/min [0.01-0.5 microgram/kg/min]). Caution with MOA inhibitors. Central venous access for safety.

Dopamine: endogenous adrenergic agonist, ampoule 200mg/5 mL (with meta-bisulfite), administered diluted as infusion, rapidly inactivated by liver (Catechol O-Methyl Transferase and Mono-Amine Oxidase), duration of action < 10 minutes. At increasing dose range activates dopaminergic receptors (0.5 – 2 microgram/kg/min)(dopa-1 = splanchnic vasodilatation and diuresis), beta-1 receptors (2-10 microgram/kg/min: increased heart rate, cardiac output), and finally alpha receptor activation (>10 microgram/kg/min: vasoconstriction, blood pressure elevation). Indirect action also via release of noradrenaline. May cause pulmonary arterial vasoconstriction and interacts with pituitary hormone release. Caution with MAO inhibitors and phenytoin (hypotension, bradycardia). Central venous access required for safety.

Dobutamine: exogenous adrenergic agonist compound resembling dopamine. Ampoule 250mg/20 mL (with meta-bisulfite) containing racemic mixture of levo and dextro enantiomers, administered diluted as infusion, rapidly inactivated (methylated and conjugated), with duration of action minutes. Levo: alpha-1 agonist (pressor effect), with modest beta-2 effects. Dextro: beta-1 and beta-2 agonist with alpha-1 blocking activity. Combination of effects complex, but usually inotropic with some vasodilatation (ie. blood pressure may fall, and in sepsis commonly requires an additional vasoconstrictor eg. noradrenaline); pulmonary arterial vasodilatation rather than vasoconstriction. Dose range 2.5 to 40 microgram/kg/min. Overall vasodilation means can be administered safely via a peripheral vein.

Thirteen out of thirty-one candidates passed this question.

8. ***List the causes of a sudden acute fall in systolic blood pressure to 50 mmHg one hour after an uneventful coronary artery bypass operation. Outline your principles of management for each cause.***

Potential causes are many, and more than one may co-exist. Could be divided according to causes of shock: artefactual, hypovolaemic, obstructive, cardiogenic, and distributive (with principles of management in brackets). Simple manoeuvres should be considered early (eg. raise legs to autotransfuse).

Artefactual: transducer error (check transducer: zero, level, calibration), damping of waveform (assess damping coefficient), malfunction of NIBP.

Hypovolaemic: blood loss (observe drain tubes, CXR, dressings; give fluid ± blood products), massive diuresis (observe urine output; give fluid).

Obstructive: pericardial tamponade (observe chest drainage ± clots, high filling pressures: may need to open chest), tension pneumothorax (observe expanded hemi-thorax, listen to chest: check existing chest drains, may need needle thoracostomy and replace/insert ICC), elevated intrathoracic pressure (gas trapping: disconnect from ventilator; shivering/valsalva/fighting: sedate ± paralyse; ensure ETT not blocked).

Myocardial: decreased contractility (ischaemia due to blockage/kinking/spasm: treat with GTN, inotropes &/or short term vasoconstrictor ± fix technical problem; sudden removal of inotropic drug: restart drug) or rhythm disturbance on monitor/ECG (brady-asystole: pace ± atropine/isoprenaline/adrenaline; SVT: eg. K/adenosine; AF eg. K/Mg/amiodarone, VT eg. K/Mg/lignocaine).

Distributive: anaphylaxis (rash/bronchospasm: remove hapten, adrenaline, fluids); vasodilator excess (recent boluses/infusion too high: stop responsible drug, ± titrated dose

vasoconstrictor); sympathetic block (recent bolus epidural LA: titrated dose vasoconstrictor).

Twenty-five out of thirty-one candidates passed this question.

**9. *List the clinical features associated with Systemic Lupus Erythematosus, and outline how they would influence your management of a patient in Intensive Care.***

SLE is a chronic inflammatory disease, presumably auto-immune, which occurs predominantly in women, and can affect almost all organ systems. These can masquerade as many different conditions, and can make workup very complex. Clinical features (and examples of ways they would influence management) include:

- Fatigue (common and debilitating)- care with differential diagnosis
- Fever (episodic and related to activity of disease)- need to exclude sepsis, potential for un-necessary antibiotics
- Arthritis (painful, migratory and asymmetrical; rarely deforming)- care with positioning, may need analgesia
- Skin changes (butterfly rash, and hair loss)- care with handling
- Raynaud's phenomenon- caution with vasoconstrictors, pulse oximeters, arterial lines
- Renal dysfunction (usually glomerulonephritis)- avoid nephrotoxins, adjust drug doses
- Pleurisy and pleural effusions- need to diagnose, exclude other conditions
- Pericarditis and Libman-Sacks (verruccous) endocarditis- may require TOE or surgery
- Increased incidence of coronary artery disease- need to be aware of problem in otherwise young females without risk factors!
- Delirium, psychosis and seizures- complex management and diagnostic problem
- Thrombosis in association with anti-phospholipid antibodies- need to diagnose, and may need treatment for pro-coagulant state
- Abnormal haematology (leukopenia, anaemia, thrombocytopenia)- may need further investigation
- Lymphadenopathy and splenomegaly- may make suspicious of alternative disease process; may need further investigation
- Auto-immune disease and immunosuppressive therapy (eg. corticosteroids, cyclophosphamide)- at particular risk of infections in immunosuppressed. Early and aggressive workup and initial treatment may be required. Aware of potential for adrenal suppression.

Twenty-five out of thirty-one candidates passed this question.

**10. *Outline the diagnostic features of Toxic Epidermal Necrolysis and list the likely causes in patients in Intensive Care.***

TEN is condition involving rapid progression of erythems and extensive (usually > 30% epidermis involved) epidermal necrolysis. It overlaps with the Stevens-Johnson syndrome, and has a high mortality rate (up to 44%!). Early dermatological consultation is important. Diagnostic features include:

- Skin eruption that begins 1-3 weeks after starting a suspicious drug
- A prodrome of fever and flu-like symptoms, 1-3 days before eruption

- Poorly defined macules with purpuric centres that coalesce to form blisters, and then epidermal detachment (involving > 30% epidermis)
- Symmetrical, primarily over face and upper trunk
- Burning or painful lesions (with complications similar to extensive thermal burns)
- Mucosal involvement in 90% (eg. conjunctiva, mouth, oesophagus, genital)
- Pulmonary complications can occur (eg. excessive-secretions, sloughing of bronchial epithelium, BOOP)

Most cases are drug induced, few are idiosyncratic. The commonest drugs to be implicated are: sulphonamides antibiotics, aminopenicillins, quinolones, cephalosporins, carbamazepine, phenobarbital, phenytoin, valproic acid, NSAIDs, allopurinol and corticosteroids! TEN is more common in patients with SLE and HIV.

Four out of thirty-one candidates passed this question.

**11. *Outline the circulatory and respiratory changes that occur after birth.***

The transfer from the fetal to the neonatal state is complex. There is a close relationship between the simultaneously occurring cardiovascular and respiratory changes. Closure of umbilical vessels results in an increase in peripheral resistance and blood pressure. Respiratory centre activation (clamping of umbilical vessels, and cold) results in expansion of previously collapsed lungs. The resultant dramatic decrease in pulmonary vascular resistance increases blood flow through the lungs, and increases return to the left atrium. This, plus the reduced return to the right atrium (clamped umbilical vein) and the increased resistance to left ventricular outflow reverse the pressure gradient across the atria (closing the valve over the foramen ovale. The fall in pulmonary artery pressure (decreased PVR) and the increased aortic pressure results in flow reversal through the ductus arteriosus. Constriction and closure of the ductus arteriosus appears to be initiated by the high arterial oxygen tension which is now in the aortic blood. The neonate is still at risk of reversion to a foetal circulation early after birth, especially in the presence of physiological stresses and congenital abnormalities.

Twenty out of thirty-one candidates passed this question.

**12. *Critically evaluate the role of the Medical Emergency Team.***

Medical Emergency Teams in various formats have been used to manage in-hospital emergencies for over a decade. Despite this, only limited data is available for an evidence-based review. One very large prospective randomised (by hospital) study (MERIT) has been performed but its results have not been published. Various lower levels of evidence are available (eg. before and after intervention studies Goldhill 1999, Buist 2002, Bellomo 2003) and some of these have shown improvements in a number of outcomes (including cardiac arrest rates and improved survival, and length of ICU stay following cardiac arrest). Other studies have also demonstrated trends to improvement in overall mortality and unplanned ICU admissions (Bristow 2000, Kenward 2004). Potential problems associated with implementation include cost (staff, equipment), diversion of staff from other roles, and obvious requirement for appropriate educational strategies.

Eighteen out of thirty one candidates passed this question.

13. *For each of the following terms, provide a definition, outline their derivation and outline their role: Sensitivity, Specificity, Positive Predictive Value, and Negative Predictive Value.*

Test	Disease Present	Disease Absent	
Positive	A	B	A+B
Negative	C	D	C+D
	A+C	B+D	A+B + C+D

Using the presence or absence of a disease, and the result a specific test as an example:

Sensitivity = proportion of patients with disease detected by positive test =  $A/(A+C)$ . Very high values essential if wish to catch all with disease, and allow a negative result to virtually rule out the diagnosis.

Specificity = proportion of patients without disease detected by negative test =  $D/(B+D)$ . Very high values of specificity essential if wish to catch all without the disease, and allow a positive result to rule in the diagnosis.

Positive predictive value = proportion of patients with positive test who have disease =  $A/(A+B)$ . PPV allows estimate of certainty around positive result.

Negative predictive value = proportion of patients with negative test who do not have disease =  $D/(C+D)$ . NPV allows estimate of certainty about a negative result.

Twenty-eight out of thirty-one candidates passed this question.

14. *Outline your approach to the diagnosis and management of severe hyponatraemia.*

Severe hyponatraemia implies either a very low level (eg.  $< 120$  mmol/L) or one associated with significant symptoms (eg. neurologic). Approach should allow determination of aetiology by history, examination and simple investigations (and/or repetition of test). An approach involves measurement of plasma osmolality, urine osmolality and urine sodium concentration. Causes are multiple, and include:

Factitious: contaminated by hypotonic intravenous fluid

Isotonic: pseudohyponatraemia (eg. hyperlipidaemia, hyperproteinaemia)

Hypertonic: (eg. hyperglycaemia, mannitol) where hypertonicity induces movement of water out of cells, and lowers Na by dilution. No specific treatment is usually required.

Hypotonic:

- Water retention: (urinary Na is usually  $> 40$  mmol/L) SIADH, inappropriate antidiuresis (eg. hypovolaemia, cardiac failure, pain, post-operative, renal failure), psychogenic polydipsia
- Salt depletion: (urinary Na is low, eg.  $< 20$  mmol/L) adrenocortical failure, diuretic excess

Management includes diagnosis and, if appropriate, specific treatment of underlying cause. Most patients are asymptomatic, with plasma Na  $> 120$ .

Initial treatment obviously depends on the specific cause (eg. corticosteroids), but water restriction and isotonic saline is usually sufficient. More aggressive therapy (eg. hypertonic saline) is indicated if Na  $< 110$ , or if patient is symptomatic (eg. confusion, coma, seizures). Relationship of rate of correction of Na and risk of osmotic demyelination (central pontine myelinolysis) is controversial, but appears reduced if rate of correction of Na is less than 10-12 mmol/L over the initial 24 hours (ie.  $< 0.5$  mmol/hr). Desmopressin (dDAVP) may be required to slow the rate of water excretion. Consider even administration of sterile water to lower sodium if rising too quickly.

Twenty-six out of thirty-one candidates passed this question.



**15. *Compare and contrast the advantages and disadvantages of humidification of a ventilator circuit using a wet circuit versus a Heat and Moisture Exchanger.***

Wet ventilator circuits require power for heating, a chamber for water to be heated, and temperature sensors to feedback appropriate temperature within chamber and ideally to within circuit. Benefits include potential for optimal efficiency (under all circumstances), reliability, ability to warm patient, and proven track record of safety. Disadvantages include potential for condensation (rain-out) with excessive (potentially hot) fluid delivery to airways, microbiological colonisation, lack of transportability, and increased cost.

Heat and moisture exchangers come in a variety of types (with more emphasis on humidification and/or microbiological filter). Benefits include ease of use (including during transport), lower staff workload, lower costs and potential for decreased ventilator associated pneumonia [Kola, Intensive Care Med (2005) 31:5-11]. Disadvantages include inability to use with all patients (eg. those haemoptysis, tenacious secretions, increased airway resistance, ARDS), problems with increased dead space and resistive load, and potential for airway occlusion.

Twenty-five out of thirty-one candidates passed this question.

## **Short Answer Question Paper 2**

**16. *Compare and contrast the advantages and disadvantages of coiling versus clipping of cerebral aneurysms after Sub-Arachnoid Haemorrhage.***

Recent published experience demonstrates that there are some significant potential benefits associated with coiling of cerebral aneurysms. These include decreased costs, no need for craniotomy and associated neuroanaesthetic, and increased independent survival ("ISAT" Lancet 2002; 360:1267-74). Other potential advantages include no need for temporary clipping. Major disadvantages include the need for a skilled operator, the fact that technique is not suitable for all aneurysms, requirement for anticoagulation, and inability to deal with major complications. A neurosurgical procedure may still be required if complications ensue.

Clipping has a long track record with clearly defined risks, with no evidence of increased mortality. Most aneurysms are amenable to clipping, though in some regions (eg. posterior fossa), because of accessibility, coiling is considered the procedure of choice. Disadvantages of surgical clipping include need for a skilled operator, a craniotomy and neuroanaesthesia, and potentially increased costs.

Both techniques require some degree of sedation/paralysis, and subsequent neuro-Intensive care with close monitoring and re-evaluation for complications. Either technique may be quite prolonged.

Twenty-one out of thirty-one candidates passed this question.

**17. *Outline your approach to determining the appropriate magnitude of respiratory compensation for a metabolic acidosis and a metabolic alkalosis.***

The extent of respiratory compensation for a metabolic disorder is determined by the balance between the abnormality in the pH (hence the drive to change), and how hard it is to get there (eg. work of respiratory muscles in hyperventilation). A knowledge of the expected degree of compensation for a given acid base status is necessary to determine the presence of an additional respiratory disorder. Two traditional methods have been used: use of formulae, and the use of a standardized diagram.

The direction of change in the CO<sub>2</sub> should be to normalise the pH for the underlying disorder. A normal pH indicates an additional process is present. The commonest relevant formulae to estimate the PaCO<sub>2</sub> in use are:

For a metabolic acidosis, the expected PaCO<sub>2</sub> = the last two digits of the pH (+/- 2-5 mmHg; from pH 7.1 to 7.6; Narins 1980), or the expected PaCO<sub>2</sub> = (1.5 X measured bicarbonate) + 8 (+/- 2). The measured bicarbonate, not the standard bicarbonate, must be used. Other approaches include: expected change in PaCO<sub>2</sub> = Standard Base Excess (Schlichtig R et al Crit Care Med 1998); 1.2 mmHg fall in PaCO<sub>2</sub> for each 1 mmol/L reduction in HCO<sub>3</sub>.

For a metabolic alkalosis, the same equation is used, though the reliability may be less than with a metabolic acidosis. Expected PaCO<sub>2</sub> = the last two digits of the pH (+/- 2-5; from pH 7.1 to 7.6). Other approaches: change in PaCO<sub>2</sub> = 0.6 X Standard Base Excess (Schlichtig R et al Crit Care Med 1998); 0.7 mmHg rise in PaCO<sub>2</sub> for each 1 mmol/L increase in HCO<sub>3</sub>.

Eighteen out of thirty-one candidates passed this question.

**18. *List the ways in which the paediatric airway differs from the adult airway. Outline how these influence your management.***

Anatomic paediatric airways offer significant potential challenges to the critical care practitioner. Factors to consider include:

- Absolute size of airway (including trachea), small mandible, large tongue (use of chart, formula [age/4 + 4 mm if > 1 yr] or Braselow measurement tape to allow sizing of ETT, and depth estimates essential [age/2 + 12 cm from lower lip]; often need smaller blade [narrower, shorter]; concern about tracheostomy)
- Large head (neck already flexed, not need pillow or as much head extension for intubation and airway management)
- Epiglottis long and stiff and may obscure view (may need to include epiglottis under laryngoscope blade, or consider using straight blade)
- Larynx high, anterior and the narrowest point is usually the laryngeal outlet/cricoid cartilage (often use uncuffed tubes, increased concern about laryngeal stenosis)

Other specific management concerns related to the small size of the artificial airways include: importance of fixation (ease of dislodgement), increased likelihood of blockage, circuit/mechanics to minimise work of breathing.

Twenty-six out of thirty-one candidates passed this question.

**19. *When a patient is fed parenterally after a period of starvation certain metabolic problems can occur. Please list these problems, and outline your principles of management for each.***

The refeeding syndrome is associated with a number of metabolic problems, which in general can be diminished by the gradual introduction of nutrients (eg. limit to 20 kcals/kg for first day), anticipation and pre-emptive replacement, and the careful monitoring of the patient. These changes are more likely to occur in the severely malnourished or those who have had a rapid weight loss. They can occur with both enteral and parenteral feeding.

Associated problems include:

- Hypophosphatemia (which may be severe and associated with impaired myocardial function, weakness, rhabdomyolysis and even seizures), which is treated by replacement, but may be prevented to some degree by additional pre-emptive phosphate replacement
- Hypokalaemia and hypomagnesemia (which can lead to weakness, and arrhythmias) require monitoring and replacement
- Thiamine deficiency (which may result in Wernicke's encephalopathy) requiring thiamine replacement in anticipation or treatment
- Fluid overload and cardiac failure (multifactorial), avoiding with careful monitoring and replacement

Twenty-two out of thirty-one candidates passed this question.

**20. *Compare and contrast the advantages and disadvantages of Transoesophageal Echocardiography, Angiography, and CT Angiography for the diagnosis of aortic injuries.***

The major aortic injury is traumatic aortic rupture. This usually occurs at the aortic isthmus, between the left subclavian and the first intercostals arteries, where a few cm only of subadventitial rupture may be seen, with an associated intraluminal flap. Other potential injuries include intimal tears, mural thrombi and aortic dissection.

All of the techniques have potential practical limitations, as they all require expert practitioners to perform, and a degree of sedation/anaesthesia. No comparative studies have evaluated management based on a particular technique. Choice will usually depend on local expertise!

The definitive test (gold standard) is still direct angiography (aortography). It requires catheter placement into the proximal aorta, and has problems associated with arterial access (eg. femoral) and arterial dye injection, but it provides better anatomical details for some areas (eg. aortic arch, brachiocephalic arteries and distal arteries).

CT angiography (usually high resolution, contrast enhanced spiral CT) has the advantages of providing other anatomical information, is more widely available, can be performed at short notice with rapid results (in trauma centres) and can be performed as part of workup for other injuries (eg. patient has other indications for chest CT). It still requires IV contrast injection, transport to CT scan, immobilisation and expert interpretation.

Trans-Oesophageal Echocardiography is becoming more accessible at short notice as more practitioners are trained in its use. Limitations include availability of expert practitioner (and equipment), requirement for sedation (+/- airway protection) and need for oesophageal placement of scope (in patient with unknown cervical spine status). Artefacts may limit diagnostic accuracy (including atherosclerotic change). Advantages include portability of procedure, rapid results with good sensitivity and specificity (comparable to spiral CT), and the ability to assess other cardiac and aortic structures (eg. in the presence of aortic dissection).

Twenty-three out of thirty-one candidates passed this question.

**21. *Outline your approach to the initial and subsequent management of the cervical spine after major trauma.***

Management of patients with potential cervical spine injuries is still controversial, despite a number of major groups attempting to provide evidence based guidelines (eg. ATLS,

Eastern Association for the Surgery of Trauma). Delayed clearance of the cervical spine can result in many potential problems, related to requirements for immobilisation as well as the cervical collar (eg. pressure areas, airway access, delayed mobilisation etc.). Candidates often failed to discuss the “subsequent management” component.

Patients with major trauma are at increased risk of having associated spinal injuries (including those related to the cervical spine). All patients should be treated as if they have cervical spine injuries (ie. appropriately immobilised) until further information is available. The conscious patient without distractors can be assessed and managed clinically (National Emergency X-radiography Utilization Study, Hoffman NEJM 2000), but the scenario usually seen in ICU is one where one or more pre-conditions for clinical clearance are not met (eg. distracting injuries, or presence of intoxicants). In this scenario the usual recommendation is three view cervical spine radiographs (AP, lateral and open mouth view) supplemented by high resolution CT (especially directed to suspicious areas). Debate still surrounds the need for lateral fluoroscopic flexion/extension to decrease the injuries missed by plain films and CT (EAST J Trauma 1998, www.east.org, Morris BMJ 2004). Routine MRI is problematic because of ferromagnetic compatibility.

Fifteen out of thirty-one candidates passed this question.

**22. *Outline the role of the Laryngeal Mask Airway in the critically ill patient.***

The Laryngeal Mask Airway has a number of potential roles in the ICU:

- Most important role is as part of the difficult airway algorithm (use to ventilate when cannot intubate; easily taught, good success rate, buys time)
- Can be used as a conduit for bronchoscopy and/or intubation in a patient who is difficult to intubate
- Could be considered as part of cardiac arrest management as an alternative in establishing airway and ventilation by practitioners not expert in the use of the endotracheal tube
- Can be used to maintain airway and ventilation during the performance of a percutaneous tracheotomy
- As an alternative airway during procedures in the ICU

Other variations have been developed (including the intubating laryngeal mask, which is one of the techniques that could be used for the patient who is difficult to intubate).

Twenty-four out of thirty-one candidates passed this question.

**23. *Critically evaluate the role of glucose control in the critically ill.***

Routine ICU management includes the control of glucose to avoid the potential complications of hypoglycemia (arrhythmias, cardiac events, neurological deficits) and hyperglycemia (especially infections, eg. documented using retrospective controls). Traditional goals have varied, but have in general been fairly broad (eg. glucose < 10-15 mmol/L). Prospective randomised trials to guide therapy have been lacking until the last decade.

The potential role for tight glucose control in critically ill patients has been suggested in two main patient groups: acute myocardial infarction in diabetics, and the surgical ICU.

The DIGAMI study demonstrated that an insulin-glucose infusion followed by a multidose insulin regimen improved one year mortality in diabetic patients with acute myocardial infarction (Malmberg JACC 1995).

Much more interest, and significant debate, was generated by the study by Van den Berghe (NEJM 2001). It demonstrated in a surgical intensive care population (enrolling 1548 patients) that tight glucose control using intensive insulin therapy reduced mortality during intensive care from 8.0 percent with conventional treatment (10 – 11.1 mmol/L) to 4.6 percent (4.5 - 6.5 mmol/L) (NNT = 29; P<0.04, with adjustment for sequential analyses) and “also reduced overall in-hospital mortality by 34 percent, bloodstream infections by 46 percent, acute renal failure requiring dialysis or hemofiltration by 41 percent, the median number of red-cell transfusions by 50 percent, and critical-illness polyneuropathy by 44 percent, and patients receiving intensive therapy were less likely to require prolonged mechanical ventilation and intensive care”. This was apparently due to glucose control and not insulin dose, but the study could not properly blind the treating physicians, and there are problems in extrapolating this to the general Intensive care population, and further studies are underway.

Nineteen out of thirty-one candidates passed this question.

24. ***For each of the following terms related to pressure monitoring, provide a definition and outline their role: zeroing, levelling, and calibration.***

**Zeroing:** is a process which confirms that atmospheric pressure results in a zero reading by the measurement system. Intermittent confirmation ensures the absence of baseline drift (relatively common with disposable transducers), where atmospheric pressure no longer reads zero, resulting in aberrant results.

**Levelling (or establishing the “zero reference point”):** is a process which determines the position on the patient you wish to be considered to be your zero. Transducers are placed at a point level with this point (often utilising fluid filled tubing). Usually this is chosen as the midaxillary line (in a supine patient) or it could be the phlebostatic axis. Significant errors in measurement may occur if readings using different zero reference points are used (eg. Cerebral Perfusion Pressure).

**Calibration:** is a process of adjusting the output of a device to match a known input value. Verification of calibration requires using a gold standard (eg. mercury or water manometer), and usually a simple two-step procedure (eg. confirming that zero = zero and 100mmHg = 100mmHg), which assesses linearity of the system. The calibration of disposable transducers is preset, and cannot be altered.

Fifteen out of thirty-one candidates passed this question.

25. ***A 68 yr old critically ill man with pulmonary infiltrates has the following haematology results.***

<b><i>Haemoglobin</i></b>	<b><i>79</i></b>	<b><i>(130-170 g/L)</i></b>
<b><i>Mean Corpuscular Volume</i></b>	<b><i>83.8</i></b>	<b><i>(80-96 fL)</i></b>
<b><i>White Cell Count</i></b>	<b><i>1.5</i></b>	<b><i>(4.0-11.0 x10<sup>9</sup>/L)</i></b>
<b><i>Platelets</i></b>	<b><i>47</i></b>	<b><i>(140-400x10<sup>12</sup>/L)</i></b>

***What is the haematological diagnosis? List three potential causes of the haematological abnormalities? Outline what relevant information could be obtained from a bone marrow biopsy in this case.***

The haematologic term is pancytopenia (sometimes called “aplastic anaemia”, but this subset really requires demonstration of an empty bone marrow).

Potential causes include aplastic anaemia (eg. external radiation, drugs [eg. chloramphenicol, sulphonamides etc.], toxins [eg. benzene]), replacement of marrow (eg. with malignant cells), megaloblastic hematopoiesis, myelodysplastic syndrome, and overwhelming infections.

Bone marrow biopsy would confirm diagnosis and allow therapy to be targeted. It would assess marrow cellularity, identify normality or otherwise of haematopoietic cells (eg. megaloblastic change), demonstrate infiltration or fibrosis, or macrophages engorged with haematopoietic cells (viral hemophagocytic syndrome).

Twenty-five out of thirty-one candidates passed this question.

**26. *Outline your approach to palliative care in the dying intensive care patient.***

This is a common scenario in the care of the critically ill. The usual ethical principles need to be considered:

- Autonomy (patient's right to choose or refuse therapies),
- Beneficence (obligation to further the patient's interests),
- Nonmaleficence (not inflict evil or harm, including refraining from interventions which are more likely to be of harm than benefit), and
- Justice (social justice, including fair allocation of societal resources).

The key premise is one of full disclosure regarding medical condition, understanding of patient's wishes (direct or via appropriate surrogate), and a collaborative plan of management which clearly outlines priorities (eg. relief of pain and suffering versus prolongation of life at all costs) and plans regarding interventions (eg. analgesic medications, removal of ETT, not for futile procedures or therapies [eg. CPR]).

One proposed tool is the PEACE tool, which considers:

- Physical symptoms (including pain, nausea, other side effects)
- Emotive and cognitive symptoms (including anxiety)
- Autonomy (sense of control and participation in decision making)
- Closure of life affairs (spend time with family, others to visit etc.)
- Economic (assistance, arrangements, insurance etc) and existential issues (eg. religious and spiritual)

Conflict resolution is essential, and is usually prevented by adequate communication with patient and families involving complete and open discussion, but on occasions may require external input (eg. external specialist, courts etc)

Fifteen out of thirty-one candidates passed this question.

**27. *Critically evaluate the role of open lung biopsy in the critically ill patient with a diffuse infiltrate on chest radiograph.***

There are a myriad of potential causes of a diffuse infiltrate. These include high pressure pulmonary oedema, low pressure pulmonary oedema, diffuse pneumonia, malignancy (eg. lung, haemopoietic), pulmonary haemorrhage or auto-immune/vasculitic. Most patients are able to be managed without invasive investigations.

Open lung biopsy is reserved for those situations where:

- The cause is not apparent
- The patient is not responding to management, or
- There is a suspicion of another specific disease state which would require different management (eg. disseminated malignancy, alveolar haemorrhage, Bronchiolitis Obliterans Organising Pneumonia [BOOP] etc.), and
- The diagnosis has not been able to be made on less invasive tests (eg. Broncho-Alveolar Lavage or even Video Assisted Thoracoscopic Surgery), or
- Determination of prognosis is essential for management.

Open lung biopsy is associated with risks, especially in the critically ill patient, which include death, air-leak and even a sampling error (as limited tissue removed). These potential risks must be balanced against the information to be obtained. The expectation is that, with further information some potentially harmful/expensive/un-necessary medications would be able to be stopped, and more specific management introduced (eg. high dose corticosteroids).

The biopsy needs to be taken from an area likely to be representative, not one with a high likelihood of non-specific fibrosis (eg. dependent segments of RML), and not too late in the disease process.(Patel 2004 Chest)

Eighteen out of thirty-one candidates passed this question.

28. *These are the biochemical results taken from a 50-year-old woman, missing from an alcohol rehabilitation programme, who was found in her home by police three days since she was last seen. Blood was drawn for investigation.*

<i>Na</i>	<i>126</i>	<i>mmol/l</i>	<i>138 - 145</i>
<i>K</i>	<i>3.5</i>	<i>mmol/l</i>	<i>3.6 - 5.2</i>
<i>Cr</i>	<i>0.25</i>	<i>mmol/l</i>	<i>0.04 - 0.1</i>
<i>Urea</i>	<i>7.0</i>	<i>mmol/l</i>	<i>3.1 - 7.5</i>
<i>Bilirubin (Total)</i>	<i>509</i>	<i>micromol/l</i>	<i>2 - 22</i>
<i>Protein (Total)</i>	<i>40</i>	<i>g/l</i>	<i>65 - 85</i>
<i>Albumin</i>	<i>20</i>	<i>g/l</i>	<i>38 - 48</i>
<i>ALP</i>	<i>153</i>	<i>IU/L</i>	<i>40 - 100</i>
<i>GGT</i>	<i>459</i>	<i>IU/L</i>	<i>0 - 50</i>
<i>ALT</i>	<i>336</i>	<i>IU/L</i>	<i>0 - 45</i>
<i>CK</i>	<i>400</i>	<i>IU/L</i>	<i>30 - 180</i>
<i>TroponinT</i>	<i>0.1</i>	<i>mcg/l</i>	<i>0.00 - 0.03</i>
<i>Glucose</i>	<i>3.2</i>	<i>mmol/l</i>	<i>3.5 - 5.6</i>
<i>Ammonia</i>	<i>342</i>	<i>micromol/l</i>	<i>0 - 50</i>
<i>Lactate</i>	<i>3.7</i>	<i>mmol/l</i>	<i>0.6 - 2.4</i>

*Based on these results, what is the most likely cause of her reduced conscious state? Give reasons. What other simple blood test would support this diagnosis? What is the significance of the high plasma creatinine but normal urea concentrations?*

Most likely cause is hepatic encephalopathy, but many other conditions would be excluded as part of her work up. She has obvious liver dysfunction (GGT, ALT, bilirubin), supported by a low albumin and a very high ammonia level. Other results (eg. Na, Cr/urea, glucose) are not as extreme and less likely to contribute to her reduced conscious state.

An additional assessment of the synthetic function of the liver would support the diagnosis (eg. prothrombin time, which is a marker of severity and should be prolonged).

The high plasma creatinine probably reflects significant renal impairment (not rhabdomyolysis as CK only mildly elevated). The urea value is probably a reflection of decreased production and a nutritional deficiency. A normal value makes gastrointestinal bleeding and severe hypovolaemia unlikely as precipitants for the encephalopathy.

Nineteen out of thirty-one candidates passed this question.

- 29. *Your anaesthetic colleague asks for advice. He is going to anaesthetise a 70 year old diabetic hypertensive patient with chronic renal failure (creatinine 258 micromol/l) for an elective infrarenal endoluminal aortic graft. He wishes to know how he can help prevent a deterioration in the patient's renal function perioperatively. What evidence based advice would you give him?***

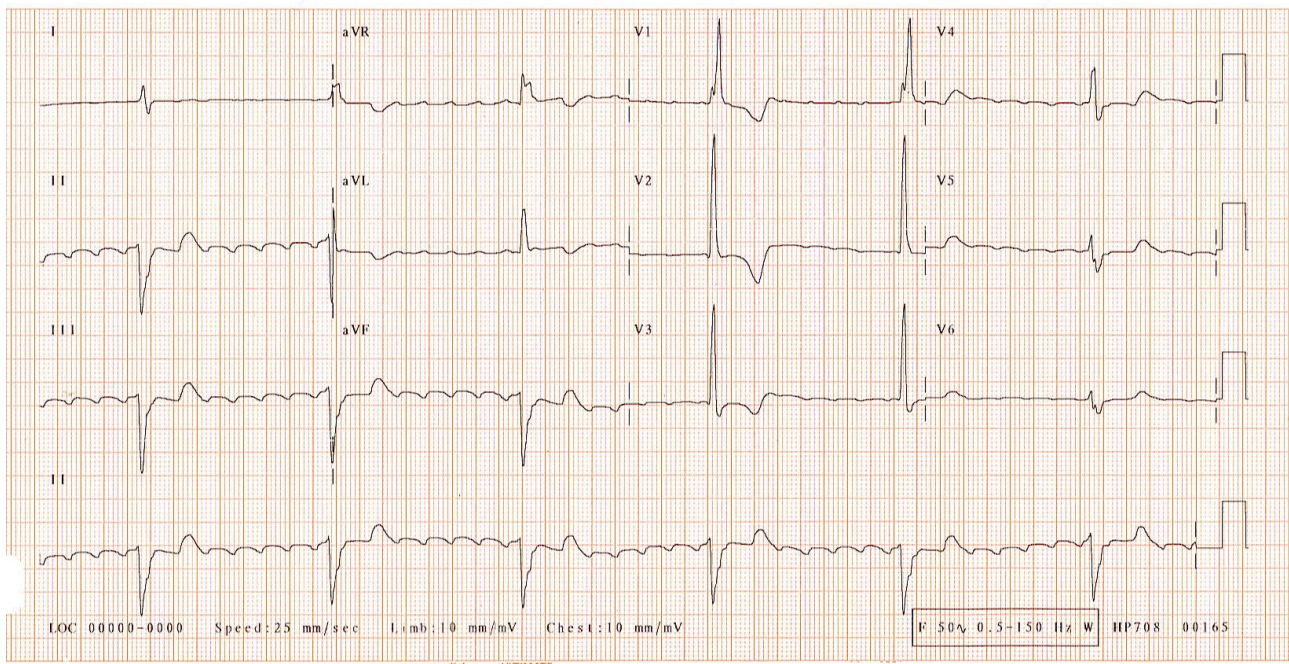
This patient is at high risk (baseline renal impairment, diabetes, manipulation of aorta, and requirement for intravenous contrast). Potential causes of deterioration with Endoluminal grafts are multiple. Specific factors include: they require radiographic evaluation (ie. contrast administration), involve arterial catheter insertion and aortic manipulation (ie. particulate [including cholesterol] emboli), the patients develop a post-operative inflammatory response, and they may be associated with problems with deployment (eg. occlusion of accessory renal artery, or complications that may be associated with haemodynamic compromise, &/or reoperation).

No specific studies have looked at endovascular grafts. Prevention of intravenous dye related renal dysfunction has been studied (mainly in coronary angiography). Factors shown to be potentially of benefit include volume expansion (in particular with 154 m/eq/L sodium bicarbonate [Merten 2004 JAMA]), the use of N-acetylcysteine orally (or IV) [Alonso 2004 Am J Kidney Dis], the use of lower doses of low osmolal and iso-osmolal non-ionic dyes, and the avoidance of closely spaced studies. Other standard preventative measures include avoidance of volume depletion and nephrotoxins. The role of mannitol, dopamine, loop diuretics and haemofiltration is uncertain.

*Twelve out of thirty-one candidates passed this question.*



30. ***This is the ECG of a 73 year old man who was noticed to have a slow pulse rate. He has a past history of ischemic heart disease and is being treated with digoxin and beta-adrenergic blockers.***



***What is the rhythm? What is the conduction abnormality? Please justify your responses.***

The rhythm is Atrial Flutter with a high degree (but apparently consistent) AV block, and a ventricular rate of approximately 40/minute. There is an obvious saw-tooth pattern of atrial depolarisations (at a rate of approximately 250/min) seen in many leads. Association between the flutter and the ventricular depolarisations is based on the finding of a constant PR interval (with a fixed relationship between the P wave and the QRS complex), which excludes AF, and complete heart block.

The conduction abnormality is a tri-fascicular block as it includes:

- Second degree (Mobitz II) AV block (as evidenced by constant relationship between P waves and the QRS)
- Right bundle branch block (QRS > 0.12, RSR in V1, S in lead 1)
- Left anterior hemiblock implied by left axis deviation (slightly positive in I, negative with small R waves in II and III)

Sixteen out of thirty-one candidates passed this question.

## ORAL SECTIONS

### **Objectives Structured Clinical Examination (OSCE) Section**

There were sixteen stations with six rest stations (including one before and after each of the four interactive stations). A systematic approach to the types of investigations examined was more likely to maximise the candidate's score. Candidates should ensure that they take note of the **carefully chosen clinical information** provided when considering their answer. It is imperative that candidates answer the specific question asked (eg. differential diagnosis, "the most likely" = give one, or "list five" means list up to five but **not** more).

Eighteen out of twenty-two candidates passed the OSCE section overall.

Station:

#### **1. Chest X-rays.**

*Candidates were asked to describe the X-ray findings, list possible aetiologies, and suggest relevant further investigations or treatment. Introductory questions included:*

"Identify causes of respiratory inadequacy which are revealed on the initial Chest X-ray and outline appropriate treatments for these conditions"

"This is the Chest X-ray of a man who suddenly developed rapid AF and pleuritic chest pain which was preceded by a 2-hour history of severe nausea and vomiting. What abnormalities are revealed on his Chest X-ray?"

"This is the Chest X-ray of a patient who was the subject of a Medical Emergency Team (MET) call due to hypoxia. He had his jaw wired 24 hours earlier for a major comminuted mandibular fracture.

Describe the abnormalities on this Chest X-ray, and list the possible causes of the abnormalities."

*Examples included tension pneumothorax, gastric dilatation, lobar collapse and oesophageal rupture.*

Seventeen out of twenty-two candidates passed this station.

#### **2. CT Scans.**

*Candidates were asked to describe the X-ray findings, list possible aetiologies, and suggest relevant further investigations or treatment. Introductory questions included:*

"This is the abdominal CT scan of an 86 year old lady who presented with sepsis and metabolic acidosis. She is complaining of abdominal pain and tenderness.

List two clinical diagnoses based upon the CT scan provided which may explain the clinical presentation."

"This is the CT Scan of a 38 year old male following a motor vehicle accident. Describe the abnormalities."

“This is the CT Scan of a 65 year old female with chronic lung disease who presents with chest pain and shortness of breath.

What are the diagnostic findings (site and nature) on this CT scan?”

*Examples included cholecystitis, cervical spine subluxation, and pulmonary emboli.*

Five out of twenty-two candidates passed this station.

### 3. Clinical Case 1.

*Case presented regarding investigation and management of a patient with multiple trauma (including a pelvic fracture). Introductory material and initial question was:*

“You are asked to see a male motorbike rider in his early 20’s. He was the rider of a bike that hit a car at high speed. He was wearing a helmet. Ambulance officers say that he was thrown 15 meters and sustained a brief loss of consciousness at the scene.

Vital signs en route to hospital included: GCS 15, P 125/min, BP 70 systolic. He was pale, complaining of back, abdominal and pelvic pain. Ambulance officers have commenced IV fluid resuscitation.

You are attending to him in the Emergency Department as part of the hospital Trauma Team.

He has GCS 15, but is agitated and uncooperative. He has low BP and tachycardia with impaired peripheral perfusion.

What are your immediate priorities and what immediate investigations do you order?”

Eighteen out of twenty-two candidates passed this station.

### 4. Rest Station.

### 5. Other X-rays.

*Candidates were asked to describe the X-ray findings, list possible aetiologies, and suggest relevant further investigations or treatment. Introductory questions included:*

“This is the Chest X-ray of an adult who presents with status epilepticus.

List the abnormal findings on this chest X-Ray.”

“Examine the Chest X-Ray of this 80 kg male who is being ventilated for respiratory failure in the setting of Acute Pancreatitis. He has no past history of respiratory illness.

Three sets of ventilator settings (A, B & C) are shown below.

	A	B	C
FiO <sub>2</sub>	0.8	0.8	0.8
Respiratory rate (breaths /min)	12	12	12
Tidal Volume (ml)	600	1200	400
PEEP (cm water)	7	8	0
Peak pressure (cm water)	35	24	45
Plateau pressure (cm water)	32	23	28
Peak inspiratory flow rate (L/min)	80	80	80

Choose one setting that is most likely to represent the findings on this Chest X-Ray.”

“Examine the Chest X-Ray and the pulmonary function assessment of this patient who is short of breath.

Age: 57	Sex: Female	
FEV1	2.03	(4-5L)
FVC	3	(4-5L)
FRC	1.9	(2-2.5L)
DLCO	31	(17-20)
pH	7.41	
PCO2	39	
PO2	68	

What is the major abnormality on the X-Ray?”

*Examples included pulmonary haemorrhage, and cord compression.*

Eleven out of twenty-two candidates passed this station.

## 6. Equipment.

*Candidates were expected to describe or discuss advantages or problems with devices presented. Examples included an under water seal drain, a Laerdal resuscitator with inside valve missing, and a Red cell leucodepletion filter.*

Sixteen out of twenty-two candidates passed this station.

## 7. Clinical Case 2.

*Case presented required interpretation of investigations and management of a patient with multiple injuries (including ruptured spleen, tension pneumothorax, meningitis and hypernatraemia). Introductory material and initial question was:*

“A 67 year old male driver involved in high speed motor vehicle accident arrives in the Emergency Department.

He has been intubated at the scene and undergoes radiological investigations before being transferred to the Intensive Care Unit.

He has multiple injuries identified including a closed head injury.

Examine this CT abdomen and list 5 abnormalities.”

Sixteen out of twenty-two candidates passed this station.

## 8. Rest Station.

## 9. Clinical Examination (Cold Case) 1.

*Clinical cases presented included patients with polio, brachial plexopathy, multiple sclerosis. Introductions included:*

“Long standing weakness of upper limbs, please perform a neurological examination on upper limbs”

“Inability to walk and difficulty with speech, please examine neurological state”.

*Common problems identified were related to knowledge deficits, failure to recognise clinically significant issues, poor exam technique, and poor interpretation of clinical signs.*

Fourteen out of twenty-two candidates passed this station.

**10. Rest Station.**

**11. Clinical Examination (Cold Case) 2.**

*Clinical cases presented included patients with mitral regurgitation, prosthetic heart valves, pulmonary hypertension, polycystic kidney disease and primary biliary cirrhosis. Introductions included:*

*Anorexia and lethargy; please examine abdomen*

*Abdominal distension; please examine abdomen*

*Syncopal episodes; please examine cardiovascular system*

*Common problems identified were related to knowledge deficits, failure to recognise clinically significant issues, poor exam technique, and poor interpretation of clinical signs.*

Ten out of twenty-two candidates passed this station.

**12. Rest station.**

**13. Procedure Station**

*Candidates were expected to provide a systematic approach to the management of a cardiac arrest in a pregnant patient. The scenario provided was as follows:*

*“You are about to meet with the wife of a patient who was admitted with life threatening head injuries to the Intensive Care Unit and who has been declared dead after 30 min of CPR. You are about to break the news to his wife (who was not involved in the accident). She is 36 weeks pregnant.*

*As you are preparing to enter the room, you are called urgently as the wife has dropped off from the chair and has become unresponsive.”*

Nineteen out of twenty-two candidates passed this station.

**14. Rest station.**

**15. Communication Station**

*As for communication stations in general, candidates were expected to provide an empathic explanation of the situation, using appropriate body language, and appropriate attention to the needs of the wife. Other factors looked for included appropriate listening to the wife’s concerns, and conveying the need to give the benefit of the doubt with regard to final neurological outcome. The clinical scenario provided was as follows:*

*“A 45 year old man is admitted to the hospital with a reduced level of consciousness (GCS = 7/15). A CT scan shows a subarachnoid haemorrhage from a ruptured anterior communicating artery aneurysm. Neurosurgical opinion is that the aneurysm is amenable to both surgical and interventional radiological correction. The patient’s wife is insistent that he would not wish to have any medical intervention in the event that he is on “life support”. She states they have previously discussed this issue and his wish is not to be treated in this situation.*

*The nursing staff state that she is refusing to consent for surgery or interventional radiology, despite the assurances that these are safe procedures, with the possibility of a reasonable neurological outcome. She insists mechanical ventilation is ceased and no further treatments be given.*

You wish to discuss the possibility of coiling the aneurysm. Please explain the situation regarding the aneurysm to his wife Deborah who is now waiting to speak with you. Explain the diagnosis and the required procedure and the probable outcome.”

Twenty-one out of twenty-two candidates passed this station.

16. **Rest station.**

## Cross Table Viva Section

There were 6 stations of ten minutes each for structured Vivas. There were two minutes provided to read a introductory scenario (which includes the initial question) outside each viva room. This same information is also provided inside each Viva room.

Twenty-one out of twenty two candidates passed this section.

Candidates should be able to provide a systematic approach for assessment and management of commonly encountered clinical scenarios. Candidates should also be prepared to provide a reasonable strategy for management of conditions that they may not be familiar with.

Feedback from examiners suggested that common problems encountered included knowledge deficits (recognised or not), deficient problem solving, and problems with judgement, identifying clinically significant issues, and exam technique.

The topics covered, including introductory scenarios and initial questions were:

- **Toxicology**

*“A 79 year old man is admitted to the Intensive Care Unit following a right hemi-hepatectomy for excision of liver metastases. He was previously in good health, except for depression. Past surgical history includes a colectomy 6 months previously for carcinoma of the colon.*

*Medications – Paroxetine (Aropax) 20 mg oral nocte. Allergies – Nil*

*Post-operative analgesia consists of –*

- *thoracic epidural (T7/8), with an infusion of pethidine (10mg/ml concentration) in the range 5-10 ml/hr via the catheter*
- *paracetamol 1gm 4 hourly IV/PR/NG as supplemental analgesia.*

*Observations on admission to the Intensive Care Unit are stable. The patient is conscious and comfortable.*

*After an uneventful 18 hour stay in the Intensive Care Unit, the patient is discharged to the surgical ward the next morning. 8 hours later you are consulted by the surgical team because they are concerned the patient is very drowsy. BP and HR are stable.*

*What is your differential diagnosis for the drowsiness?”*

All twenty-two candidates passed this section.

- **Obstetrics**

*“A 37 year old primigravida with Type II Diabetes mellitus and morbid obesity presents to hospital in labour at 36 weeks gestation with known twins. Due to complications, she is taken for an emergency caesarean section (LUSCS).*

*This is complicated by a significant post-partum haemorrhage and she is then transferred to ICU for haemodynamic stabilisation.*

*On arrival in ICU, her blood pressure is reported at 170/115 mmHg.*

*What is your differential diagnosis of the hypertension?”*

Fifteen out of twenty-two candidates passed this section.

- **Electrolyte/Metabolic**

*“A 45 year old male weighing 75kg presents to the Emergency Department with nausea and vomiting and is tolerant of fluids only. He has progressive weakness and is unable to walk and dress. He has developed constipation over the last few days. Initial observations are a systolic blood pressure of 90 mmHg, pulse 95 beats per minute, respiratory rate 18 breaths per min and tympanic temperature of 37.4 C. An abdominal examination reveals a soft abdomen with epigastric tenderness and no organomegaly.*

*His initial blood tests are as shown below and you are asked to provide assistance.*

<i>Sodium</i>	<i>124</i>	<i>mmol/L</i>	<i>137 - 146</i>
<i>Potassium</i>	<i>1.8</i>	<i>mmol/L</i>	<i>3.7 - 5.0</i>
<i>Chloride</i>	<i>67</i>	<i>mmol/L</i>	<i>98 - 108</i>
<i>Urea</i>	<i>9.1</i>	<i>mmol/L</i>	<i>3.0 - 8.5</i>
<i>Creatinine</i>	<i>81</i>	<i>umol/L</i>	<i>60 - 120</i>
<i>Glucose</i>	<i>3.8</i>	<i>mmol/L</i>	<i>3.0 - 8.0</i>
<i>Bilirubin</i>	<i>8</i>	<i>umol/L</i>	<i>2.0 - 18.0</i>
<i>Albumin</i>	<i>41</i>	<i>g/L</i>	<i>34 - 46</i>
<i>Calcium</i>	<i>2.37</i>	<i>mmol/L</i>	<i>2.1 - 2.6</i>
<i>Magnesium</i>	<i>0.74</i>	<i>mmol/L</i>	<i>0.7 - 0.96</i>
<i>Phosphate</i>	<i>0.7</i>	<i>mmol/L</i>	<i>0.8 - 1.5</i>

*What are the key biochemical abnormalities?”*

Nine out of twenty-two candidates passed this section.

- **Sepsis**

*“The Medical Emergency Team is called to see a shocked 74 year old woman on the surgical ward.*

*Until the last few hours she had been progressing well since undergoing an elective left hemicolectomy for carcinoma 5 days earlier.*

*The result of a Full Blood Examination (FBE) and blood picture taken one hour earlier is available (previous FBE results had been unremarkable):*

<i>White cells</i>	<i>3.4</i>	<i>4.0-10.0 x 10<sup>9</sup>/L</i>
<i>Haemoglobin</i>	<i>95</i>	<i>125-175g/L</i>
<i>Platelets</i>	<i>98</i>	<i>150-500 x 10<sup>9</sup>/L</i>
<i>Haematocrit</i>	<i>0.30</i>	<i>0.40-0.56</i>
<i>Neutrophils</i>	<i>0.56</i>	<i>2.0-7.5 x 10<sup>9</sup>/L</i>
<i>Lymphocytes</i>	<i>1.5</i>	<i>1.0-4.0 x 10<sup>9</sup>/L</i>
<i>Monocytes</i>	<i>0.08</i>	<i>0.2-1.0 x 10<sup>9</sup>/L</i>
<i>Eosinophils</i>	<i>0.00</i>	<i>&lt;0.5 x 10<sup>9</sup>/L</i>
<i>Basophils</i>	<i>0.00</i>	<i>&lt;0.2 x 10<sup>9</sup>/L</i>
<i>Nucleated red cells</i>	<i>21</i>	<i>0/100 WBC</i>
<i>Bands</i>	<i>0.56</i>	<i>&lt;0.6 x 10<sup>9</sup>/L</i>
<i>Metamyelocytes</i>	<i>0.28</i>	<i>&lt;0.01 x 10<sup>9</sup>/L</i>
<i>Myelocytes</i>	<i>0.26</i>	<i>&lt;0.01 x 10<sup>9</sup>/L</i>
<i>Promyelocytes</i>	<i>0.06</i>	<i>&lt;0.01 x 10<sup>9</sup>/L</i>
<i>Blasts</i>	<i>0.06</i>	<i>&lt;0.01 x 10<sup>9</sup>/L</i>

*Film. Marked toxic change.*

*Can you explain this result?"*

Nineteen out of twenty-two candidates passed this section.

- **Paediatric**

*"You are asked to attend the Emergency Department urgently. A male child aged 2 years and 10 months who was found "unconscious" is being brought to your hospital. A second hand report from the ambulance officers suggests the child has been vomiting and may be fitting. No other information is available until the patient arrives (ETA 10 minutes).*

*What preparations would you make while waiting for the arrival of the child?"*

Nineteen out of twenty-two candidates passed this section.

- **Cardiovascular**

*"A 50 year old woman presents one hour following the sudden onset of a severe tearing interscapular pain.*

*Her blood pressure is 180/110 heart rate 95/min.*

*She is conscious, but in severe pain.*

*She has no respiratory distress and her SpO<sub>2</sub> is 97% (on air).*

*Her past medical history includes steroid dependent brittle asthma.*

*What do you think the likely diagnosis is?"*

Twenty-one out of twenty-two candidates passed this section.

## **The Clinical Section: Hot cases**

The Clinical Section (hot cases) was conducted at the St George Hospital, and Prince of Wales Hospital, Sydney.

Fourteen out of twenty-two candidates passed this combined section.

Candidates should listen carefully to the introduction given by the examiners and direct their examination accordingly. Patients were usually presented as problem solving exercises. For maximal marks, candidates should demonstrate a systematic approach to examination, clinical signs should be demonstrated, and a reasonable discussion regarding their findings should follow. The twenty minutes available for each case provides ample opportunity to discuss related investigations and plans of management.

Exposing the patients should be limited to those areas that are necessary for that component of the examination, and in keeping with the modesty requirements of the patients.

Candidates must show appropriate courtesy and respect to patients.

Cases encountered as hot cases included patients with:

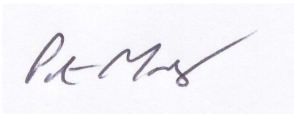
- Cardiogenic shock after cardiac surgery (introduced as "presented with cardiogenic shock. Subsequently suffered a cardiac arrest. After resuscitation he had urgent angiography which showed severe triple vessel disease. Then had urgent coronary artery grafting. This was now 5 days ago. Please can you assess with a particular focus on suitability for weaning.")



- Oliguria after prolonged abdominal surgery (introduced as “could you please examine, particularly in regards to diagnosis/management of oliguria”)
- Multiple trauma (introduced as problem is increased ICP. Can you please examine patient in relation to increased ICP”)
- Febrile after surgery (introduced as “in ICU after complications post-elective surgery. Febrile overnight; please examine for a cause.”)
- Respiratory failure and AML (introduced as “respiratory failure for 5 days. Please examine for causes and status of respiratory failure”).
- Spinal injury (introduced “prolonged ICU stay after being injured in an accident. Please examine neurological state”)

Comments documented at the time of the clinical examination suggested that common problems encountered related to examination technique (eg. erratic/disorganised), detection and interpretation of clinical signs, and identification of clinically significant issues.

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Dr Peter Morley  
**Chairman, Court of Examiners,  
Chairman, Fellowship Examination Committee**

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