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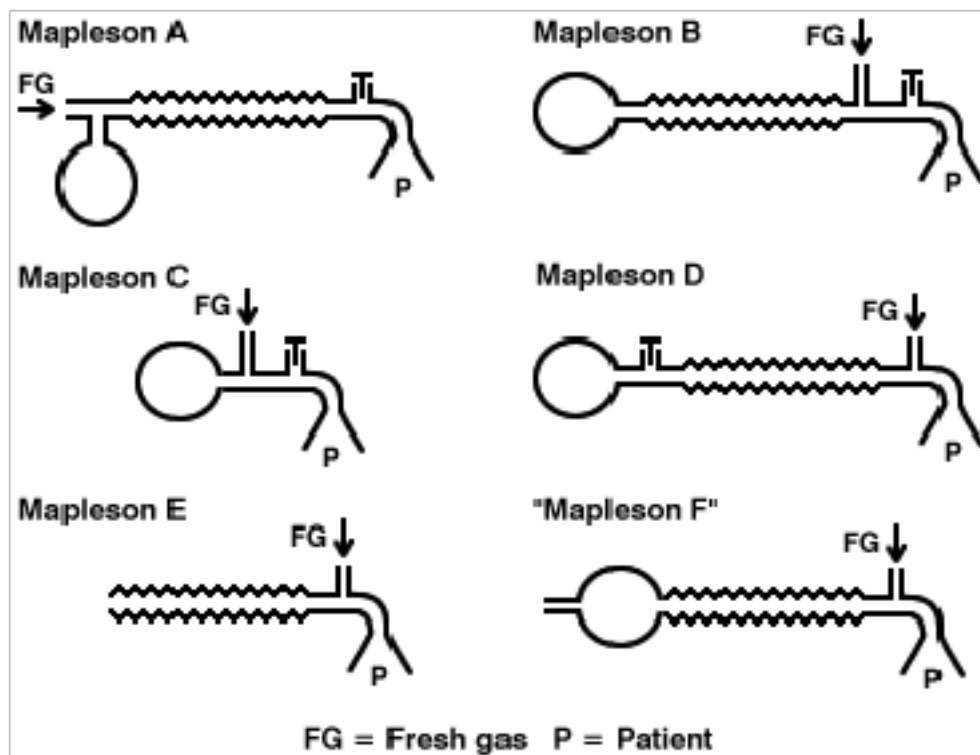
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Made Up

Mapleson's vs circle

What types of breathing system would you use for a patient that has hypoxia?



- Map A = most efficient to prevent rebreath during SV.;
 - FGF required = ie ~1 x minute ventilation. 80ml/kg/min.
 - But also worst w IPPV, need 3 x MV to avoid rebreath.
 - Also A rarely used now, so use D = A with APL, FGF reversed.
 - D efficient in IPPV (require 1 MV FGF), as FGF forces expired air away from pt so minimises rebreathing.

NB:

ABC = APL close to pt's end;

DEF = 'T piece group'.

- ABC rarely used now (C = Bag/mask)
- DEF commonly used.
- D (Bain modification = contain additional tube inside reservoir tube, supplying FGF to pt.)
- Potential problem of unrecognised kinking/disconnection of FGF tube.

E = Ayre's T piece:

- need FGF 2x MV to prevent rebreathing in SV;
- min 3L/min w IPPV.
- Reservoir tube needs to be > TV in volume to prevent entrainment of room air.

F = Jackson-Rees modification –

- mostly used for paed <20kg
- Open bag on end of circuit (allows IPPV by occlusion).
- Reservoir should be same volume as TV, as if too small → entrain room air, if too large → rebreath.
- Pros: compact, inexpensive, no valves, minimal dead space/resistance, portable, BMV, simple set up
- Cons: High FGF.

Important ones to know are D, E, F, circle.

Mapleson vs Circle:

Mapleson:

• **Disadvantage:**

- No CO₂ absorption
- High FGF required – waste of VA, pollution;
- Loss of pt heat and moisture; no humidification

• **Advantage:**

- No unidirectional valve to reduce flow resistance.
- Lightweight, inexpensive and simple.

Circle:

- Pros: good for its scavenging, economy, heat/moisture conservation.
- Cons: But no good for being complex (so risk of disconnection), bulky, less portable, re-breathing of expired gas if no CO₂ absorber.

9 components:

- FGF, APL, tube, unidirectional valve, Y-piece, reservoir bag, vaporiser, ventilator, CO₂ absorber
- Circle may be closed or semi-closed.

Scavenging + volatile hazards

Tell me about scavenging systems...

- = collection and subsequent removal of waste gases from OT

- **5 components:**

- Exhaust port: APL/ventilator/expiratory valve → transfer system
 - Transfer system: carry waste → receiving system
 - Receiving system: reservoir; scavenging typically at 80L/min to remove all expired wasted gas.
 - Has flow indicator/control in place.
 - Valve included to prevent high/low P developing
 - Disposal system: air pump to exterior
 - Pressure regulated so exhaust ports don't get affected
 - Exterior
- Efficient OT ventilation need 15 air changes/hour, to prevent accumulation.

Extra: Hazards of anaesthetic gas pollution:

- Prev old studies suggested:
 - ?spontaneous miscarriage, congenital anomalies, hepatic dx, cervical Ca, lowered psychomotor performance.
 - But results considered invalid as erroneous study design.
- ASA review in 1999: concluded 'no proof of AE'.
- But N₂O a baddie.
 - Haem, neuro toxicity long term exposure.
 - Teratogenicity in animal studies; avoid use in 1st trim;
 - Greenhouse effect.
 - irreversible oxidation of cobalt in Vitamin B12 (a co-factor for methionine synthetase) – inhibition of DNA synthesis and myelin formation.
- <1:1000 ppm (0.1%) is ok. So problem rarely seen in modern OT.

Cerebral perfusion monitors

Evaluate methods for monitoring of cerebral perfusion, during elective carotid endarterectomy.

Cerebral perfusion is measured, particularly during clamping of 1 carotid artery to assess cerebral circulation is maintained from collateral circulation. If there is sign of cerebral circulation compromise, a shunt placement should be considered.

Techniques:

- awake
- stump p measure
- cerebral oximetry (NIRS)
- TCD
- EEG (incl BIS/Entropy)
- Jug venous oximetry
- Systemic BP as surrogate

- options to measure cerebral ischaemia: (Adam + Auckland notes compiled below)

- TCA - monitors flow & emboli, continuous, non-invasive;
 - Operator dependant & can be difficult to get views, limited evidence/experience

- **NIRS** - frontal lobe sensors, continuous, easy to use; poor +ve predictive value/sensitivity/specificity/intervention thresholds not established
- **SSEPs**. Thought more sensitive & specific than EEG. GA can alter signal, intermittent nature
- **EEG** - 16ch EEG = Gold standard; partial ones only reflects localised cortical structures. cannot see emboli, difficult to read
- **Stump pressure** - Specific measure of P pressure, easy/cheap; but not sensitive ie high false negative. Cannot see emboli
↳ = Most used
if pressure within range of MAP then shunt not needed
- **RCBF** - measures CBF; invasive, time consuming, expensive
- Also include awake technique = gold standard

NB.

Evidence is lacking for any of these methods to actually improve outcome.

Substance abuse welfare policy setup

As a newly appointed consultant with an interest in welfare you find your training department has no substance abuse policy.... What are some of the basic tenants of such a policy

- **welfare doc**; Consult welfare doc on management of substance abuse.
- **Evidence**: Basis on Evidence
 - **Prevention** (Drug Control Policy)
 - **Detection**
 - **Intervention** (Plan and Team)
 - **Treatment**
- **Team of interested** people
 - System must have **redundancy** – ie a SUD Interest Group
- **Support**: External Support
 - **CADs**
 - **Psychiatry**
 - **Inpatient**

Substance abuse scenario management

You are the consultant on call in a tertiary hospital, a registrar has been found in the toilet collapsed with a propofol syringe on the floor next to them...

Will consult **welfare guideline** on management of substance abuse

- **Back up** to manage current clinical situation (while colleague is impaired, patient still needs help)
- **Major sign??**
- **Immediate intervention**: Need immediate intervention plan
 - **Suspicion** and recognition of SUD
 - Critical situation requiring immediate action
 - Major and Minor signs should be considered – including circumstantial evidence
 - **Preparation** and Response
 - Confidentially gather information.

- Avoid prejudice
 - Maintain patient and colleague safety
- **Verification**
 - Collate and Document information (Time sensitive)
- **Intervention Team**
 - Intervention
 - Team approach – HOD/Psych/SUD committee member/Support Person
 - **DO NOT LEAVE THEM ALONE-high suicide risk**
 - **STONED**
 - Treatment
 - Decision is to be made by the members of the professional team treating the doctor
 - Inpatient vs outpatient; Voluntary vs Involuntary
 - Reporting
 - Return to Work

Colleague impaired by stress discussion

You are supervising on a Saturday Morning when a senior recovery nurse reports that she has concerns about Dr T.

Dr T's handwriting – previously legible, is now hard to interpret. Her charts are incomplete and when questioned she became teary. She is often stressed in recovery about minor issues. What are you going to do next?

Consider factors:

- **Bio** – Brain tumour, physical illness
- **Psycho** – depression, anxiety, drug abuse
- **Social** – family, fertility, relationship, money, social problems

Actions: Preassess, Prep, Perform, Post-meeting intervention

- **Preassess:**
 - Whatever cause, maintain confidentiality but negotiate with need for statutory report
 - **privacy**
- **Prep:** **Discuss** with Welfare officer
 - **Timely** approach required
- **Perform:** **STONED**
 - Suggest treatment by GP
- **Post:** Arrange for lighter workload for Colleague in meantime.
 - Maintain contact

Dealing with patient complaint

A Colleague seeks your advice. A patient to whom they gave a general anaesthetic 2 days ago for removal of wisdom teeth as a day case, claims that she was awake during the operation. The patient remembers hearing someone refer to her as a 'fat old cow'. Your colleague has been notified that a formal complaint about this matter is to be investigated by the relevant legal authority.

- Q1. Discuss the factors which may have contributed to awareness in this patient.
 Q2. Give your recommendations for mx of this patient's complaint
 Q3. What strategies may be used to assist your colleague with the stress they may feel about the forthcoming investigations?

Q1 – look at my own classification for awareness.

Patient Mx:

- Consult welfare doc on critical incident support
- Patient should receive apology and talk about concerns
- Contact GP
- Document
- Inform Medical Indemnity

Colleagial support

- Welfare doc on critical incident support + ?possibly bigger issue of impairment
- Expect to encounter combinations of feelings:
- Denial, anger, blame, bargaining, depression
- Identify if this is one off or part of a bigger issue
- Beware of 'second victim' effect – what support does colleague has?
- Recommend mentoring/counselling
- Discussion of case, Avoid judgement

Sexual Harassment

The Supervisor of Training informs you, as HOD, that a junior female registrar has filed a sexual harassment complaint against a senior anesthetist.

What are the typical behaviors of sexual harassment?

How are you going to respond?

Sexual Harassment = Unwelcome conduct of a sexual nature which offends, humiliates, or intimidates the person towards whom it is directed, regardless of intent

- Eg. offensive jokes, display of offensive material, physical conduct, requests for sexual favours etc.

Response:

- As per ANZCA Welfare guideline...
- Investigate: Obtain complaint detail
- Interview: Consult Anaesthetist + Trainee individually
- Support: Ensure support for trainee / Anaesthetist
 - Maintain confidentiality and safety of both parties
 - Psych Liaison / Counselling for both
- S-support
 - Seek guidance on policy for suspension, management, rehabilitation.
- T-timely, take time
- O-outline role, event, management, outcome ;
 - Or outline complaint, legal requirement by Hospital/DHB;
 - Or outline consequence if fail to comply
- N- notify (Management, HR, Legal opinion, Medical Council) or need for further meeting/intervention?

- E-escort
- D-Document

Palliative Care Pearls

(from Auckland course)

- Oral opioid therapy convert to SC
- 24 hour morphine po total / 2 = SC 24 hour dose syringe driver
- 1/6th total morphine po dose = break through pain prn SC dose
 - (which effectively = 1/3 of PO dose)
- Oral anxiolytic convert to SC clonazepam
- Oral steroid convert to SC dexamethasone
- Look at hospital guidelines for syringe driver medication compatibilities

CRPS Pearls

- SNS block – lumbar sympathectomy
- Multimodal analgesia
- Psychosocial support
- Specials: Vitamin C, corticosteroids, palmitronate

Non-Pharm pain treatment:

- Psychosocial: Relax/meditate/distract/reassurance/education/manage expectation
- Temp: Hot/cold
- Physical: Compression, massage, splints, position
- TENS
- Other placebos

Carcinoid syndrome

Tx:

- Treatment is normally suppression with somatostatin analogue octreotide (SC or iv)
 - 200 to 300 mcg per day, IV or subcutaneously, in 2 to 4 divided doses
- Aim for symptom resolution
- 'Carcinoid crises' are an exaggerated form → profound flushing, bronchospasm, tachycardia, and widely fluctuating blood pressure, including hypo- and hypertension
 - Treat with iv boluses 20-100 mcg octreotide
 - Avoid catecholamines which may increase serotonin release, but use direct acting if needed. Consider vasopressin.

Chemotherapy info:

Classified by MoA:

- 1 Alkylating drug: Cyclophosphamide: pulm fibrosis, cardio
- 2 Platinating agents: Cisplatin: renal, electrolyte, peripheral neuropathy
- 3 Nucleic Acid synthetase inhibitors: Methotrexate-pulm tox-pneumonitis/fibrosis, nephrotox
- 4 DNA topoisomerase inhibitors: Doxorubicin: cardiotoxicity
- 5 Other DNA-damaging drugs: Bleomycin: pulm fibrosis 10% which assc w high mortality.
- 6 Antimicrotubule drugs: Vincristine: neuropathy

7 Signal transduction modulators: Tamoxifen: DVT.

Approach to cancer pt:

- Head/neck: airway
- Cardio toxicity?
- Lung: lobar collapse, SVC syndrome
- GI: obstruction? NV, aspiration?
- Renal failure
- MSK: Pathological #? Spinal cord compression?
- Haem: neutropenic sepsis? Anaemia? Thrombocytopenia?
- Electrolyte? High Ca? low Na?
- General:
 - chronic pain?
 - Malnutrition? Can't swallow, mucositis.
 - Tumour lysis syndrome: up uric acid, urea, K, (KUU,C), high P, low Ca

Other immunosuppressive drugs in organ transplant:

- cyclosporin-in transplant; SE: nephrotoxic, neurotoxic, squamous cell carcinoma, HTN (due to renovasoconstriction+Na absorp)—> CVS
- tacrolimus-in transplant; SE: nephrotox, Skin CC, NH-lymphoma + CVS/resp/CNS/liver
- azathioprine - pulm toxicity, bone marrow suppression. Rarely: Hepatitis, pancreatitis, lymphoma

DMARD complication:

- gold-thrombocytopenia, nephrotic syndrome, gold lung (pneumonitis)
- hydroxychloroquine-Bone marrow suppression, agranulocytosis, aplastic anaemia, eye
- sulfasalazine-thrombocytopenia, megaloblastic anaemia,
- leflunomide-liver damage, lung disease and immunosuppression
- adalimumab/infliximab - serious infections, reactivation of infections, demyelinating CNS disorders

Cardiac Drug recipe

- GTN (0.5-1mg/ml)
 - 0.1-5mcg/kg/min; roughly 0.5mg/ml @ 0-30ml/hr
 - 50mcg-100mcg bolus
- SNP (0.5mg/ml)
 - 0.01-2mcg/kg/min
- Mg
 - 10-20mmol; if infusion 1g/hr (Obs); watch level
- Esmolol (10mg bolus)
 - 0.5mg/kg loading; 25-300mcg/kg/min
- Phenyl
 - 0.1-1mcg/kg/min; 100mcg/ml @ 0-30ml/hr
- Ephedrine
 - 5-20mg/hr
- Noradr
 - 0.01-0.2mcg/kg/min; 100mcg/ml @ 0-30ml/hr

- Adre
 - 0.01-0.2mcg/kg/min; 100mcg/ml @ 0-30ml/hr
- milrinone (200mcg/ml)
 - 20-50mcg/kg bolus; 0.375-0.75mcg/kg/min; 5 or 10ml/hr
- Ca
 - 0.035mmol/kg
- Vasopressin (V1 R)
 - 0.5-3unit/hour; bolus 1u if desperate
- Isoprenaline (20mcg/ml)
 - 0.01-0.05mcg/kg/min; bolus 10mcg if required
- Iloprost
 - 20mcg neb prn/Q2h for 2 days. normally Q6H.
- sildenafil
 - 25-50mg tds/qid
- Desmopressin
 - 0.3mcg/kg (max 24mcg) over 30 mins (once only)-bleed
 - DI dose = 100-200mcg intranasal or 0.4mcg dose IV prn
- Hypertonic saline (3%)
 - 3 mL/kg over 10 min or 10-20 mL 20% saline
- Salbutamol
 - bolus 5-15mcg/kg; infusion 5-10mcg/kg/min for 1 hour then 1-2mcg/kg/min
- Phentolamine
 - 1-2mg Q5-10mins

Paeds pressor

Dopamine	5-15mcg/kg/min; reasonable 1 st line agent, can be used peripherally
Adenosine	0.1mg/kg fast IV, max 12mg
Ephedrine	10mcg/kg IV Q5min
• Dexmedetomidine	<ul style="list-style-type: none"> ○ 0.5-1 mcg/kg over 15 mins loading, then 0.5-1mcg/kg/hour ○ IN: dexmed 2mcg/kg intranasal; elim ½ life 2hrs

bicarbonate for obstetric epidural = 1ml / 10ml of lignocaine; or 0.1ml / 10ml of bupivacaine

Remifentanyl PCA

- **Variable bolus with no basal (roughly ~2x potency of fentanyl)**
 - 0.25mcg/kg, 2 min lock out, increase in 0.25mcg/kg increments at Q15min until VAS score <5; Up to 0.75mcg/kg (IBW)
 - If on improvement, consider change to variable basal.
- **Fixed bolus with variable basal**
 - Fixed bolus 0.25mcg/kg; 2 min lock out.
 - Basal 0.025mcg/kg/min (10x less), increase rate in 0.025mcg/kg/min Q30mins until VAS <5. Up to 0.1mcg/kg/min.

Max. hourly rate = 12mcg/kg/hour = 0.2mcg/kg/min.

Phil Quinn's SAQ session – 2016

Q1 – acute porphyria

Describe the pathogenesis of acute porphyrias, and its diagnosis? (40%)

How would you safely manage a patient with an acute porphyria perioperative? (60%)

Pathogenesis of Porphyria =

= group of **genetic** disorders; featuring **enzyme defect** hence **inability to synthesis Hb** resulting in an accumulation of **precursors oxidised to porphyrins**

- 3 main hepatic forms affecting anaesthesia.
- autosomal dominant - but with variable expression
 - **AIP** - acute intermittent porphyria (sweden)
 - **VP** - variegated porphyria (afrikaners). Dermal photosensitivity
 - **HCP** - hereditary coporporphyria (rare - dermal hypersensitivity)

Diagnosis:

Management

Principles = **minimize stress** and potential **trigger**.

- Pre
 - Hx: Assess carefully; **previous attack?** +ve **FHx?**
 - Must be treated as potentially at risk from acute attack with FHx.
 - Exam: presence of **neuro deficit?**
 - Invx: may be normal in between attacks.
 - Urine, serum faecal **porphyrins**; **DNA testings**.
 - Many commonly used medication shave potential to trigger porphyric crises, therefore important to formulate periop plan with medication use and consult up-to-date information from established medication review centres.
 - **Minimise stress:**
 - **premed** with BDZ. **Avoid prolonged fasting** and use **glucose**/saline fluid.
 - **Multimodal analgesia** + regional (unless in acute crises as neuropathy can happen)
- Intra; key = **obtund SNS stress + aseptic practice** as at risk of infection.
 - GA with propofol. Maintain with TIVA.
 - Iso/halo probably safe
 - Bupivacaine prob safe
 - NMD prob safe; except atracurium
 - Fent/morphine safe
 - If HTN/tachy → use BB
 - If Convulsion → use BDZ, propofol, MgSO₄, don't use thio/phenytoin.
- Post
 - crisis may be delayed for up to 5d
 - ICU/HDU is crisis

In acute crises:

- **Many precipitants** - drugs, stress, infection, alcohol, menstruation, pregnancy, starvation, dehydration
- **Symptoms** incl:

- **GI:** Abdo pain + Vomiting (may mimic acute abdomen)
- **CNS:** Motor and sensory neuropathy
 - Autonomic dysfunction
 - Cranial nerve palsies
 - Confusion
 - Coma
 - Seizures
 - Fever
- **Care:** stop trigger; help; **speicla:** use **haem arginate 3mg/kg** IV OD for 4/7 (inhibits ALA synthetase hence stops haem production); **BB** to decrease ALA activity; **plasmapheresis**.
 - Supportive care + monitor Art line +/- CVP (as can get labile BP from ANS neuropathy) + glucose (20g/hr = 200ml 10% /hr)

NB.

	Def Unsafe	Maybe	Probably Safe
Induction	thio etomidate	ketamine	Propofol
Volatiles	Enflurane	iso sevo	Nitrous
NMBs		panc atrac roc	Sux vecuronium
Reversal			Atropine Glyco Neo
Analgesia		dicofenac	aspirin & paracetamol alfent, fent, morphine naloxone
LAs	Ropiv	Lignocaine	Bupiv Prilocaine
Sedatives	nitrazepam	Diazepam	Midazolam Chloral hydrate
Antiemetics	metoclopramide	ondansetron Ranitidine	Droperidol
CVS Drugs	Hydralazine Nifedpine Phenoxybenzamine	Diltiazem verapamil SNP	Adrenaline α & β agonists Mg β blockers phentolamine

Others	OCP phenytoin sulfonamides aminophylline	Steroids	
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Q2 – TCA overdose

You suspect a patient has taken an overdose of TCA. What are the clinical signs and investigations that would support this diagnosis (50%). Outline your initial management of this patient (50%)

Features (signs/invx) for TCA

- **Effect of TCA** = anticholinergic, peripheral alpha blockade, inhibition of NAdr/5HT3 reuptake.
 - **Feature**: Manifested mainly in CVS, ANS, CNS
- **Anticholinergic**: delirium, fever, tachycardia, mydriasis, flushed dry skin, ileus, urine retention – MR-DHB – mad, red, dry, hot, blind
- **CVS**: tachy, prolonged many things: PR, QRS complex, QR interval (QRS proportional to serum TCA level); hence level usu. not measured and guided by QRS complex;
 - Hypotension/VT/torsades
- **CNS**: agitation, blindness, sedation, hallucination, seizure, coma, death

Initial Mx of patient (Stoelting)

- **Activated charcoal, gastric lavage**
 - Don't induce emesis due to risk of aspiration as patient can become obtunded quickly
- **Serum alkalinisation** = principal tx → inc protein bound drug, less free drug;
 - Give HCO₃⁻ or hyperventilate to pH 7.45-7.55
 - Titrate to narrowing of QRS complex or cease of arrhythmia
- **ACLS** if malignant arrhythmia occurs + MgSO₄ for torsades.
- **Support ABCD.**
- **Seizure control** with BDZs.
- NB. Hemodialysis not effective due to high lipid solubility/protein binding of TCAs.

NB.

CEACCP say TCA use should care with indirect SNS (ephedrine/metaraminol) – presume because of reduced reuptake of NAdr?? Can use direct SNS carefully.

○ ~~Dry as bone, hot as hare, red as beetroot, blind as bat, mad as hatter.~~

○ **MR-DHB**

Cholinergic syndrome mnemonics:

- ~~DUMBELLS: Diarrhoea, Urination, Miosis/Muscle weakness, Bronchorrhea/Bradycardia/Bronchospasm, Emesis, Lacrimation, Salivation/Sweat~~
(don't use above, as below easier: one is common, one is severe)
- **SLUDGE**: Salivation/Sweat, Lacrimation, Urination, Defecation, GI distress, Emesis
- **Killer Bs**: Bradycardia/Bronchorrhea/Bronchospasm

Q3 – Environmental impact of anaesthesia

Summarise the environmental impact of anaesthesia practice, and how this can be mitigated.

Anaesthetic gas

- **green house**: Significant green house effect, CO₂ emission from anaesthetic gas
- **Global warming** potentials: **DES>>>> Iso > N₂O > Sevo**
 - Mx by: using closed circuit, low flow, switch FGF off at intubation (using intubation button for temp gas flow pause eg. 30-60sec pause); automated gas delivery systems which adjust to use minimal flow and maintain set depth of EtAA; circle systems; consider RA/TIVA, avoid Des/N₂O unless strongly indicated clinically.

Recycling of resources

- **Recycling**: **Reusable vs disposables; generally better with reusables**, benefits with less energy use, less carbon footprint and solid waste; at competitive cost with disposable options. eg.
 - **Textiles/gowns**, drape → reusable textiles has
 - Anaesthetic trays
 - **LMA**.
 - Avoid using **Styrofoam cups**
 - Unless items require sterilization; in which case disposables may be better: Eg. CVC kits

Bluebook: Reduce, reuse, recycle, research and advocate:

Practical steps for the anaesthetist to reduce their environmental impact.

Reduce:

- Minimize nitrous oxide use; low flow anaesthesia.
- Minimise multiple disposable items: eg, anaesthetic trays, IV fluid bags, bear hugger warming blanket.
- Use less paper, record information electronically. Print double sided.
- Use fewer batteries. Consider rechargeable batteries and equipment.
- Reduce lighting cost with efficient lamps.
- Turn off the theatre ventilation and air conditioning when not in use.
- Turn off all appropriate theatre equipment at the mains when shutting down for the day.

Re-use

- Consider the financial and environmental benefits of reusable equipment:
 - recycled paper, rechargeable batteries,
 - consider reuse equipments with low infection risk: eg. SCDs, air warming blankets.
 - Consider purchase products from recyclable materials.

Recycle

- Segregate recyclable material.
- Form or join an Operating Suite Environment Committee.
- Contact local waste recycling firms about recycling options.
- Encourage the purchasing of more sustainable products.

Research

- Encourage life cycle analysis and costing of products used in the operating suite.
- Investigate where decreases in energy and water consumption can occur.

Advocate

- culture promoting sustainability practices
- purchasing of sustainable products.
- Facilitate bike use by advocating for bike parking and form a bicycle users' group (BUG).
- Advocate for the environment. Join DEA (Doctors for the Environment Australia), ACF (Australian Conservation Fund) or contact a politician.

Q4 – lung isolation discussion (repeat)

Describe the different techniques to achieve lung isolation along with their pros/cons.

Q5 – thoracic paravertebral block (repeat)

Describe the anatomy relevant to performing a thoracic PVB. (50%) List the pros/complications of performing this block for a patient undergoing radical mastectomy (50%).

Q6 – Anorexia nervosa (repeat)

Describe the pathophysiological changes assoc w anorexia nervosa, and their anaesthetic implications.

AN = highest mortality of any psych disorder = high risk!!

- chronic, severe, multi-system disorder, fear of becoming fat with deliberate weight loss
- co-morbidities: major depression, anxiety, OCD, drug misuse - laxatives, emetics, diuretics

Pathophys (+ anaesthetic implications – do my own restructuring in actual SAQ)

CVS:

- arrhythmia/bradycardia, AV block, prolonged QT,
- Myocardial impairment: hypotension, ST depression, TWI - risk of cardiac failure if over-filled intraop
- ECG changes in up to 80%: AV block, ST depression, TWI, prolonged QT, arrhythmias
- MV prolapse

Resp:

- Decreased compliance; bradypnoea,

CNS:

- impaired cognition, seizure

GI: delayed gastric emptying / malnutrition

Blood:

- Immunosuppression at <50% of normal body weight
- Electrolyte:

↓Cl, ↓Ca, ↓K metabolic alkalosis - from excessive stomach fluid loss
hypothermia.

Endo: (panhypopituitarism features) - hypothyroid, loss glycaemic control, amenorrhoea, adrenal insufficiency

MANAGEMENT

rehydrate

- fix electrolytes
- avoid re-feeding syndrome - dangerous so avoid

Hypophosphataemia:

- -> Myocardial impairment + arrhythmias, cellular hypoxia and clinical signs of ATP def.
 - muscle weakness, rhabdomyolysis, haemolytic anaemia (rare, due to RBC unable to maintain cellular integrity);

Intraoperative

A RSI

B loss of lung elasticity ie reduced compliance -> high AWP

- avoid hyperventilation – worsens 'hyperventilation-induced hypocalcaemia)

Carpopedal spasm

C cautious fluid therapy as can precipitate cardiac failure

E hypothermia cares

D

- NMB - potentiated if ↓K & ↓Ca
- avoid neostigmine if possible - risk of arrhythmia
- PharmK/D changes, low albumin,

P pressure cares

- Random ones: assoc w mitral valve prolapse, Superficial parotitis, dental caries

Postop:

long to wake, long to heal

NB.

- marked electrolyte derangement (decreases in serum potassium, phosphate, and magnesium levels) and expansion of the extracellular fluid compartment (leading to increased cardiac workload) and the introduction of carbohydrates may lead to increased oxygen consumption, increased carbon dioxide production, and an increased respiratory quotient.

~~Q7 – PONV (repeat)~~

List the risk factors for PONV (30%). Evaluate methods to minimize PONV (70%)

Q8 – CSWS/SIADH discussion

Describe the clinical and biochemical features of CSWS, and SIADH (60%). What are other common causes of hypotonic hyponatraemia? (40%)

Table 3 Clinical and biochemical features of the SIADH and the CSWS

Feature	SIADH	CSWS
Clinical <i>key is volume difference.</i>		
Central venous pressure	Normal or increased	Decreased
Orthostatic hypotension	Absent	Present
Body weight	Increased	Decreased
Fluid balance	Positive	Negative
Plasma volume	Increased	Decreased
Biochemical <i>Urine is relatively dilute and the flow rate is often high in cerebral salt-wasting syndrome; urine is usually very concentrated and the flow rate is low in SIADH</i>		
Serum sodium concentration	Low	Low
Serum osmolality	Decreased	Increased or normal
Urinary sodium concentration	High	High <i>ie losing lots of water too</i>
Urinary osmolality	High	High or normal
Sodium balance	Equal	Negative
Plasma urea and creatinine	Decreased or normal	Increased
Haematocrit	Decreased	Increased

Table 2 Common causes of hypotonic hyponatraemia

Hypovolaemic hyponatraemia	Normovolaemic hyponatraemia	Hypervolaemic hyponatraemia
CSWS	SIADH Traumatic brain injury Subarachnoid haemorrhage Other central nervous system pathology Drug induced Pulmonary pathology	SIADH
Diuretics (including osmotic)	Thiazide diuretics	Congestive cardiac failure
Ketonuria	Adrenal insufficiency	Nephrotic syndrome
Diarrhoea/vomiting	Hypothyroidism	Cirrhosis
Sweating	Iatrogenic	Acute renal failure
Blood loss		Iatrogenic
Adrenal insufficiency		

NB.

Hyponatraemia very easy classification!!

Hypotonic hyponatraemia:

- **Hypervolaemic:** SIADH, heart, renal, liver, iatrogenic, pregnancy
- **Normovolaemic:** SIADH, adrenal insuff, hypothyroid, iatrogenic (hypotonic fluid), thiazide, other drugs: PPI, antibiotics, SSRIs, AEDs,
- **Hypovolaemic:** CSWS, diuretics, D/V, Ketonuria, Sweats, bleed, adrenal insuff (esp. Addison's), Burns, Pancreatitis, trauma

Pseudohyponatraemia (isotonic or hypertonic):

- Hyperlipid, hyperprotein, severe hyperglycaemia

Invx:

- For all: Na/urine osmol, urine Na, BGL, TFT, urine dip (protein/ketone), cortisol/ACTH

- Consider: ECG, CXR, abdo USS, staging CT, Echo, short synacten test

Q9 – Spinal cord blood supply (repeat)

Describe the blood supply of the spinal cord (50%). Explain the determinants of spinal cord perfusion (50%).

Q10 – PICC line discussion (repeat)

Outline your procedures for insertion and management of a PICC line.

Eddie Coates' SAQ session – 2016

Q1 – High risk extubation

Describe your strategies for recognizing and managing high risk extubation (60%). Outline the use of a re-intubation system you are familiar with (40%).

Use DAS guideline on difficult extubation

Stratify risk for extubation

- difficult airway? Reintubation difficult?
- Ability to oxygenate?
- Any other risk factors?

Optimise condition – ABC

- **Patients** – **phys, pharm, anatomy**: ABCDE – ensure adequate reversal of muscle relaxant – aim TOFR>0.9
- **Other factors** – location, assistant, monitor, equipment

Ask – Is it safe to remove the tube? If yes, then may proceed to below:

Use high risk extubation strategy –

- LMA exchange
- Remi extubation
- Cook AEC
- Awake extubation

If not, then need postponing extubation for elective extubation or tracheostomy

Postop: consider HDU/ICU care.

NB.

Table 3 Sequence for 'low-risk', deep extubation. Deep extubation is a technique that should be reserved for spontaneously breathing patients with uncomplicated airways and only performed by clinicians familiar with the technique.

- 1 Ensure that there is no further surgical stimulation
- 2 Balance adequate analgesia against inhibition of respiratory drive
- 3 Deliver 100% oxygen through the breathing system
- 4 Ensure adequate depth of anaesthesia with volatile agent or TIVA as appropriate
- 5 Position the patient appropriately
- 6 Remove oropharyngeal secretions using a suction device, ideally under direct vision
- 7 Deflate the tracheal tube cuff. Airway responses such as cough, gag or a change in breathing pattern indicate an inadequate depth and the need to deepen anaesthesia
- 8 Apply positive pressure via the breathing circuit and remove the tracheal tube
- 9 Reconfirm airway patency and adequacy of breathing
- 10 Maintain airway patency with simple airway manoeuvres or oro-/nasopharyngeal airway until the patient is fully awake
- 11 Continue delivering oxygen by mask until recovery is complete
- 12 Anaesthetic supervision is needed until the patient is awake and maintaining their own airway

Table 4 Sequence for LMA exchange in 'at-risk' extubation.

- 1 Administer 100% oxygen
- 2 Avoid airway stimulation: either deep anaesthesia or neuromuscular blockade is essential
- 3 Perform laryngoscopy and suction under direct vision
- 4 Insert deflated LMA behind the tracheal tube
- 5 Ensure LMA placement with the tip in its correct position
- 6 Inflate cuff of LMA
- 7 Deflate tracheal tube cuff and remove tube whilst maintaining positive pressure
- 8 Continue oxygen delivery via LMA
- 9 Insert a bite block
- 10 Sit the patient upright
- 11 Allow undisturbed emergence from anaesthesia

Table 5 Sequence for use of a remifentanyl infusion for 'at-risk' extubation.

- 1 Consider postoperative analgesia. If appropriate, administer intravenous morphine before the end of the operation [126]
- 2 Before the end of the procedure, set the remifentanyl infusion at the desired rate
- 3 Antagonise neuromuscular blockade at an appropriate phase of surgery and emergence
- 4 Discontinue anaesthetic agent (inhalational agent or propofol)
- 5 If using inhalational agent, use high-flow oxygen-enriched gas mixture to aid full elimination and monitor its end tidal concentration
- 6 Continue ventilation
- 7 Laryngoscopy and suction should be performed under direct vision if appropriate
- 8 Sit the patient upright
- 9 Do not rush, do not stimulate, wait until the patient opens their eyes to command
- 10 Discontinue positive pressure ventilation
- 11 If spontaneous respiration is adequate, remove the tracheal tube and stop the infusion
- 12 If spontaneous respiration is inadequate, encourage the patient to take deep breaths and reduce the infusion rate
- 13 When respiration is adequate, remove the tracheal tube and discontinue the remifentanyl infusion, taking care to flush residual drug from the cannula
- 14 After extubation, there is a risk of respiratory depression and it is essential that the patient is closely monitored until fully recovered
- 15 Remember that remifentanyl has no long-term analgesic effects
- 16 Remember that remifentanyl can be antagonised by naloxone

Table 6 Sequence for use of an airway exchange catheter for 'at-risk' extubation.

- 1 Decide how far to insert the AEC. It is essential that the distal tip remains above the carina. If there is any uncertainty about the position of the tracheal tube tip, its position relative to the carina should be checked with a fiberoptic bronchoscope before AEC insertion. An AEC should never be inserted beyond 25 cm in an adult patient
- 2 When the patient is ready for extubation, insert the lubricated AEC through the tracheal tube to the predetermined depth. Never advance an AEC against resistance
- 3 Employ pharyngeal suction before removal of the tracheal tube
- 4 Remove the tracheal tube over the AEC, while maintaining the AEC position (do not advance the AEC)
- 5 Secure AEC to the cheek or forehead with tape
- 6 Record the depth at the teeth/lips/nose in the patient's notes
- 7 Check that there is a leak around AEC using an anaesthetic circuit
- 8 Clearly label the AEC to prevent confusion with a nasogastric tube
- 9 The patient should be nursed in a high dependency or critical care unit
- 10 Supplemental oxygen can be given via a facemask, nasal cannula or CPAP mask
- 11 The patient should remain nil by mouth until the AEC is removed
- 12 If the presence of the AEC causes coughing, check that the tip is above the carina and inject lidocaine via the AEC
- 13 Most patients remain able to cough and vocalise
- 14 Remove the AEC when the airway is no longer at risk. They can be tolerated for up to 72 hours [137]

DAS: Advanced extubation techniques

Q2—Emergence delirium (repeat)

A 9yo is scheduled for their second ENT operation. The previous surgery was complicated by extreme emergence delirium. What are the features of emergence delirium? What techniques are employed to minimize this complication?

Q3—Mastectomy analgesia (repeat)

Evaluate the various modes of periop analgesia in women undergoing mastectomy for breast Ca.

Q4 – Bullying

You are SOT in a regional hospital. A trainee confides that he is experiencing bullying from a particular consultant. Define bullying and describe your duties and considerations when addressing this situation.

Bullying

= repeated unreasonable behavior directed towards a person or group that creates risk to health and safety

- Intimidates, offends, degrades, insults others (physical or psychological).

SOT duties/considerations to address situation

- Refer to ANZCA policy on bullying, discrimination and harassment
- Verify the information
 - Assess if bullying is actually not constructive feedback or personal conflict
 - Obtain detailed account of the complaint

- **Employing Body** must be involved
 - Written **warning** if appropriate
 - Legal opinion may be required esp if patient harm is possibility (as bully may lead to unsafe environment with poor communication among staff)
- **Offer counselling/mentoring** to trainee
- **Intervention** with Consultant:
 - **Meeting** (+/- support person) – don't use **STONED**, doesn't fit here
 - **-support, take time** to listen, **outline** team roles, **notify** Consultant for meeting, **E-escort**, Document.
 - Be prepared to deal with denial, anger, threats
 - **Outline** complaint, legal requirement by hospital/DHB

NB:

- S-support
 - Seek guidance on policy for suspension, management, rehabilitation.
- T-timely, take time
- O-outline role, event, management, outcome ;
 - Or outline complaint, legal requirement by Hospital/DHB;
 - Or outline consequence if fail to comply
- N- notify or need for further meeting/intervention?
- E-escort
- D-Document

Q5 – HELLP, obs emergency, difficult airway

You are called by your reg (BTY2) on obs call. A term primip 29 yo w HELLP syndrome requires cat 1 EMCS. Your reg is concerned that her airway looks challenging due to BMI 41 and marginal TMD. She's had garde 2 laryngoscopy from lap chole 2 years ago.

Her p_{lts} 1 hour ago = 109. Yesterday, they were 112.

BP is 170/110. She has headache and hyperreflexia.

What will be your advice to your reg? outline and justify your anaesthetic mx of this situation.

- Issues here: Cat1CS, PET/HELLP, cerebral oedema, high BMI, probable difficult airway, surgical bleed
- Advice to Reg =
 - Get help while I'm coming in immediately
 - MDT – Obs/Haem/Paeds/Midwife
 - Pre – assess pt/consent, prep anaes – personnel, equipment, drugs, Surgical concern? Need experienced Surgeon, Fetal concern? Why cat 1?
 - If no immediate maternal concern, then wait for me to arrive so Reg doesn't kill patient; Intrauterine resus
 - If immediate maternal concern, try to optimize, utilize all resources while I come in
 - Equipment: DI trolley/AFOI?, 2x big IV, fluid resus,
 - Drugs: GA/RSI drugs/airway reflex blunt, judicious fluid, TXA, DDAVP, MgSO₄, labetalol, GTN, hydralazine, neuraxial? May required MTP/cell saver/level 1 rapifuser

- Intra -
- Post – HDU/ICU

Q6 – 3 chambered chest drain (repeat)

Explain the function of a 3 chambered chest drain and its employment in blunt trauma PTX.

Q7 – prone discussion in neurosurgery (repeat)

On your elective neurosurg list is a 39yo man, BMI 39 for resection of post fossa tumour. Outline the issues in prone positioning for this case, and briefly explain physiological or practical basis of each.

Q8 – DVT prophylaxis (repeat)

A 23yo woman is scheduled for pelvic surgery. She has Factor V Leiden and hx of DVT after long haul flight 2 years ago. Describe periop mx of VTE risk.

Q9 – Paeds regional, upper limb

4yo suffered bilat complicated wrist #s (= only injuries). What regional technique might you consider here? Outline its pros/cons (60%). Evaluate performing regional asleep (40%).

Axillary/infraclav/supraclav

General pros/cons of GA vs RA

Pros

- Best analgesia, avoidance of GA – PONV, respiration, sedation, vasodilation if neruvas repair involved, ?reduced chronic pain

Cons

- **Gen**: Failure, nerve damage, LAST (although risk reduced with USS use; also can achieve faster onset, higher success rate)
- **Block** specific: phrenic nerve, PTX etc.
- **Environmental**: time consuming, need expertise

Regional asleep? Pros/cons

Pros

- No evidence to say it's more dangerous
- Neuropraxia risk GA > ?RA
- Greater tolerance, acceptance, less pain
- Easier to position, less movement,

Cons

- Need GA supervision while doing RA
- ?absence of warning from patient re: paresthesia/pain

On balance:

- awake if patient can tolerate
- but low threshold to convert to asleep RA
- do not persevere if difficult RA apparent.

Q10 – AS periop management (repeat)

72yo man at APAC for inguinal hernia repair. He's known with mild/mod AS fro echo 10 years ago. How will you evaluate his AS? 60%. How would your findings affect your approach to his mx? 40%.

Q11 – Anorexia nervosa (repeat)

What's pathophys of anorexia and how do these impact mx of an anorexic patient on ORIF hip # case?

Q12 – PACU requirement

What are the requirements of a suitable PACU?

Refer ANZCA PD**General**

- **Sufficient Personnel/Equipment:** Should include sufficient levels of equipment, staff with appropriate training/experience + roster to ensure service provision + supervision.
- **Appropriate location:** Designated area, close to anaesthesia/sedation area.

Emergency plan:

- **Emergency** call system, telephone with internal call system
- **Anaesthetist** support immediately PRN
- **Resus** – BMV, emergency airway trolley, defib, chest drains, mechanical ventilator
- **Drugs** – emergency drugs, IV access, fluids, analgesia, needle/syringes
- **Power:** Emergency power supply

Other Equipment/drugs –**DAMSIP**

- O2 outlet, flowmeter, suction, power outlets, light, areas to mount equipment
- Monitor – sats, NIBP, ECG, temp, stethoscope, EtCO2, 12 lead ECG, NMT, art line, CVL
- Warming device, cupboard, refrigerator for drugs/blood,
- Access to ABG, Lab, diagnostic imaging services
- Bed-tiltable both ways, easy to tilt, brakes, sit up, secure rails, IV pole, mattress

Staffing**Experience/Training/Supervision/Ratio**

- Trained, with experience
- Charge nurse
- Supervision for trainees or unexperienced nurses
- **1:1** for unconscious patient
- **1:3** for stable conscious patient

Management

- protocolised
- daily checking of equipments/drugs/resus trolley
- anaesthetist supervision with easy contact access at all times
- discharge criteria
- Anaesthetist – instructions, prescription of ongoing therapies, ensure patient's safe before leaving PACU, authorize patient's discharge from PACU.

Design specifics:

- Part of OT/Procedural suite
- Easy access without need for scrub
- Adequate ventilation (OT standard)
- Adequate space for bed (9m²)
- Easy access to patient's head
- At least 1.5 spaces per OT
- Uninterrupted view of patients
- Nursing station, utility room, storage, scrub facilities; access to electronic management system for viewing of investigations eg. lab, radiology
- clock

Q13 – ARDS (repeat)

Describe pathophys of ARDS and 2 possible mechanisms in this patient (70%); (femoral # when escaping from house fire, now has ARDS in ICU). How will you ventilate this patient? (30%)

Q14 – Preemptive, preventative analgesia (repeat)

Explain the terms preemptive and preventative analgesia. Give examples of both in your clinical practice and briefly outline the presumed physiology involved.

Preventive analgesia: defined as analgesia that persists beyond the expected duration of action of the intervention (ie **more than 5.5 half-lives of the medicine**)

- and most likely rely on **reducing peripheral and central sensitization**
- eg. **ketamine** (level 1), **gabapentin**, **LA** (level 1), epidural analgesia.
- Mabe with Mg,

Preemptive analgesia: Preoperative treatment is more effective than the identical treatment administered after incision or during surgery.

- “timing” of a single analgesic intervention reduces effect of peripheral & central sensitization.
- Eg. epidural analgesia (level 1), possibly with ketamine.

NB.

- In clinical practice, preventive analgesia appears to be the most relevant and, of pharmacological options, holds the most hope for minimising chronic pain after surgery or trauma because it decreases central sensitisation and “wind-up”.
- to maximise the benefit of any analgesic strategy is that the active intervention should be continued for as long as the sensitising stimulus persists (ie well into the postoperative period)
- Central and peripheral sensitisation affects both the intensity of acute pain and the persistence of pain well into the postoperative period and beyond.

Q15 - HIT

Outline pathophys and presentation of HITT as it may pertain to a vascular pt in postop period (60%). Describe the mx of this diagnosis (40%).

HIT = heparin induced thrombocytopenia

- if concurrent thrombosis = HITTS (thrombosis syndrome)
 - (3 parts): Platelet Factor -4 + heparin + IgG complex on platelet surface ⇒ inappropriate activation of platelets ⇒ hypercoag state ⇒ thrombosis
- 1-6% incidence (much less with LMWH)
- present 4-14 days after 2nd exposure to heparin
- diagnoses 4 Ts:
 - Thrombocytopenia = >50% fall
 - Timing - within 5-10 days starting heparin
 - Thrombosis - venous or arterial
 - no other explanation
- Tests:
 - antibody test - best
 - platelet activation assay
 - clinical scoring systems available to quantify risk
- more frequent with bovine lung heparin

Features:

2 types:

type 1 (non-immune, little significance)

- transient/self limiting ↓ platelets to ~50
- = direct heparin induced plt agglutination ie non immune mechanism

type 2 (immune-high mortality!)

- platelet ↓ to ~10 & assoc with thromboembolic phenomena
- immune mediated plt aggregation by IgG & IgM antibodies
- development of antibodies to platelets following 1st heparin exposure. ie occurs on next exposure
- = type II hypersensitivity reaction – ie cytotoxic
- usually resolves rapidly on stopping heparin (can last for 2/12)
- must avoid UFH forever, but can use LMWH (with caution)

Rx:

- stop heparin immediately
- use alternative – lepirudin or fondaparinux
- postpone warf until platelets >150 (initiate without loading dose)
- monitor for thrombosis
- avoid platelet transfusions

NB.

- Heparin action: Potentiates formation of AT3-2a complex. Inhibits 10, 2, at high dose also 12, 11, 9.
- Protamine: 1mg~100iu, give no more than 50mg every 10mins, guided by time of dose for heparin + ACT.

Sam Paul's SAQ session – 2016**Q1- OSA/OHS**

Outline risk factors, causes, methods of diagnosing OSA and OHS (80%). Explain their relationship (20%).

OSA:

- = partial or complete obstruction of the upper airway during sleep → O₂ desaturation, hypercapnia, and cortical microarousals in an attempt to restore upper airway patency.
 - Assc w increased risk of OHS, HT, IHD, CCF, CVA, metabolic syndrome.

Risk factors (=all patient)

- STOPBANG – Pressure (don't specify number), age >50, Neck >40, BMI >35.
 - >3 = high risk; >5 = very high risk;
 - STOP bang very specific, but not sensitive enough.
- **Others as per CEACCP:**
 - Excess alcohol intake
 - Smoking
 - Pregnancy
 - Sedentary: Low physical activity
 - A/T: Tonsillar and adenoidal hypertrophy
 - Craniofacial abnormalities (e.g. Pierre Robin, Down's syndrome, acromegaly)
 - Neuromuscular disease

Diagnosis

- **PSG-**
- (4) EEG/ECG/EMG-chin+leg/EOG.
- (3) Sats, nasal/oral airflow, chest/abdo efforts.
- (2) Snoring volume/video record
- AHI = episode / hour; >5, 15, 30 defines mild, mod, severe OSA.
 - Apnoea = >10sec
 - Hypopnea = dec flow by 30% or desat by 4%.

OHS

OHS affects control of breathing.

- **Defined** as obesity + hypoxaemia during sleep + hypercapnoea during day; resulting from hypoventilation from reduced ventilatory response to carbon dioxide.
- Increased risk of pulm HTN.
- Depressant drugs, including many anaesthetic agents and analgesics, accentuate this.
 - Has different pattern of PSG (consistently low) cf. OSA (ups/downs)

Risk factors:

- BMI 30 ~10%; 40 ~20%.

OSA vs OHS:

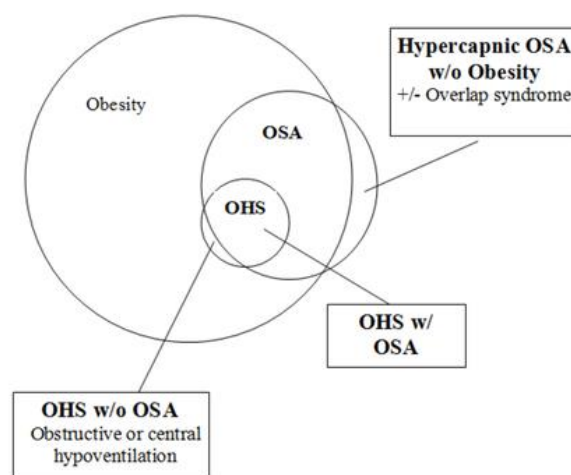
The obesity hypoventilation syndrome, although discreet from OSA, is often found in the same individuals with severe OSA (ie end-stage OSA, Auckland course)

- OHS is 'end-stage' of OSA
 - CO₂ sensitivity now decreased
 - By definition have chronic raised PaCO₂ with raised HCO₃⁻
- resp acidosis on ABG + HCO₃⁻ raise to compensate
- High risk pulm HT and CHF
- Very elevated perioperative risk of badness

NB.

- Long term CPAP is helpful, however No evidence for short-term preop CPAP, but familiarization helps. Also stops disease from getting worse (Auckland).
- OSA by itself isn't risk factor for pulm HTN. But end stage OSA ie OHS is. **However if HCO3 is normal, it rules out OHS. (NPV = 97%)**
- **Can preoxygenate to ET 90% O2 with 10cmwater CPAP for 3-5 mins + 25deg reverse Trendelenburg.**
- **PACU dc criteria:** when **sats is baseline** and **no desaturation when left undisturbed**. Otherwise have a **monitored bed for continuous sats monitor**.
- If considering for **Day surgery??**, ASA guideline can help –
 - Considers OSA **severity**
 - Invasiveness of **surgery**
 - **Opioid** requirement
 - Observed in **PACU** for **additional 3 hours**; and if OSA seen, for additional 7 hours. Recommendation is same following RA as GA (expert opinion only)

Hypercapnic Sleep Breathing Disorders



Q2- scleroderma discussion

Outline periop anaesthetic implications of scleroderma

Systemic Sclerosis (ABC-renal)

- = autoimmune mediated widespread collagenous deposition; varied severity
- **2 major types:**
 - limited cutaneous form = commoner 60%, milder: **CREST**: Calcinosis (calcium deposit in any soft tissue), Raynauds, Esophageal dysfunction, Sclerodactyly (localized thickening and tightness of the skin of the fingers or toes) and Telangiectasia
 - Limited to face, and skin upto elbow without chest, abdominal or internal organ (except oesophagus)
 - **diffuse cutaneous form** = systemic sclerosis; more aggressive; widespread skin hardening & internal organ involvement; high mortality

Anaesthetic implications:

- **A:** ↓ mouth opening; C-spine movement; **reflux** care.
- **B:** Fibrosing alveolitis; RLD.
- **C:** "Raynauds >90%
 - HTN & pHTN
 - myocardial fibrosis
 - arrhythmias
 - pericardial effusions"
- **D:** at increased risk of chronic pain; may have difficulty with using PCA
- **E:** Ensure warm to avoid Raynaud's exacerbation.
- Renal: "CRF
 - HTN renal crisis"
- **GI:** Reflux ++
- **Immune:** strict asepsis
- **MSK:** difficult cannulation

NB.

	RA (ABCD-renal-haem)	Anky Spond (ABCD-renal-eye)	SLE (clot, infection, vasculitis)	Systemic Sclerosis (ABC-renal)
Prevalence (%)	1	0.15	0.03	0.001
Airway & intubation	1 C spine unstable/AAS 2 TMJ arthritis 3 Cricoarytenoid arthritis → Glottis stenosis/larynx obstruction or rarely: amyloid/nodules	1 TMJ arthritis 2 Occult C-spine #s / AAS 3 cricoarytenoid arthritis 4 Cx kyphosis	not usually tricky; watch for airway oedema	↓mouth opening
Resp	Fibrosing alveolitis pleural effusions nodules on CXR bronchiolitis obliterans (rare) costo-chondral disease, reduced compliance.	Fixed chest wall apical fibrosis (1%) CPR difficult	LRTI PE pleuritis pulm fibrosis	Fibrosing alveolitis
CVS	IHD (association), amyloid infiltration of myocardium, restrictive pericarditis, conduction abnormalities, valve pathology (AR), Raynauds	AR (1%) MV & arrhythmias = rare	Raynauds IHD (arteritis) pericarditis endocarditis	Raynauds >90% HTN & pHTN myocardial fibrosis arrhythmias pericardial effusions
Neuro	Periph neuropathy Radiculopathy Myelopathy	Cauda equina (rare) myelopathy, AAS (rare)	Cranial/Periph neuropathy (arteritis) Psychosis Seizures Stroke esp AntiPhos3	
Renal	mild CRF (common)	amyloid	glomerulonephritis	CRF HTN renal crisis
GI	Drug induced gastritis	Drug induced reflux	nonspecific abdo pain Nausea mesenteric vasculitis	Reflux ++
Haem	↓Hb - drug & disease Felt's syndrome (splenomegaly & ↓WCC) Infection risk	↓Hb - drug & disease	Antiphospholipid syndrome ↓Hb ↓platelets clot or bleed risk both likely	

Neuraxial Blocks	Often difficult infection risk	Difficult- lat approach required ↑ risk epidural haematoma	Check coags Infection risk	
Others	vasculitis; assoc w Sjogrens: dry eye, scleritis	Eye: Conjunctivitis and uveitis	Skin: and joint involvement common, oral and pharyngeal ulceration	

Q3—Paediatric general management planning (repeat)

7month old having elective inguinal hernia repair. Outline and justify anaesthetic management.

Q4- nutrition assessment

How can periop nutritional status be assessed (30%) and how can it be managed in periop period (70%)?

Two key risk factors that predispose to adverse peri-op outcomes are obesity and under-nutrition.

- **Undernutrition** – increased risk of surgical complication, infection
- **Obesity** – associated with increased intra- and post-op complications.

Assessment:

Hx

- **Intake** – type, frequency, quantity
 - N/V, diarrhea, dysphagia?
 - Weight loss?
- **Surrogate** measures – lethargy, mood, function
- Increased **demand**? – sepsis, undergoing major surgery?
 - **PMHx**: active cancer? Anorexia nervosa.
 - Seeing **Dietician**?

Exam

- Obese?
- Malnutrition? – muscle wasting, fragile skin, frailty, poor balancing, cachexia?
 - Features of anorexia nervosa? – CVS, Resp..etc.

Ivix

- Anaemia?
- UECr – severe electrolyte imbalance?
- LFT – protein/albumin level
- Coagulopathy w impaired hepatic synthesis of factors?

Screening tools available with some validity; in general include questions: (bluebook)

- have you **lost weight** without trying?
- if yes, **how much** (kg)?
- have you been **eating poorly** because of a decreased appetite?

Periop mx:

MDT input:

- **Identify** 'at-risk' patients - undernourished or obese.
- Special:

- Consider pre-op **immune-enhanced formulas** in patients undergoing GI surgery for malignancy.
- **Early** return to PO intake as soon as practical; use multimodal PONV prophylaxis strategies.
- Early input by **Dietician** for daily balance assessment +/- intervention.

Undernutrition:

- **Nutrition intervention: tailored nutrition plan** (intake, expected surgical insult and demand).
 - Adequate optimisation not always possible, however even intervention as **little as 5-7 days of nutritional support**, to prepare patient to endure surgical insult from a metabolic perspective, is helpful.

Obesity:

- Use of **strict low-calorie diets** to facilitate rapid pre-op with loss becoming commonplace despite lack evidence
 - Limited evidence for very-low calorie diet pre-op in cancer surgery - primary concern is rapid loss of lean muscle mass.

Other relevant considerations:

- **ERAS** (nutritional component: continue CHD drink until 2 hour preop) have lead to improved **glycemic control**, lowered level of **insulin resistance**, more rapid return of **bowel function** and reduced **length of stay**. (but leave out CHO loading in diabetic patients)
 - Consider **early return** to enteral intake ie <48 hours.
 - Trial En when viable in patient requiring specialised nutrition support post-op. Limit PN to patients unable to have EN.

NB.

- Controversial re: PN in malnourished patients undergoing GI surgery (commence pre-op for 5-7 days, continuing post-op in patients unable to tolerate EN) – although recommended by ASPEN.
- ESPEN (European Society Parenteral and Enteral Nutrition) endorse use **immune-modulating formula** in elective upper GI surgical patients.
- **arginine, omega-3-fatty acids, glutamine** and other antioxidants.
 - Nutrients positively modulate immune response, influence gut function and attenuate inflammatory response post-op in GI cancer patients. Improvement in short-term outcomes (reduction in post-op infection and shorter length of hospital stay).
- But controversial in ICU patients – worse outcome shown by some study

Q5 IABP discussion (repeat)

Describe principles of using IABP (50%). What are indications and contraindications to use of IABP (50%)?

Q6 Myasthenia Gravis discussion (repeat)

What are clinical features of myasthenia gravis? (30%). What are the important aspects of management of MG during lap cole? (70%).

Q7- premed discussion (repeat)

List indications (+ eg) for premed for surgery (60%). Discuss pros/cons of sedative premed in day surgery.

- Analgesia
- Anxiolytic
- Antiemetic
- Antisialagogue
- Anticholinergic – atropine esp in paed when sux is used
- Amnesic
- Antacid – ranitidine, Na citrate, omeprazole
-
- Decrease SNS response – BB
- Anticoagulant – clexane
- Anti-glycaemic – basal insulin etc.
- Anti-hyperlipid – statins

Q8- pacemaker discussion (repeat)

Outline pacemaker classification (40%) and periop management of patient with pacemaker (60%).

Q9- Venous air embolism (repeat)

Describe features (30%) and management of suspected venous air embolism (70%).

Features

If awake – dyspnea, impending doom

Q10- POCD (repeat)

Outline risk factors (40%), prevention and treatment (60%) of post op cognitive dysfunction

Q11- Fatigue

Outline guidelines to minimize fatigue in an anaesthetist

ANZCA welfare doc (primarily) + PD (simple principle)

Strategies

- **supports**
 - have mentor, maintain network, avoid work isolation join department or private practice group, CPD for ongoing network.
 - Recognise high stressful situation and get more support
- **self-care**
 - ABC mental health:
 - A ct-be active biosychosocially
 - B elong, join social group
 - C ommitt, to hobbies, skills, volunteer, contribute
 - Don't HALT

- Don't be hungry, angry, late, or tired to work
- Have regular breaks
- I'M SAFE (free from effects of)
 - Illness, medication, stress, alcohol, fatigue, eating.
- Regular assessment of insight and take action if seeing warning signs.
- Develop stress mx activities: hobby, exercise, read...etc.
- **health care**
 - make formal appointments to see GP as required, don't do corridor care
 - don't self-care or medicate esp need follow up of effect
 - have a GP and have regular visit; be a patient.
 - Be mindful of family history
- **work organization**
 - be mindful of list arrangement, avoid unbalanced frequent high stressful list; be fair with colleagues
 - you're an 'expert' on par with any other specialists; don't treat like a slave
 - regular appropriate sick leave, annual leave
 - maintain CPD, skill, knowledge – regular conferences, courses
- **home organization**
 - ensure appropriate home help as required
 - maintain regular breaks with family, with kids, with partner (eg. 'date night')

Need help?

- Colleague, mentor, SOT, Employee assistance program, DHAS (doctor health advisory service) ANZ, Departmental Welfare officer, Psych Liaison, GP. SIG Welfare.

Q12- Unexpected death management

There is an unexpected death in theatre. Outline your management of this event.

ANZCA welfare doc on management after mishap...

- Major mishap = "an incident which may have (a "Near Miss"), or has, potential to produce harm to a patient".
- Leads to 4 areas for aftermath consideration
 - Patient/relative (see RD 10)
 - Anaesthetic Practise / Environment
 - Staff members involved (see RD 5)
 - Root cause analysis (RCA)
- Then...
 - Equipment involved should be isolated for examination
 - Primary Team informed, Hospital admin informed, if medico-legal process implied then management, insurers, legal advisor informed.
 - FACTS, not opinions should be documented – for records, medio-legal defence, coroner's exam.
 - NEVER alter existing notes
 - Coroner's notification.
- Patient/relative: interviewed by surgeon/anaesthetist
 - Open disclosure, breaking bad news,
- Staff members involved: support system should be in place, it's responsibility of all involved; debrief, counselling, 'open door' policy for professional support eg

- GP, local welfare officer, mentor, friend, SOT; keep close watch of those involved during this time
- Other examples: Doctors Health Advisory Service (DHAS) ANZ, Mental Health Team, ANZCA Welfare rep, Lifeline etc...
- Root cause analysis: by reviewing body; identify ways to improve future care

Q13 postpartum headache

35yo 2 days postpartum now has headache. List your differentials (30%) and describe assessment/management of a post-dural puncture headache (70%).

Q14 brainstem death physiological implication (repeat)

Outline the physiological implications of brainstem death following SAH in a patient listed for organ donation

Q15 post heart transplant issues (repeat)

50yo with orthotopic heart transplant 10yr ago now for elective non-cardiac surgery. Outline issues and describe how these affect anaesthetic management.

April-2016, 57.7%

Q1 weakness after TKJR, spinal, FNB (repeat), 71%

A 65-year-old patient with type 2 diabetes is unable to dorsiflex her left foot 24 hours after undergoing a left total knee joint replacement under spinal anaesthesia and a left femoral nerve block.

Discuss the possible causes of this problem. (50%)

Outline how you would manage this situation. (50%)
(report)

- Know existence of **anaesthetic** and **non-anaesthetic** related causes.
- Has an ordered approach to assessment, investigation and management.
- Comment: FNB has nothing to do with dorsiflexion

Q2 myotonic dystrophy discussion (repeat), 65%

A 30-year-old patient with myotonic dystrophy is scheduled for surgery for acute appendicitis.

Outline the important factors in the preoperative assessment of this patient. (50%)

Describe how this patient's myotonic dystrophy will affect your anaesthetic management.(50%)

Q3 safety feature of anaesthetic machine (repeat), 65%

The anaesthetic machine is designed to deliver gases and anaesthetic vapours to patients via a breathing circuit.

Outline the safety features of an anaesthetic machine.

(report)

- features present that produce accurate gas concentrations and flows.
- features to avoid oxygen running out, being insufficiently delivered and replacing it by alternative means.

- Comment: This was a big question but core knowledge for anesthetists. A pass rate of 65% was disappointing.

Q4 Lung isolation technique in L/pneumonectomy (repeat), 66%

You are asked to anaesthetise an adult patient for a left pneumonectomy.

Describe the different methods for lung isolation in this patient, including the advantages and disadvantages of each.

Q5 remifentanyl discussion (repeat), 66%

Outline the pharmacological features of remifentanyl. (50%)

Describe how these features can be utilised when using remifentanyl in clinical practice.

(50%)

(report)

A - Describes clearly the nature of short duration of action and potency/analgesic capacity

B - clearly describes the benefits of rapid onset and offset. Includes decent discussion of at least one clinical use (eg. haemodynamic, cough or respiratory control) or discussion touches on multiple clinical aims.

Q6 spinal cord ischaemia in EVAR (repeat), 68%

Outline risk factors for spinal cord ischaemia in a patient undergoing endovascular repair of a thoraco-abdominal aortic aneurysm. (50%)

Discuss your approach to minimising spinal cord ischaemia in this setting. (50%)

Q7 brain injury issues and risk minimization (repeat), 72%

Outline the pathophysiological insults that exacerbate a primary brain injury following head trauma and indicate how can they be minimised.

- All about minimizing hypoxia, hypotension, ICP

Q8 pyloric stenosis (repeat), 80%

A six-week-old term baby weighing 4.0 kg requires pyloromyotomy for pyloric stenosis. How would you assess the baby's hydration status? (50%)

Detail and justify your resuscitation regimen. (50%)

Q9 oxygen delivery device (repeat), 62%

Considering the indications and limitations, compare the rationale for the use of:

—Hudson masks

—Non-rebreathing masks

—Nasal prongs

Q10 pulm HTN discussion (repeat), 77%

A patient with known primary pulmonary hypertension is scheduled to undergo elective umbilical hernia repair.

How will you assess the severity of this patient's pulmonary hypertension? (50%)

How does this diagnosis affect your perioperative management of this patient? (50%)

Q11- smoking cessation strategy, 79%

As a perioperative physician, what strategies can you offer to assist a patient to cease smoking tobacco and how will you best communicate them?

ANZCA PD on smoking in relation to perioperative care

Assisting patient to care

- **AAR** –
 - **ask** – even if answer is known, to use opportunity to emphasise importance of smoking cessation,
 - **advice** – highlight specific periop risks,
 - **refer** eg. Quitline, smoking cessation support groups.
- **Mx: Use adjuncts to assist quit process:**
 - **Non-pharm**
 - Counselling, rapid smoking aversive therapy
 - **Pharm**
 - Most effective = Champix (Varenicline)
 - NNTs long term abstinence
 - **zyban** (bupropion) = 11
 - **champix** (varenicline) = 8
 - **nortriptyline** = 11
 - **NRT**: nicotine replacement therapy = 14

How best to communicate

- AAR
- Empathy, but emphasise on benefit of quitting on biopsychosocial grounds
- Offer cessation adjuncts such as NRT + info card on quitline

http://www.saferx.co.nz/Smokefree_Pharmacotherapy.pdf

(report)

discuss non-pharm + pharm agents

Q12- Brainstem death physiology , 25%

Outline the physiological implications of brainstem death following subarachnoid haemorrhage in a patient listed for organ donation.

(report)

Recognises key potential issues that are likely to be needed to be managed if patient is going to provide suitable organs for donation:

1. **hypoperfusion** of vital organs
2. some aspect of **hypothalamic dysfunction**
3. the physiological effect of the increase **in intra-cranial pressure**

(comment)

Many candidates provided information on brain stem death assessment, liaising with relatives, consent, etc. with resultant low scores.

Q13- ECT physiology (repeat), 58%

Describe the physiological responses to electroconvulsive therapy (ECT). (50%)

Discuss how these affect your anaesthetic management of a patient undergoing ECT. (50%)

Q14- hypertension management (repeat), 80%

An obese 55-year-old female has undergone sleeve gastrectomy which concluded one hour earlier. The post anaesthetic care unit has called to report a blood pressure of 190/110 mmHg.

Discuss your approach to the evaluation and management of the hypertension.

- Assess + consider differential + stabilize if symptomatic (headache, chest pain, dyspnea)
- General management

Q15- preop anaemia management (repeat), 67%

A 40-year-old patient who is scheduled for elective total abdominal hysterectomy has a haemoglobin level of 80 g/l.

Describe your preoperative assessment and optimisation of this patient's anaemia.

October-2015, 61.4%

Q1 – upper limb regional

A 65 year old female patient requires open reduction and internal fixation (ORIF) of her fractured distal radius and ulna. She has no other injuries and is otherwise well but is keen to avoid general anaesthesia.

a. List the options for nerve block to provide regional anaesthesia in this patient. (30%)

b. Describe the advantages and disadvantages of each of these options. (70%)

Need to cover: median, ulnar, radial, MSC + medial forearm cutaneous nerve

Options for UL RA (distal forearm): **brachial plexus = C5-T1 (lumbar = L1-4)**

- Supraclavicular
- Infraclavicular
- Axillary
- Interscalene

Pros/cons of each block

- **Interscalene (block C5-7; C8/T1 hard to block)**
 - Superficial nerve bundles to block, relatively easily seen on USS, can possibly relieve tourniquet pain; rapid onset
 - Cons: Phrenic N palsy problematic esp if patient has preexisting lung disease; dyspnoea
 - Horner's syndrome
 - RLN block (15%)
 - Risk of intrathecal/epidural injection, pneumothorax, vertebral artery puncture.
 - Incomplete block of inferior trunk hence miss ulnar N. (15%)

- **Supraclav**
 - Rapid onset, good efficacy; tourniquet pain relief
 - Cons: can still get phrenic nerve block, Horner's and risk of PTX (5%), SC artery puncture. **Can still miss ulnar N.**
- **Infraclav**
 - Good for catheter placement, can relief tourniquet pain
 - Deeper block, likely more difficult on USS; PTX. But much less risk of phrenic N block, Horner's; difficult to compress artery if punctured.
- **Axillary:**
 - No risk of PTX or Horner's; easy to compress artery/vein if punctured
 - Cons: need to be able to abduct shoulder and externally rotate arm.
 - Multiple injections to capture all 4 nerves.
 - May not be enough for medial forearm cutaneous Nerve → need LA top up.
 - Less hygienic location/infection risk, less ideal for catheter placement.

NB:

Interscalene: aim for C5 to C7; 8/T1 hard to block, **can have muscle bridge b/w C7&8** ->miss C8 & T1

Digress:

General advantages of UL RA:

- possible avoidance of GA and associated risk/complications
- minimisation/avoidance of opioids
- post-op analgesia

General disadvantages of UL RA:

- bleeding/infection
- nerve damage - temporary or permanent
- vascular damage
- potential for block failure
- LA toxicity (esp if intravascular injection)
- residual block postop with safety concern;

These risks many can be reduced by use of USS and/or PNS

Q2 – heart transplant

A 50 year old patient has received an orthotopic (back to the correct place) heart transplant 10 years ago. He now presents for elective non-cardiac surgery. Outline the issues a prior heart transplant may present for the anaesthetist AND describe how these will affect anaesthetic management.

Issues:

- **Denervation:** Heart denervation; loss of ANS response/baroreceptor reflex
 - At resting HR **~80bpm** and no baroreceptor reflex → likely haemodynamic lability on induction, to volume loss and atropine is ineffective.
- **Pacemaker:** Likely presence of pacemaker and arrhythmia
- **Ongoing disease process, silent MI:** Likely ongoing disease present that caused the initial cardiomyopathy needing transplant ie. CAD, amyloidosis; and may have silent MI due to denervation.

- **Immunosuppression** therapy/complications – cyclosporine, azathioprine, steroid.
 - Cardiac, resp, renal, bone marrow dysfunction, risk of severe sepsis.

Management:

- Preop
 - **MDT** input with Cardiologist, Transplant Team, cardiac PM technician on periop planning – find out if any issue of rejection.
 - **PPM**: Cardiac pacemaker assessment to ensure optimal functioning.
 - **Optimise**: Optimize underlying cardiac dysfunction / chronic lung disease / renal dysfunction, anaemia/thrombocytopenia, if present from immunosuppression therapy.
 - Establish plan for periop use of immunosuppression therapy
 - **Careful airway** assessment as patient may have tracheal anastomosis (if heart/lung transplant done) Consider if intubation is required? Is tracheal stenosis present? Risk of trauma to anastomosis with intubation?
 - Consider suitability for regional eg. peripheral surgery.
- Intraop:
 - **A-** If intubation is required, consider shorter tube so not to contact tracheal anastomosis.
 - Maintain physiological parameters:
 - Optimize preload, contractility
 - Maintain afterload to maintain Coronary blood flow.
 - HR resting ~85-95bpm.
 - Use direct acting sympathomimetic eg. phenylephrine, noradrenaline if required to maintain MAP within 20% of patient's baseline BP.
 - **C-** If regional used, NAB may result in marked fall in BP due to heart denervation – optimize preload and support MAP with vasopressor.
 - **Steroid** supplement as required.
 - **Strict asepsis**, antibiotic prophylaxis
 - **Pharm: supersensitivity**: adenosine, adrenaline, noradr
 - **No effect**: digoxin, atropine, no reflex HR changes to GTN, panc, sux, neo.
- Postop
 - Impaired cough likely due to phrenic N, RLN palsies → early chest physio, mobilization to minimize risk of LRTI.
 - Close monitor of silent MI.
 - **Can get epilepsy** (? Mechanism)

NB:

Betablocker, alpha blocker act as expected.

Original file has lots of explanatory note.

Drug	Effect in recipient	Mechanism
Adenosine	4-fold increase in sinus and atrioventricular nodal blocking effect	Denervation supersensitivity
Digoxin	Minimal delay in atrioventricular nodal conduction	Denervation
Atropine	No effect on heart rate	Denervation
Epinephrine	Increased contractility and chronotropy	Denervation supersensitivity
Norepinephrine	Increased contractility and chronotropy	Denervation supersensitivity
Isoprenaline	Normal chronotropic effect	
Glyceryl trinitrate	No reflex tachycardia	Baroreflex disruption
Pancuronium	No tachycardia	Denervation
Succinylcholine	No bradycardia	Denervation
Neostigmine	No bradycardia	Denervation

Q3 – blood conservation

An adult patient is scheduled for a major operation during which significant blood loss is expected.

Describe strategies you would consider peri-operatively when planning to minimise blood loss and transfusion requirement.

Techniques rely on:

1. **Optimise**: increasing patients red cell mass
2. **Minimise**: decreasing peri-op blood loss
3. **Rationale**: optimising blood transfusion practices

Preop

- **Inx** and Rx **anaemia** and **coagulopathies**
- **optimise** pre-op Hb
 - **Iron**: If iron deficient and time allows (ie 2 months period before surgery) and patient tolerates: use oral iron (if time allows, and patient tolerates/is compliant). If surgery **<2 weeks away**, use IV infusion
 - **EPO**: If criteria meets, consider EPO – eg. renal failure anaemia, with no other contributing causes. Consult Renal Physician.
 - **Time**: may need to delay surgery until optimised (if appropriate)
- **Minimise**:
 - **STOP Drugs**: stop anti-platelet and anticoagulants if appropriate (warfarin, clopidogrel, ?NSAIDS in ortho surgery)
 - **Surgery**: Minimally invasive surgery
 - **Anaesthesia**: TXA, good physiology control to avoid triad of doom (acidosis, hypothermia, coagulopathy) – see below
- **Rationale**: Pre-op **autologous** donation

Intraop

1. **anaesthetic** factors:
 - **regional** vs GA - regional may reduce blood loss due reduced arterial and venous pressures
 - volatile vs **TIVA** (?TIVA assoc with reduced blood loss)
 - reduce **venous ooze** - avoidance of venous congestion (positioning), high intra-thoracic pressures (IPPV), hypercapnia and hypothermia
 - consider **permissive hypotension** – but balance potential risk of ischaemic cerebral and cardiac complications. Ideally keep BP low normal for patient.
 - Consider **antifibrinolytics**; tranexamic acid;
2. **surgical** factors:
 - **extent**: quick and meticulous surgery
 - **technique**: minimally invasive surgical technique
 - **local vasoconstriction**

- topical haemostatic agents
 - tourniquet use
3. autologous transfusion: which include 2 techniques:
- cell-saver
 - collection and re-infusion of autologous red cells lost during surgery
 - Consider use when large volume shift expected eg. upper GI open surgery, open heart surgery.
 - **CI:** bacterial contamination surgical field, malignant ds, presence of fat or amniotic fluid (although safety in Obstetric is increasingly established)
 - disadvantages: expensive, labour-intensive
 - acute normovolaemic haemodilution
 - peri-op collection whole blood with simultaneous infusion crystalloid to maintain normovolaemia. Re-infused into patient once surgical blood loss ceased (Consult with transfusion specialist + local guideline)
 - **advantages:** no testing, minimal risk ABO-incompatible transfusion; minimises allogenic transfusion
 - **Cons:** **CI:** LV impairment, unstable angina, severe AS, critical LMS ds.
 - Controversial evidence regarding its benefit.

Postop

- Consider carefully transfusion triggers
- **TRICC:** Hb 70 is a common target for transfusion; higher targets have not been shown to confer additional benefit.

NB:

Re: cell saver: indications: can provide equivalent of 10U bank blood per hour (open heart, vascular, spinal joint replacement, liver transplant, obstetric haemorrhage)

- **Re: haemodilution indication:** indications: (UK) potential surgical blood loss >20% of blood vol with pre-op Hb >100

Q4 – Trigeminal Neuralgia

a. Describe the clinical features of trigeminal neuralgia (50%)

b. Discuss the efficacy of the treatment modalities available for this condition. (50%)

a) Trigeminal neuralgia features

- Pain, paroxysms of intense stabbing, lancinating or burning pain usually lasting seconds in the distribution of the trigeminal nerve (CN V)
- commonly unilateral, affecting the mandibular (V3) and maxillary (V2) divisions of the nerve; although ophthalmic branch (V1) may also be affected.
- Pain may recur many times throughout day, with features of allodynia, hyperalgesia.
- Higher risk of condition if >50 yo.

b) Management = of two main types

- Membrane stabilising agents eg.
 - Carbamazepine = 1st line (start at 100mg/12h po: max 400mg/8 hours;
 - Phenytoin 200-400mg/24 hours po
 - allow 1-2 weeks for treatment to take effect, continue with

- other antineuropathic analgesia eg. gabapentin, TCA, ketamine, tramadol
- other multimodal analgesia. Paracetamol, NSAID, opioids.
- Psychosocial input
- Surgery
 - To: peripheral nerve vs trigeminal ganglion or nerve root (if compressed by tortuous blood vessels as it enters the brainstem)
 - surgical decompression/ablative procedure
- Others: Lignocaine infusion or magnesium infusion for 1-3 weeks (AP book)
- spontaneous remission may occur

NB:

EXTRA: often idiopathic, trigeminal sensory or motor deficits are not demonstrated unless the cause is structural eg in MS, vascular malformation or cerebello-pontine angle tumour

Q5 - awareness

A 61 year old woman is scheduled for total laparoscopic hysterectomy. She has had an episode of awareness under anaesthesia during previous laparoscopic surgery.

a. What are the risk factors for awareness? (30%)

b. How would you minimise this patient's risk of awareness during her operation? (70%)

Awareness = ie 'explicit recall of operative events during GA'.

- serious complication of anaesthesia with long term psychological sequelae
- explicit and implicit memories: explicit memory is recalled spontaneously, implicit memory may be provoked by subsequent post-operative events
- incidence 0.03% ie 1:5000-1:10,000 (~half of epidural abscess); 1:500 in GACS 10x less than general

Causes for awareness under GA

- Breaks down into:
 - Human factor: Accidental
 - Unrecognised equipment failure
 - Reduce practitioner vigilance (eg. empty vaporiser)
 - Patient: Abnormal patient physiology (Patient)
 - Masked physiology eg. complete HB, hypothyroidism, BB use, ANS neuropathy
 - Patient's SNS stimulation is 'masked' from alerting Clinician
 - Drug resistance eg. genetic variability, excessive ETOH, chronic pain, regular use of illicit substances
 - Also: pyrexia, hyperthyroidism, obesity, anxiety, Young age
 - Higher MAC requirement; previous awareness
 - Poor CVS reserve eg. severe AS or heart failure
 - Anaesthesia: Poor technique (Anaesthesia)
 - Underdosing eg in LSCS
 - Unexpected DI + insufficient anaesthesia

- TIVA (failure of drug delivery or poor understanding of pharmacology, esp combined with NMBD)
- Surgery: Special circumstances
 - Specialist surgery eg. cardiac, obs, paed, rigid bronch, trauma
 - Life threatening emergencies eg. severe bleed, septic shock, cardiac/peri-arrest

minimise risk

- pre-operative counselling with an anaesthetist for previous awareness episode.
 - reassurance and counselling
 - pre-medication with benzo's or use of IV at induction reduces the incidence of awareness in the high risk period a few minutes after induction
- intraop:
 - vigilance on depth of anaesthesia appropriate for patient: eg. assurance of MAC of 0.8-1.0 + setting audiovisual alarm on MAC range using end-tidal control.
 - only use neuromuscular blocking agents when necessary
 - use BIS or entropy + audiovisual alarm.
 - regular checking of clinical signs eg. hypertension, tachycardia, lacrimation and salivation (but has low sensitivity and specificity)
 - Consider isolated forearm technique, however this technique may not be reliable and may be late response.
- Postop:
 - Assess patient recall using of the Brice Questionnaire

NB:

Brice Questionnaire (Awareness)

1. What was the last thing you remembered happening before you went to sleep?
2. What is the first thing you remembered when you woke up?
3. Did you dream or have any other experiences whilst you were asleep?
4. What was the worst thing about your operation?
5. What was the second worst thing?

Q6 – OSA in Paed AsTs

A three year old child requires an adenotonsillectomy for obstructive sleep apnoea. Outline and justify your peri-operative management plan.

Intro:

- OSA = sleep disorder, pauses in breathing, or instances of shallow breathing during sleep.
- Issue: Periop biggest danger is impairment of resp drive / hypoxic arousal by sedatives;
- Aim = minimise sedation and ensure vent/oxygen maintained until adequate recover.

Management

Pre –

- **Assess** severity of OSA – does it impact on development, learning, growth of child? Poor attention, behavioural problem, hyperactivity, enuresis? Any daytime somnolence? Previous treatment?
- **Careful airway assessment**. Paediatric OSA assoc w increased resp complication: desaturation, laryngospasm, and developing airway obstruction during induction. Need to have airway management strategy well considered beforehand.
- **Recurrent tonsillitis? Active infection?**
- exam: **right ventricular failure**
- Invx: sleep study, **polysomnography**, **polycythaemia**.

Intra

- Consider **Careful premed** carefully, as risk of sedation/resp depression.
 - May use ketamine PO 5mg/kg or smaller dose of midaz PO 0.25mg/kg but monitor for resp depression in preop holding bay.
- **A: preferably SV technique**: careful induce with SV technique, gas induction, then intubate with RAE or use LMA.
 - **EMLA before aim for IV induction**. This allows establishment of adequate anaesthetic depth rapidly for intubation/securing airway and rescue drugs to be given effectively
- D:
 - polymodal analgesia to opioid spare. Can use NSAID without increased bleeding risk (except for ketorolac)
 - polymodal antiemetic (dex 0.15mg/kg IV / ondans – 0.1mg/kg IV)
- Extubation: **careful suction, left/lateral head down for extubation**.

Post

- Monitor by experienced PACU team.
- Child should be admitted for overnight observation with continuous pulse oximetry.
 - **Admission criteria for OSA As+Ts.**
 - age<3,
 - severe OSA ie AHI>10 or desat to 80% comorbidities)
- Ongoing monitor postop in HDU/ICU maybe required depending on severity of OSA and progress in PACU.

NB:

Schneider model (**validated for children above the age of 1years**); less than 30kg use Kataria, >30kg use Schneider

Q7 – intraarterial injection management

A drug has been unintentionally administered through a radial arterial line in an awake patient. Describe your management of this situation.

IA injection:

- **Pain, ischaemia, thrombosis**
- Depending on the drug – complications may vary from pain, hyperaemia, swelling,

- vaso-spasm, arterial damage, extravasation from damage,
- thrombosis, ischaemia, gangrene
- Aim = to maintain perfusion distal to the site of injury + manage pain to maintain patient comfort.

Immediate Management

- **Identify** the drug injected
- **analgesia**: IV analgesia to keep patient comfortable. E.g iv Fentanyl
- **Vasodilator** (4 drugs + RA)
 - Keep the arterial line in-situ – allows for **intraart injection of papaverine (sm relaxant or LA or saline flush)** +
 - **1% lignocaine 5ml + papaverine 40mg** flushed by **heparin saline**
 - **iloprost**-prostacycline analogue to vasodilate and platelet-inhibit;
 - **calcium channel blockers**,
 - **SNS block of the limb**. Consider Stellate ganglion block (but no evidence for improve outcome) and risk of insertion should be considered
- **Venous drainage**: **Elevate the arm**, improve venous and lymphatic drainage
- Consider **heparinisation** or anticoagulation to keep the artery patent if the drug is known to cause thrombosis
- **Other drugs to consider**:
 - **aspirin/methylprednisolone** to inhibit thromboxane,

Subsequent Management:

- **plastic / vascular surgeons** if drug is known to cause serious effects like thrombosis or ischaemia – thrombectomy or necrosis washout debridement, repair etc.
- **Ongoing observation** – for pain/paresthesia, ischaemia, infection.

Long term:

- **Multimodal analgesia**, watch for potential **CRPS**
- **Explain** to patient briefly what has happened – full explanation will need to be done once acute situation has been managed.
- **Document** event + plan for ongoing care, monitor.
- Local WebAirs event, **QA** discussion

NB: management of extravasation vs. IA injection – know the compare/contrast (CEACCP)

- **Stop, disconnect** infusion, **aspirate** as much as possible from cannula
- **Leave cannula** in but **label clearly** not to use
- **Monitor**: Mark area of extravasation if visible, photo
- **Elevate** limb
- **Treat**: (4 drugs + RA)
 - **Saline** wash
 - **Steroid** via IA IV to reduce inflammation
 - **Hyaluronidase** to help with dispersing extravasate: 1500 units are dissolved in 1–2 ml of saline and injected into the area of extravasation
 - **Phentolamine**, 5-10mg in 10ml, given by SC injection into area extravasation

- RA SNS block
- Plastic Surgery
- Open disclosure, QA, document

Q8 - anaphylaxis

A 20 year old patient has been successfully resuscitated from suspected anaphylaxis. Describe your immediate and longer term post crisis management.

I'd refer to ANZAGG post-resuscitation management guideline for anaphylaxis.

Immediate

- HDU/ICU admission depending on severity of anaphylaxis for monitor of recurrence.
 - ~20% patient can have biphasic anaphylaxis course which may last up to 36 hours.
- Supportive:
 - BC: Maintain adequate oxygenation >92% sats + MAP (within 20% of patient's baseline BP)
 - D: Steroid: hydrocortisone 2-4mg/kg or 0.1-0.4mg/kg dexamethasone.
 - PO/NG antihistamines to be considered.
 - Investigate: Tryptase at 1 hour, 4 hour and 24 hours, as well as routine ICU blood checks.
 - Document thoroughly event + report to Webairs.

Longer term

- Referral to ANZAAG affiliated Allergy Testing centre. Testing to be done 6 weeks post event to allow histamine to replenish.
- Patient counselling regarding event and educate re: risk minimization strategies in future:
 - List of potential triggers/medications to be given to patient and for future medical care reference; until definite allergy testing, potential triggers should be avoided.
 - Medical alert in patient's medical record. Medical bracelet for patient once trigger is known.
- If prolonged resus, patient's at high risk of neurocognitive dysfunction and should refer for neurocognitive testing and monitor recovery.

NB:

- Don't use IV promethazine as may worsen hypotension.

Q9 = CVL access

A patient requires vascular access for three weeks.

A) list the advantages and disadvantages of PICC line compared to a percutaneous CVL.

B) outline the methods by which you would minimise the risk associated with the placement of PICC

PICC

Advantages:

- Can last longer than CVL
- Less catheter occlusion

- Lower risk of **pneumothorax**
- Lower risk of **arterial** damage (arterial puncture, arterial dilation) c/f with CVL in the internal jugular vein; or damage to **nerves** nearby eg. IJ-RLN, vagal N, brachial plexus.
- Lower risk of CLABSI

Disadvantages:

- Higher incidence of **DVT** in long term use
- **Wrong route**: Catheter can enter subclavian or neck veins
- Infection risk would be lower than if femoral CVL but PICC associated CVL **infection** can still occur
- **Less lumen** than CVL.

Risk minimization

Environment of insertion:

- OT/PACU rather than ward where maintaining asepsis may be difficult due to more crowded space for line trolley.

CLAB bundle: ANZCA endorsed guideline: ANZICS on CVL insertion and maintenance:

- strict aseptic technique (gown, gloves, mask, large sterile drape and maintaining sterility from nearby equipment)
- *consider using chlorhex impregnated patch (good evidence for its effect)*

Avoid risk of arterial puncture:

- *Consider using **USS** if vein not readily visible.*
- *if suspected of arterial puncture, check blood gas result.*

Avoid cardiac complication / arrhythmia, tamponade.

- **measure depth** of insertion.
- Avoid inserting catheter beyond estimated depth.
- Avoid forceful insertion of catheter.

Maintenance of line function:

- **Clean** thoroughly then apply clear dressing.
- **Confirm placement** of PICC with **CXR** to ensure tip in good position: in SVC parallel to vessel wall and no pneumothorax or pericardial enlargement.
- Daily **site check** and maintain sterility.
- Aseptic technique when using PICC line.
- Consider **hep saline lock** if prolonged inactivity expected to minimize thrombosis.
- remove PICC as soon as it's no longer required

Facility's skill maintenance: staff involved in caring of patient's with CVL should have education on it's care

Q10 – NIM tube in parathyroidectomy

At surgeons request you have placed a Nerve Integrity Monitor tube for monitoring recurrent laryngeal nerve function. The surgeon is unable to elicit a response from the monitor when stimulating the RLN.

- **Explain how the NIM tube monitors nerve function (30%)**
- **Outline the possible causes of being unable to elicit a response and how you would manage them.**

NIM

- = specialised ETT which allows monitoring for laryngeal nerve injury during surgical dissection
- **EMG** system
- useful for identifying **RLN**

- placed that colour coded contact band is placed between vocal cords
- complete circuit made with electrodes on skin above sternum
- small current 0.5-2mA electrical current with sterile probe placed on anatomical site in question.
If in contact with nerve:
 - depolarisation of nerve \Rightarrow motor function, vocal cords contract \rightarrow movement sensed by NIM ETT \rightarrow audiovisual display of response.

Causes for no response and management:

equipment issues:

- incorrect placement of NIM - sensing coloured band part; or dislodged during position change
- dislodged electrode pad on sternum.
- Lead disconnection: monitor, surgical probe, NIM tue.
- Equipment failure due to poor maintenance.
- Power failure
 - Managed by preop check of integrity of equipment parts
 - Regular maintenance of equipment
 - Systemic check of all parts to ensure connection and correct placement of ETT (using FOI or VL)

nerve transmission:

• NM blockade will ↓ or prevent sensing:

- Lignocaine gel lubrication to ETT used.
- nebulised or trans-tracheal lignocaine
- superior LN blocks
- NDNMBs given -
- DNMBs eg sux which hasn't been metabolised yet
 - Clear communication with anaesthetic assistant regarding use of NIM tube and avoidance of lignocaine to airway.
 - Avoid SLN block.
 - May use NMBD initially, but monitor recovery with NMT to ensure TOFR>0.9
 - Obtund airway reflex with remifentanyl during case.
- the RLN may have already been transected \Rightarrow prevent transmission of signal to muscles governing action of vocal cords \therefore nothing will be sensed
meticulous technique and vigilance by Surgeon throughout case.

Q11 – Post endarterectomy complication

Describe the complications that can occur post carotid endarterectomy and how these may present in the post anaesthesia care unit (PACU):

Complications

Specific to CEA:

- Airway compromise: oedema due to dissection close to airway.
 - Present as: SOB, resp distress, stridor, wheeze, desats, agitation, resp arrest.
- Bleed – haematoma (5-10%)
 - Present as swelling over wound site (can be concealed too), airway compromise, tachycardia, hypotension (although less likely due to small compartment in neck, would see other changes earlier – eg. airway compromise)
- CVA – from ischaemic stroke
 - Present as neuro deficit (sensory/motor/speech/visual disturbance), LOC, dyscoordination.
 - Hyperperfusion syndrome can present as haemorrhagic stroke.

Other General complications

- B: desaturation from resp depression, atelectasis
- CVS instability: present with tachycardia, hyper/hypotension, cardiac ischaemia.
- D: emergence agitation

- PONV, pain

Q 12 – chronic alcoholism

A 47 year old man presents to the emergency department with acute abdominal pain requiring a laparotomy. He is known to have chronic high intake of alcohol. Describe how chronic alcohol misuse will affect your perioperative management of this patient.

Issues of chronic alcoholism

- Association with chronic liver disease, cirrhosis, alcoholic ketoacidosis, malnutrition, hypoglycaemia.
- Increased MAC.
- Risk of withdrawal periop, risk of seizure due to lower threshold
- Other comorbidities eg. IHD, ETOH cardiomyopathy, delayed gastric emptying, anaemia. Coagulopathy (malnutrition, chronic liver disease)
- If intoxicated will not be able to consent properly.

Periop management

Pre

- Careful assessment for comorbidities as mentioned above.
- Routine important assessment – AMPLE history, airway assessment.

Intra

- A: RSI
 - If cardiomyopathy, need cardiac stable induction: ketamine, fentanyl, vasopressor (but balance risk of emergence agitation with ketamine)
- BC: Then maintain oxygenation >90%, MAP to within 20% of baseline.
 - Monitor bleed + coagulopathy
- D: monitor adequate depth of anaesthesia: clinically-HR, BP, pupil, lacrimation + with BIS to <60;
 - Maintain anaesthesia with atrac (organic independent metabolism), des (minimize hepatic metabolism)
- Monitor: art line (and monitor electrolyte/BGL) + CVL.
- Sepsis care: Maintain good hygiene care to minimize sepsis, antibiotic prophylaxis.
- Extubate when fully awake.

Post

- x2-5 ↑ ed risk of post op complications
- consider need for ICU/HDU post op esp if septic with liver failure.
- monitor for alcohol withdrawal & potential seizures & delirium; use CIWA monitor chart benzos as per local protocol
- B vitamins - to prevent Wernickes Encephalopathy
- Multimodal analgesia:
 - reduced dose paracetamol, opioids as per liver/renal function.

Q13 - ERAS

a. Describe the principles behind an “Enhanced Recovery After Surgery (ERAS)” programme for colorectal surgery. (50%)

b. Outline the key steps you would take in setting up this programme in your hospital.

A principle of ERAS in colorectal surgery:

- **Definition:** Fast-track surgery / ERAS is a **multimodal, evidence** based, perioperative care **protocolised pathway** designed to achieve early recovery for patients undergoing major surgery.
 - = involving **MDT** and comprehensive planning of patient care throughout perioperative **all stages**.
 - Shown to **reduce postoperative complications** by up to 50%
- **Key anaesthetic goals included detailed:**
 - **Preop: (3)**
 - patient **assessment, education, optimization**
 - **avoidance of preop dehydration** +/- use of **carbohydrate** drinks;
 - **bowel prep** is increasingly discouraged
 - **Intraop: (3)**
 - **drain, NGT avoided** when possible;
 - **minimal invasive surgical** technique utilized;
 - **GDFT** -
 - **Postop: (3)**
 - **multimodal analgesia / antiemetic**; close collaboration with APMS;
 - **early enteral feed**;
 - **mobilization/PT** input.

B. key steps in setting up ERAS programme

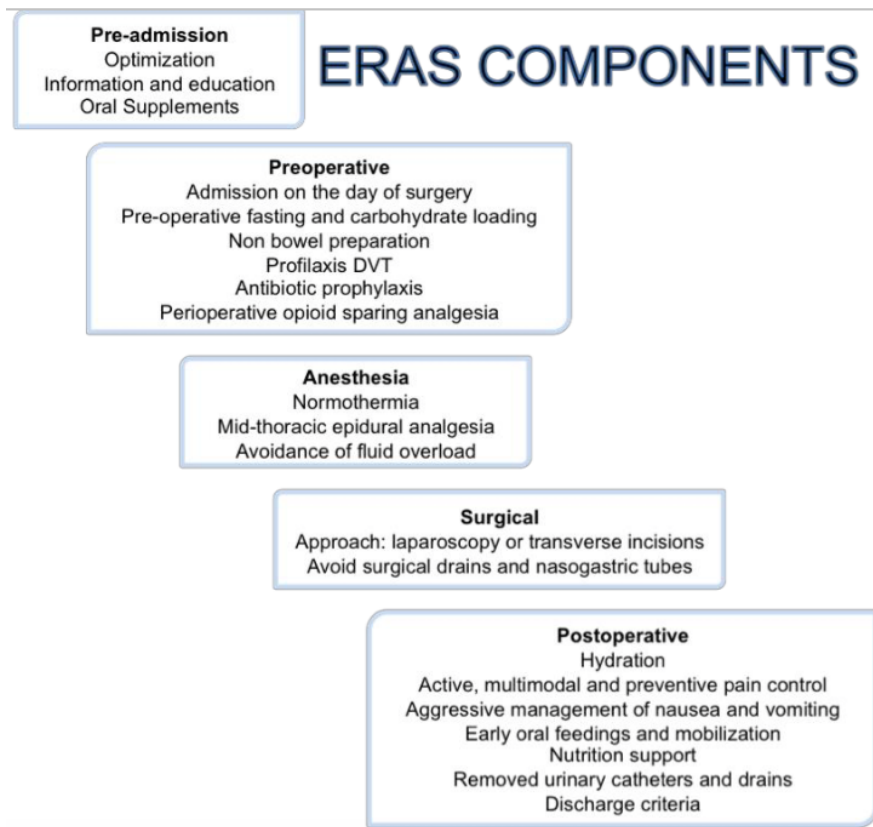
Setting up programme requires:

- tight, coordinated **teamwork** in perioperative care.
- active involvement of the **management/clinical** team

Multi-disciplinary teams need to be established and will include:

- **administrators/managers**
- **Project Leader / Educators** on the ERAS pathway to **MDT** team:
 - doctors, nurses, PT, OT, SW,
 - set project targets and set time line
- **quality assurance** personnel
 - to maintain an interactive audit system,

- overseeing of patient preop assessment, periop management, outcome, and cost of health care.



Q14 – Hyperkalaemia in burn

A 65 year old female patient is two hours into debridement and skin grafting for a 40% burn to her thorax and legs. She is intubated and paralysed. An arterial blood gas now shows:

pH 7.12 PaO₂ 150 PaCO₂ 45 HCO₃ 15 K 6.3

- Outline the potential causes for this patient's hyperkalaemia.
- Describe your management of this hyperkalaemia.

Answer: (see CEACCP article Anaesthesia and intensive care for major burns)

A potential causes include

- **Increased K** from: haemolysis from significant burn; rhabdo, compartment syndrome, use of sux
- **Reduced excretion**: renal impairment, esp due to rhabdomyolysis, SIRS/shock/dehydration
- **Increased cellular exchange**: metabolic acidosis, K/H exchange; 2nd to renal impairment, potential lactic acidosis due to hypoperfusion in state of hypermetabolism/SIRS/dehydration from burn;

- Carbon monoxide toxicity lead to hypoxia, lactic acidosis, H/K exchange.

B HyperK management:

- General: Ca, insulin, salbutamol, frusemide
- Trigger for management should be guided by K level + associated ECG/haemodynamic changes:
 - Timely treatment if K >6.5 or urgent tx if ECG changes eg widened QRS seen;
 - CaCl 10% 10ml + 10U actrapid with 50ml 50% dextrose over 30 mins.
- Source control:
 - Excessive K release: rhabdo-ensure fluid replacement/euvolaemia, compartment syndrome → fasciotomy
 - if rhabdo, aim UO 1-2ml/kg/hr and consider mannitol (0.25-0.5g/kg)
 - renal impairment: euvolemia; consider renal-replacement therapy if high grade renal impairment has occurred
 - CVS instability/metabolic acidosis
 - fluid resus using Parkland, +/- vasopressor
 - shock with SIRS may require vasopressor to maintain perfusion pressure.
 - oxygen therapy for COHb toxicity
 - consider hyperbaric therapy, esp in pregnancy or comatose patient

Q15 – Tranexamic acid

Evaluate the role of tranexamic acid in primary hip arthroplasty.

TXA:

- = synthetic lysine analogue which inhibits fibrinolysis, promotes clot stability, helps in achieving haemostasis;
- however benefit is balanced with potential risk of increased thromboembolism (which isn't strongly evidence based)

In primary hip arthroplasty, literature review has shown: (ceaccp Uses of tranexamic acid)

- Meta-analyses of total hip and knee arthroplasty surgery concluded that tranexamic acid reduces both blood loss and transfusion requirements and is not associated with an increase in thromboembolic events.

- Tranexamic acid appears to show a similar benefit in adult and paediatric patients undergoing spinal surgery. There is also evidence that both oral (e.g. 1.5 g 8-hourly before operation) and intra-articular (e.g. 50 mg kg⁻¹ at the end of procedure) administration may confer a benefit.

Table 2 A summary of the evidence base for uses of tranexamic acid. ENT, ear, nose and throat; GI, gastrointestinal; HAO, hereditary angioneurotic oedema

Application	Known benefits	Identified risks	Routine use supported?
Medicine			
HAO	Reduces symptom frequency/intensity	No	No
Upper GI bleeding	Reduced mortality	No	No
Drug-induced bleeding	Reduced blood loss	No	No
Emergency surgery			
Overall	Reduced blood transfusion	Uncertain	No
Trauma	Reduced bleeding, reduced mortality	Increased mortality if given after 8 h	Yes
Elective surgery			
Overall	Reduced blood transfusion	Uncertain	No
Oral	Reduced bleeding	No	Yes
Obs/gynae	Reduced bleeding	No	In chronic heavy menstrual bleeding
Cardiac	Reduced bleeding, reduced inflammation	Increased seizure rates and mortality (high dose, open chamber surgery)	Yes
Ortho	Reduced blood loss/transfusion requirements	No	Hip and knee arthroplasty, spinal surgery
Liver	?transfusion requirements	No	No
Maxillofacial/ENT	reduced blood loss in tonsillectomy/adenoidectomy	No	No
Neuro	Reduced re-bleeding in subarachnoid haemorrhage	Delayed cerebral ischaemia	No
Urology	Reduced blood loss in TURP, percutaneous lithotomy, haematuria	Clot retention	No
Chest	Reduced blood loss and transfusion requirements in chest surgery/haemoptysis	No	No

April-2015, 71.9%

Q1 – Thoracic paravertebral block, 66.3%

Describe the anatomy relevant to performing a thoracic paravertebral block. (50%)

List the advantages and complications of performing this block for a patient undergoing radical mastectomy. (50%)

Anatomy

Thoracic paravertebral space = wedge-shaped area, either side of the vertebral column.

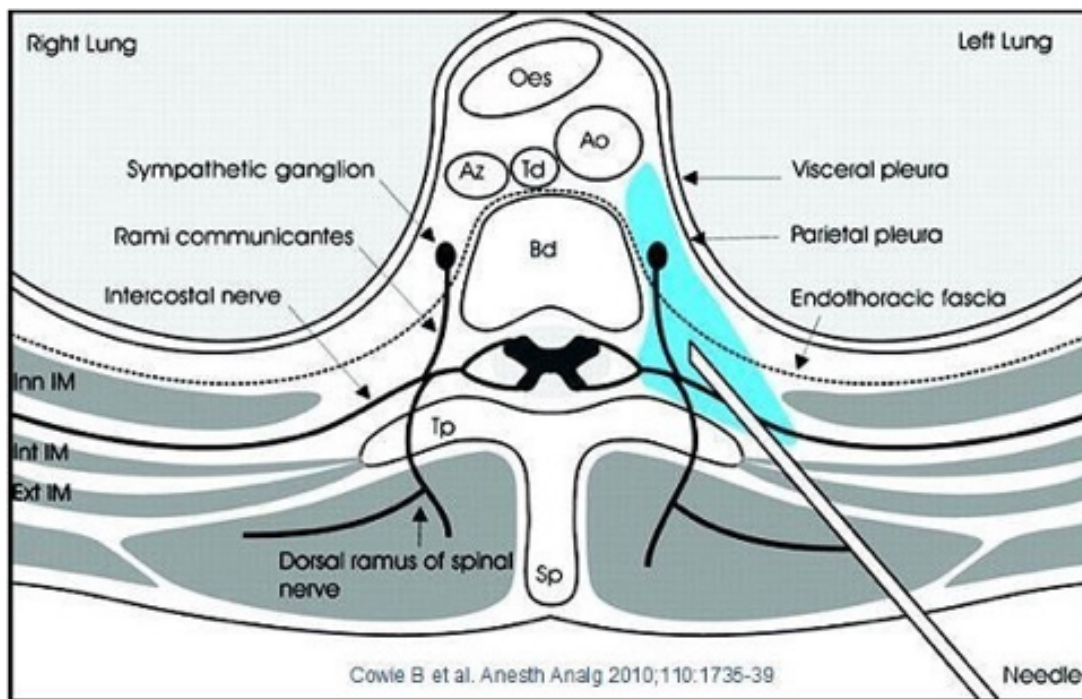
Bordered by:

- anterolaterally: parietal pleura;
- medially: the vertebral body, intervertebral disk, and intervertebral foramen; and
- posteriorly: the superior costotransverse ligament.

space contains: spinal nerve, white and grey rami communicantes to the sympathetic chain, intercostal vessels, and fat.

- Space continuous with the intercostal space laterally, epidural space medially, and contralateral paravertebral space via the prevertebral fascia.

(Draw paravertebral space)



Performing block

- directly on the **spinal nerve**,
- lateral extension → **intercostal nerves** and
- medial extension → **epidural** space through the intervertebral foramina.
- Technique: Needs insertion point is 2.5cm lateral to the cephalic aspect of the spinous process at the desired block level; contact transverse processes, walk up until no resistance felt then aim for LOR to indicate reaching paravertebral space; but not deeper than 1cm beyond TP.

Pros/cons for radical mastectomy

General:

- Mastectomy: Increased risk of **persistent postop pain**, where benefit of RA is well demonstrated to reduce risk.
- Likely benefit in breast **Ca** long term survival and ?less Ca recurrence rate.
- **unilateral** analgesia (targeted)
- can place catheter for ongoing analgesia
- opioid spare (less sedation, nausea, vomiting, and constipation)

Cf. to epidural:

- efficacy **comparable to epidural**
- relatively easy to learn and perform (cf thoracic epidural);
- lower risk of **neurological** complications
- less **haemodynamic** instability (less SNS blockade)
- less **urinary** retention

Disadvantages:

- side effects: epidural spread, sympathetic block
- complications: infection, haematoma, nerve injury, pneumothorax, LA toxicity, intravascular injection
- **intraforaminal needle passage** → risk spinal cord injury or subarachnoid injection (total spinal)

NB: Block will cover 2 levels above and below insertion point. (OHA: up to 3-5 levels)

Q2 – PONV, 58.5%

List the risk factors for postoperative nausea and vomiting (PONV) (30%)

Evaluate methods to minimise PONV (70%)

Based on ANZCA endorsed guideline on PONV assessment/management

Risk factors

- **Pt (4)**
 - Female, hx of PONV/motion sickness, non-smoking, younger age (<50),
 - Paeds: hx of POV/PONV in relative, >3 yo,
- **Aneasthesia (4)**
 - GA vs RA, volatile and N2O, postop opioids, duration of anaesthesia (>1hr)
- **Surgery**
 - Type of surgery eg. cholecystectomy, laparoscopic, gynae surgery, strabismus surgery, ENT surgery, Neuro etc.

Risk minimization:

- **Stratify**: Based on risk stratification to formulate management strategy.
- **Apfel**: Combined with using Apfel's score to guide management.
 - Low risk = 0-1RF → consider 0-1 tx. (10-20% incidence)
 - Med = 2 RF → 1-2 tx (40%)
 - High = 3 RF → 2 tx (60%)
- **Methods**:
 - **Modify risk** factors: minimize GA expose, N2O (use TIVA), opioid spare, **adequate hydration**.
 - **Multimodal antiemetic** use for PONV prophylaxis: (7 options)
 - Ondansetron (5HT3 antagonist), 4mg IV, NNT ~5
 - Balance risk of headache, constipation, potential QT prolongation
 - Dexamethasone, 4mg IV, NNT 5;
 - but balance risk with potential immunosuppression, hyperglycaemia esp in DM.
 - Droperidol (D2 antagonist), 0.625-1.25mg IV, NNT 5
 - FDA blackbox warning for potential QT prolongation, EPS, hypotension (alpha blockade) but considered unlikely at such low dose.
 - Propofol TIVA, shown to be as effective as ondansetron.
 - Cyclizine (H1 antagonist), 25-50mg IV,
 - Not available in Australia; risk of tachycardia, sedation.
 - Scopolamine patch (anticholinergic), NNT 6
 - Slower onset 2-4hours; risk of anticholinergic side effect
 - Aprepitant (NK1 R antagonist), 40-80mg
 - Limited clinical experience.
 - **Non-pharmacological** (combines with pharm approach works best)

- P6 stimulation
- Preop ginger

Q3 – Pericardial effusion management, 82.9%

A patient who is 6 weeks post cardiac surgery has a pericardial effusion requiring treatment. Outline the symptoms and signs of this condition. (70%)
Which of these features would trigger an urgent intervention? (30%)

Pericardial effusion = may cause cardiac tamponade, when pressure of the fluid accumulation in the pericardial space impairs cardiac filling.

S/S of condition depends on size of accumulation + acute vs chronic

Acute = less well tolerated

- If small, may be asymptomatic
- if large and acute, may cause worsening impairment on cardiac filling, eventually tamponade →
 - **haemodynamic** instability → obstructive shock
- Other physical signs (insensitive and nonspecific):
 - increased **CVP**
 - **Kussmaul's Sign** - distension of jugular veins during inspiration
 - **pulsus paradoxus** (decrease in SBP >10mmHg during inspiration)
 - **Beck's Triad** - **muffled** heart sounds, increased **jugular** venous pressure, **hypotension**
- **Decreased voltage on ECG.**

Chronic = better tolerated than acute, as pericardial membrane can stretch.

- If severe, will still develop symptom, often sinus tachy, SOB, jugular venous distension, hepatomegaly, peripheral oedema, fatigue

Indication for urgent intervention

- = **acute and/or severe tamponade:**
- prolonged and severe/resistant hypotension
- cardiovascular collapse
- bradycardia (vagal reflex evoked by increased intrapericardial pressure)
- sudden onset symptoms (dyspnea, chest pain, hypotension, markedly elevated JVP)

NB:

- K-sign & PP = dyssynchrony or opposing responses of R and L ventricle to filling during the respiratory cycle (aka ventricular discordance).
- electrical alternans on ECG (cyclic beat-to-beat shift in QRS axis in limb and precordial leads)

Q4 – sepsis management, 38.3%

A 40-year-old 100 kg patient presents with septicaemia of unknown cause. After receiving two litres of 0.9% NaCl (Normal Saline) as initial resuscitation the patient has the following observations:

HR 126 bpm BP 80/40 mmHg

Outline your initial resuscitation goals. (30%)

Evaluate options for ongoing fluid resuscitation at this time. (70%)

Intro:

- Patient has septic shock (severe sepsis plus hypotension not reversed with fluid resuscitation) which is a medical emergency with high risk of mortality, requiring timely source control + resuscitation.
 - Obtain blood cultures asap without delaying timely broad spectrum antibiotic, which should be given < 1 hour of recognition of septic shock

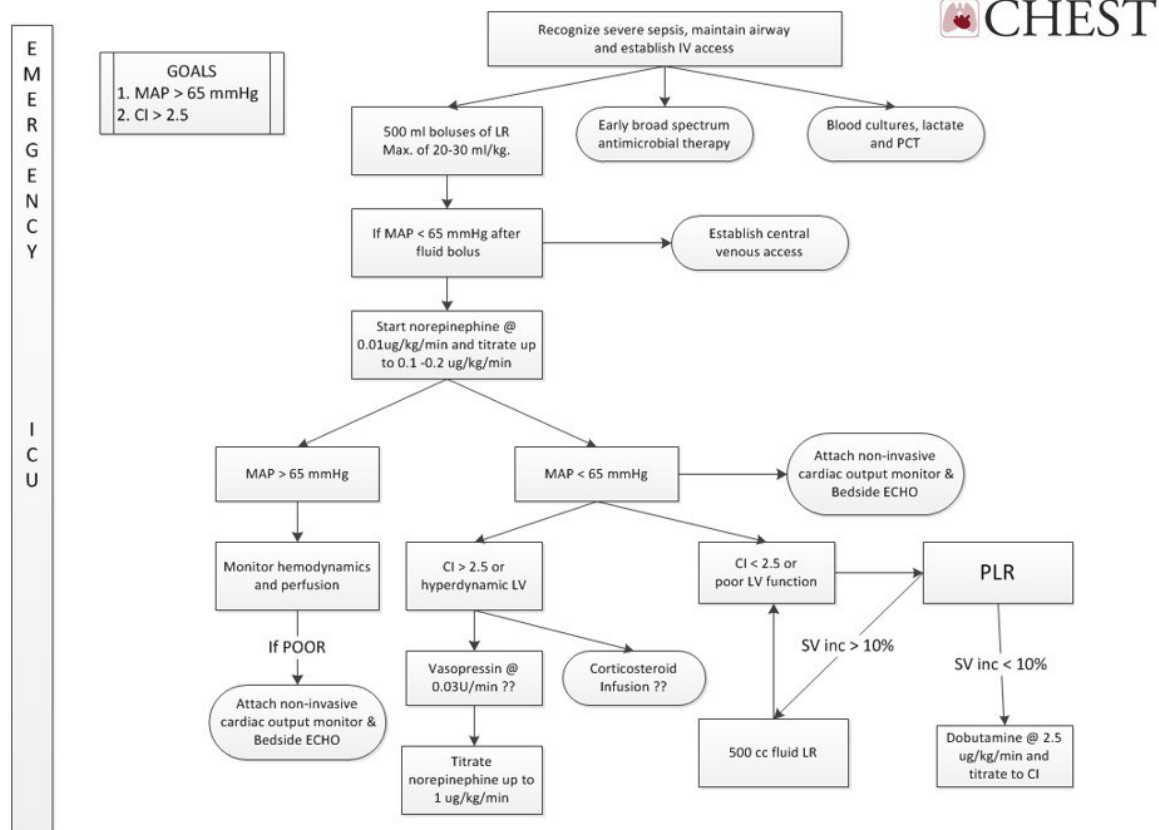
Initial resus goal

- The well known Surviving Sepsis Guidelines mandates early source control and intensive care.
- However, more recent investigations on sepsis management from the **ARISE / PROCESS / PROMISE** trials showed that resuscitation targeting CVP and SCVO2 made no difference to patient's outcome.
- My initial resus goal would then be maintaining MAP >65mmHg with vasopressor, oxygenation >90% and **preventing worsening of metabolic acidosis**.
- **If ongoing sign of poor perfusion ie worsening acidosis, then consider non-invasive CO monitor and aim for CI >2.5**
- Use of vasopressor is balanced with regular fluid responsiveness assessments – passive leg raise by elevating leg to 45 degree – if improved BP/HR is seen; would consider small volume bolus (eg. 500ml of P148).

Ongoing fluid resus option evaluation

- Type of fluid: balanced fluids eg Hartmanns or P148. Avoid large volume NaCl and assc hyperchloraemic acidosis.
- Volume of fluid: guided by evidence of fluid responsiveness, based on **ECHO, passive leg raise, arterial line pressure monitoring**.
 - However, should combine with vasopressor use and avoid large positive fluid balance; eg. noradr via CVL.
 - Consider albumin (although SAFE trial showed no difference)
- Fluid responsiveness should be **reassessed regularly** as volume status is dynamic and course of septic shock.
- In this patient, fluid responsiveness should be assessed in order to decide if further bolus should be given or to commence vasopressor.

NB:



Marik PE. Chest 2014 (in press)

Q5 – Statistics, trial design, 98.4%

You are planning a trial to evaluate the efficacy of a new drug on reducing post-laparotomy pain. Describe potential sources of bias and indicate how these can be minimised.

Bias: Systematic discrepancy between a measurement and the true value → adversely affect test results.

Potential source of bias (6)

= selection, intervention, follow up, recall, information, analysis

- **Selection** bias:
 - sample unrepresentative of population
 - controls not comparable with study group
- **Intervention** bias:
 - patients receiving more attention because of their treatment group (ie Hawthorne effect)
 - esp if unblinded comparison.
 - Blinding, ensure randomization.
- **Follow-up** bias:
 - when patients are lost to the study it may be due to confounding effect eg. less capable to continue with study due to illness
 - minimize effect by using intention-to-treat analysis
- **Recall** bias:

- patient mistaken recollection eg. ability to describe pain when very unwell post-laparotomy
 - questionnaire/interview conducted in timely manner, when patient clinically stable. Use objective assessment in combination to subjective.

- **Measurement/information bias:**

- exaggeration of effect:
 - eg it is well known that patients included in trials often do better than those not included, the patients included in the trial will have better analgesia than those not included
 - minimize by careful study design to ensure appropriate definition of inclusion + exclusion study criteria. Refer to already published high quality study during study design.
 - inaccurate or uncalibrated instruments
 - minimize by ensure working, calibrated equipment before study take place.

- **Analysis bias**

- withdrawals or design violations
 - minimize by sample-size calculation with Qualified Statistician Consult and dedicated research team to follow up patient.

Q6 – collapse post NVD, 71.5%

You are called to see a 30-year-old woman who has collapsed 2 hours post normal vaginal delivery. What is the differential diagnosis? (30%)

Outline the clinical features and investigations that would support a diagnosis of postpartum haemorrhage. (70%)

Differentials of postpartum collapse (NVD)

4H4T – in context of pregnancy

- Hypovolaemia
 - Bleeding – tone, tissue, tear, thrombocytopenia
 - Uterine rupture, abruption, placenta praevia/accrete, HELLP syndrome
 - Dehydration, compounded by epidural
 - Sepsis
 - Anaphylaxis
- Hypoxia
 - Cardiac events: peripartum cardiomyopathy, myocardial infarction, aortic dissection.
- Hypoglycaemia
- Hypothermia
- Thromboembolism
 - Amniotic fluid embolus, pulmonary embolus, air embolus, myocardial infarction;
 - CVA or intracranial haemorrhage
- Toxicity
 - **LA**, **magnesium**, **Eclampsia** and **pre-eclampsia**; drug error with opioids.

- Tension PTX / Tamponade

Determination of PPH as diagnosis – clinical/invx

History:

- Obstetric history:
 - pregnancy complications increasing PPH risk?
 - PET, bleeding diatheses (such as thrombocytopenia), foetal macrosomia, obesity, twin pregnancy, low lying placenta, uterine malformation eg fibroids,
 - Labour complication?
 - VBAC? Uterine rupture? prolonged labour, instrumental delivery, history of trauma to birth canal, incomplete placenta, eclampsia given post-partum
- PMH: inherited coagulation abnormalities eg von willebrands disease, factor VIII or IX deficiency
- Meds: any anti-coagulant administration

Examination:

- Haemodynamic instability? Tachycardia, hypotension, pallor, increased work of breathing, presyncope.
- Observed blood loss postpartum: on bed, on floor (maybe concealed)
 - PPH = EBL >500mL (OHA); or 1000ml of blood loss in the first 24 hours following delivery.
- fundus: firm and central?
- evidence of clotting abnormality: bleeding from IV line sites; petechiae/purpura?

Investigations:

- FBC: anaemia, platelet count
- U&E: renal impairment and or deranged liver profile consistent with pre-eclampsia or HELLP. (haemolysis checked by haptoglobin, LDH).
- Uric acid: suggestive of pre-eclampsia
- Coagulation profile: including fibrinogen levels and fibrin degradation products

Q7 – Chronic Pain management postop, (repeat) 74.6%

An elderly patient is scheduled for total hip replacement and has been taking oxycodone 40mg twice daily in the last six months for severe hip pain.

What issues do you anticipate with regard to her oxycodone use? (50%)

How do these issues influence your postoperative management? (50%)

(Sam's answer)

Issues:

Regular opioid use has a number of psychosocial/physiological consequences:

- Psychosocial: addiction = continued use despite causing harm and behavioural alteration; dependence: withdrawal symptoms when baseline consumption not maintained.
 - Drug seeking behaviour must be distinguished from genuine requirement of analgesia

- Physiological: increased dose requirement to achieve analgesic effect ie **tolerance**.
- Other **side effects** need to be monitored: nausea, constipation, sedation, resp depression.
- **Periop analgesia** may be difficult to control due to 'opioid use hyperalgesia, wound up phenomenon'.

Mx:

- Good preop **assessment** needed:
- **Continue regular** analgesia perioperatively including on DOS.
- **Multimodal** analgesia approach
- **Regional** when appropriate
- Postop opioid requirements **may be up to 400%** increased over baseline and prolonged requirement may be expected.
 - However **weaning of opioids must be aimed** for and planned for when appropriate
- Setting management goal together with patient – unrealistic goal of no pain is avoided, instead targetting pain level to where reasonable function is unrestricted, is more realistic.
- Consider opioid rotation.

(report)

Candidates were expected to mention the following

- Recognise the issues of chronic high dose opioid use including tolerance, dependence, addiction and side effects
- Mention the need for an increased opioid requirement, monitoring and weaning of opioid therapy and identify problems associated with opioid tolerance and withdrawal.

Q8 – penetrating eye injury management, 56.5%

A thirty-year-old man has sustained a penetrating eye injury requiring surgery. What are the key anaesthetic issues? (30%) Outline your plan of perioperative management and justify your choices. (70%)

Key anaesthetic issues:

Special point in penetrating eye injury:

- elevated **IOP** peri-operatively risks **extrusion** of the vitreous, **haemorrhage** and **lens prolapse**
 - intra-ocular pressure needs to be carefully managed and avoid further rise.

Periop mx:**Preop** (patient/anaesthetic/surgery):

- IOP factors: Prevent vomiting, coughing, crying, breath holding, eye rubbing, screaming, all of which will increase IOP
 - **Reassure** patient, consider premed (balance against risk of sedation if potentially unfasted)
 - Assess **PONV** risk and minimisation strategies: ie consider TIVA, multimodal analgesia to opioid spare.

- Consider **LA** if appropriate. Is it adequacy for surgical anaesthesia? is patient's in distress? Patient able to lie flat for surgery?
 - **Usu need to assess vision postop, communicate w Surgeon**
- **urgency** of surgery? (OHA says may be able to wait); maintain position **slight head up** if possible.
- Routine important AMPLE history / airway assessment to be done.

Intraop:

- Airway-avoid sux or agents that could increase IOP
 - If unfasted, then perform modified RSI with adequate airway reflex blunt: use prop/remi/roc; avoid coughing; maintain stable haemodynamics with use of vasopressor.
- Breathing: keep **normocapnoea**; avoid hypercapnoea which increases IOP; avoid **excessive PEEP**/airway pressure to optimise venous drainage.
- Circulation – maintain BP to <20% of baseline.
- Drug: adequate **antiemetics**/analgesic; **normoglycaemic**, **normothermic**.
 - Consider **mannitol** to control IOP if requested by Surgeon.
 - Avoid **N2O**

Postop: maintain adequate oxygenation / perfusion to avoid secondary ischaemic injury to eye

NB on IOP control

P in globe, **10-20 mmHg**

Diurnal variation, up at night.

Determinants:

- **aqueous** vol (product , absorp)
- choroidal **blood** volume as sclera layer is non-compliant: up vol up IOP.
- **external** P: extraocular muscle tone.

Control:

- **aqueous**: produced by ciliary body, absorbed via **trabecular** meshwork, via Canal of Schlemm. Down drainage in up venous P, cough, strain, mydriasis. Up drain in head up, miosis, negative ITP.
- **choroid** volume: PaCO2 vasodilate, MAP.
- **extraocular**: blink,
- Drugs: mannitol, down . amiloride, down production.

Re: Sux use: (OHA: but balance with risk of aspiration, if in doubt, use sux following a large dose of induction agent which lowers IOP and reduce the transient IOP up by sux; **report discourages using sux**); avoid N2O;

Q9 – Prolonged unconsciousness postop, 83.4%

Forty minutes after a laparoscopic appendectomy has been completed, a 55 year old patient has failed to regain consciousness.

List the potential causes. (30%)

Describe your management (70%)

List causes

Anaesthetic factors (ie drugs-anaesthetics, NMB, opioids-sedatives, error)

- Excess **sedation** from:
 - Benzodiazepines:
 - Opioid
 - Anticholinergic eg. scopolamine
 - Alpha2 agonist eg. clonidine
 - Antihistamine eg. cyclizine
 - Especially if multiple agents used with sedative potential.
- Ongoing **neuromuscular** blockade:
 - inadequate reversal
 - plasma cholinesterase deficiency with suxamethonium use.
- Prolonged effect from **anaesthetics** after long duration of GA with high lipid soluble agent. Eg. isoflurane (although less likely in context of lap appendectomy)

- Central anti-cholinergic syndrome

- Anti-Parkinsonian, antidepressant and antihistamine drugs can cause central anticholinergic syndrome

Patient factors

- **Pharm:**
 - increased **sensitivity** to sedatives, eg. OSA, encephalopathy, idiosyncrasy
 - reduced **elimination** of sedatives eg. Renal failure; hepatic failure, elderly patient (which patient is not)
- **Pathophys: 4H4T)**
 - MI, CVA, hypothermia, hyper/hypoglycaemia, hyper/hypo-kalaemia, tamponade, tension pneumothorax.
 - Other electrolyte disturbance: **hyper/hypo-natraemia, Uraemia, Hypothyroidism**

Management

- simultaneous assess + manage
- Pt exam (chart) + monitor vitals
- assess **ABC** – maintain oxygenation >90% + MAP within 20% of baseline
- assess **GCS**;
- **drugs** assess NMT – give reversal agent if TOFR<0.9 and reassure patient.
- review **anaesthetic** chart and consider causes
 - any potential causative agents that can be safely **reversed**? Eg. naloxone, flumazenil, doxapram, physostigmine.
- **BGL** and treat if low or very high suggesting HHS or DKA.
- **Temp** ensure normothermia.
- **ABG** and **electrolytes**: correct any significant deranged levels.
- FBC, UECr, **TFT** – for anaemia and uremia, or thyroid derangement.
- Focused neuro exam for ?neuro deficit, pupils and consider **CT head**
- Consult **ICU** Team for further assessment and admission if ongoing LOC.

NB:

- MAC awake is consistently and approximately 30% of MAC.
- IV anaesthesia agent:
 - Typically, a reduction of 80% in the effect-site concentration is required for emergence.

Q10 – Parkinsons management, 69.9%

A 68 year-old male with severe Parkinson's Disease presents for elective right hemicolectomy. Current medications include levodopa/benserazide and selegiline (monoamine oxidase inhibitor).

What clinical features of Parkinson 's disease affect anaesthesia? (50%)

Justify your perioperative drug management plan. (50%)

Parkinson's Disease (PD) is a multisystem disorder.

- Imbalance of mutually antagonistic **dopaminergic** and **cholinergic** systems of basal ganglia.
- **Substantia nigra pigmented** cells are lost → reduced dopaminergic activity.

Clinical features

- Cardinal = **Tremor** (pill rolling), lead pipe **rigidity**, bradykinesia and **ANS instability**.
 - **Monitor tricky**: Can affect BP, ECG, oximetry monitor with tremor
 - **Positioning**: Rigidity → difficult with positioning.
- **A**: may have **flexion deformity** of neck → difficult airway
- **B** – **bulbar dysfunction** → **aspiration** risk and underlying LRTI.
- **C**: Autonomic **instability** → haemodynamic instability esp on induction/emergence.
- **Neuropsychiatric** – **Anxiety**, depression are common → watch for **polypharmacy** and interaction.
 - **Dementia** in severe disease – **Consent**, may develop acute delirium in perioperative setting.
- **GI** – delayed GI clearance → **aspiration** risk

Periop drug management

Preoperative –

- **Assess** severity of Parkinson's as well as routine important AMPLE history, ABC examination.
- **MDT**: In severe cases of Parkinson, MDT input with Neurologist/Geriatrician.
- **Pt Prep**: Continue antiparkinson regimens is important with as minimal disruption as possible.

Intraoperative:

- **A**: consider **modified RSI** if risk of GORD high or AFOI/VL if difficult intubation anticipated
 - Eg. prop/fent/roc/phenylephrine/.
- **C** Maintain **CVS stability** with use of fluid+vasopressor esp. on induction/emergence.
- **Pharm considerations**:
 - Minimise **PONV**, consider TIVA + appropriate use of antiemetics eg. ondansetron, dexamethasone.
 - Avoid drugs which may precipitate EPS – dopamine R antagonist eg. **metoclopramide, droperidol**.
 - Avoid potential drug interaction with antiparkinsonism treatment:
 - **Tramadol / pethidine vs Selegiline (MAOi)** → serotonin syndrome and hypertensive crisis.

- Vasopressor use: MAOi can potentiate the effects of both direct and indirect acting agents. **Direct acting agent** preferred, use with care. Eg. phenylephrine.
- If prolong postop fasting, consider NJ/NG to continue antiparkinson treatment. (Levodopa, MAOi are absorbed in proximal small bowel).
- If enteral route impossible, consider **ApoMorphine; ie IV** dopamine agonist, after consulting neurologist.

Postoperative:

- **Multimodal analgesia** and antiemetic to aim for early E+D, rehabilitation/mobility.
- Consider **Nurse controlled analgesia** if patient cannot use PCA due to tremor.
- Ongoing monitor of adequate oxygenation + haemodynamics (ANS may cause instability – esp epidural used).
- May require HDU if severely dependant

NB:

General pharmacology from OHA:

- Dopaminergics
 - **L-dopa** → decarboxylase → dopamine in brain
 - **Decarboxylase inhibitors** (benserazide, carbidopa) to reduce peripheral conversion
 - **MAO-B inhibitors** (selegiline), reduce CNS breakdown of dopamine; has fewer drug interactions than non-specific MAOi, but still watch out for HTN crises/dangerous CNS excitability w SSRI/TCA.
 - 2nd line: **Ergot derivatives** eg. Bromocriptine, cabergoline, lisuride, pergolide, direct dopamine-R stimulator.
 - Watch for postural hypotension
 - Entacapone: adjuvant agent used to reduce dose of L-dopa/increase duration.
 - Other dopaminergic adjuncts included: ropinirole, pramipexole, amantadine, apomorphine, tolcapone.
- **Anticholinergic**: benztropine, orphenadrine etc. mainly for tremor, rigidity, sialorrhoea etc. Or drug-induced parkinsonism/dystonias. Bradykinesia/tardive dyskinesia won't be improved.
- Drug interactions from OHA

Class	Interaction	Notes
Pethidine	Hypertension /rigidity w selegiline	MH-like signs
Synthetic opioids eg fentanyl	Muscle rigidity	Esp high dose
Inhalational	Potentiate L-dopa induced arrhythmias	Avoid halothane
Antiemetics	EP side effects / worsen parkinsonian	Use domperidone/ondansetron
Antipsychotics eg	EP side effects / worsen parkinsonian	Prefer for newer antipsych: risperidone, olanzapine etc
TCS/SSRI	Care with selegiline ; L-dopa induced arrhythmias.	
AntiHTN	Marked BP drop	Esp clonidine

Q11 – difficult airway ANZCA PD, 77%

List the essential equipment currently recommended to manage a difficult airway in an adult patient. (50%) Justify supplementary items you would recommend. (50%)

Refer to **ANZCA professional document** on difficult airway equipment.

ADULT:

- **Basic:**
 - -OPA 3,4,5,6
 - -NPA 6,7,8
 - -LMA 3,4,5
- -Macintosh **laryngoscope** size 3,4
 - -alternative blade such as straight blade, McCoy, Kessel blade
 - -two compatible handles including short handle
- **Intubation adjunct:**
 - selection of ETT.
 - introducer with a Coude tip of 35 degrees such as Frova introducer
 - bougie
 - malleable blunt atraumatic sylet
 - intubating LMA size 3,4,5 with dedicated tubes and stabilising rods such as LMA Fastrach
 - -selection of specialised tubes such as microlaryngeal tube, parker tip, nasal RAE
- **Extubation:** long airway exchange catheter
- **Emergency cricothyroidotomy**
 - surgical kit including scalpel with **#10 blade**, tracheal hook, dilator, **size 6mm** ETT and tracheostomy tubes
 - kink resistant cricothyroidotomy cannula of 14G or higher
 - rapiflow O2 device for oxygenation through cannula
 - Manujet for oxygenation through cannula.
- oesophageal intubation detector eg. **oesophageal syringe**
- means to immediately **detect CO2**

CHILDREN is essentially the same just child sized!

Additional equipment which should be kept on the difficult airway trolley

For FOI:

- -a flexible intubating bronchoscope
- -intubating catheter such as an Aintree
- -spare light source
- -anti-fog solution
- -lignocaine and nasal vasoconstrictors
- -bite block
- -wire
- -endoscopy masks

Other Supplementary equipment: optional equipment departmental preference

- Eg optical stylet, videolaryngoscope – known capable of improving DL view and should complement DL.
- Retrograde intubation kit – in facial bleed, airway bleed but with sparing of neck.
- Rigid ventilating bronchoscopes (often large soft tissue swelling can be overcome)
- Contact phone number for oncall ENT Surgeon to allow timely ENT help access during emergency for tracheostomy.
- Grab-bag with essential equipments for remote assistance of airway management.

Q12 – VTE/DVT prophylaxis, 83.4%

In preadmission clinic you are assessing a patient who is concerned about the risk of developing venous thromboembolism (VTE) perioperatively.

Outline the patient factors that increase the risk of VTE. (50%)

Describe measures that may reduce the risk of perioperative VTE (50%)

Patient risk factors

in categories of:

- Venous stasis/endothelial injury;
 - Prolonged travel
 - Varicose veins
- thrombophilias;
 - e.g. Protein C/S deficiency, Factor V Leiden, antithrombin 3 deficiency)
- other medical conditions / increased age
 - Malignancy
 - Pregnancy/post-partum
 - MI, CVA, CHF: likely to be bed-bound.
 - Obesity
 - Prev hx or FHx of VTE
 - drugs / smoking
 - i. OCP or HRT
 - Chemotherapy

Risk minimization

1. Surgery:

- Surgery technique aiming for minimal duration and trauma

Patient factors:

3. Non-pharmacological:

- SCDs + TEDS: calf compressive device throughout hospital stay - → aid VR.
 - Evaluation: non-invasive and simple application, minimal side-effects. More expensive and still require pharmacological regime for high risk surgery/patient.
 - require accurate measurement and fitting and CI in PVD, peripheral neuropathy, lymphedema, skin breakdown etc.
- Good hydration peri-operatively
- Early mobilisation (physio)
 - Evaluation: low-cost, common sense, but need active prophylaxis.

4. Pharmacological:

LMWH:

- SC clexane once daily dosing (20-40mg)

- Cf unfractionated heparin:
- preferable unless contra-indicated (HITS)
- no monitoring required; more predictable dose-response
- less bleed risk
- however not easy to reverse as heparin (only ~50% reversibility)

Heparin, 5000units BD dosing - inconvenient

- requires monitor with APTT, may cause HIT, has higher bleed risk than clexane, but is reversible.

2. Anaesthetic technique:

- **Neuraxial**: Spinal or epidural.
 - Evaluation: associated with less VTE, however not as beneficial as for hip/knee arthroplasty; and effect may be less now with use of pharm DVT prophylaxis.

NB:

List above is comprehensive. Only other factor mentioned in CEACCP = **surgery, esp abdo/pelvic/ortho surgery, major trauma, burns.**

Q13 – advanced directives, ethics, 78.8%

An elderly patient has collapsed with a bleed into a known brain tumour and is unable to communicate. An advance health directive has been produced stating she would not wish to receive treatment if the most likely outcome was a significant permanent neurological deficit. Define advance health directive, including its scope and legal status (50%)
How would this advance health directive influence decision making around treatment options. (50%)

PART A – definition, scope, legal status

An **advance directive**

- **Code of HDC Right (Health and Disability Consumers)**
- competent consumer makes a choice about a possible future health care procedure
- **effective only when he or she is not competent** to make decision for themselves, due to physical or mental illness”.
- is **legal binding “written or oral directive”**;

PART B – how AD influence clinical decision making

- doctors must act in patient’s **best interests**.
 - **Informed advance decision**, should be taken into account when deciding what is in the individual patient’s best interests.
 - **risks and benefits** of treatment options must be carefully evaluated. If risks outweigh the benefits then surgery may not be advisable.
- **Treatment options should be comprehensive**: wish to proceed with active treatment that could potentially be life-saving; or not to proceed to treatment that is unlikely to result in improved quality of life, or resuscitation plan in the event of cardiac arrest.
- Also although advance requests or authorisation of specific treatment can be helpful, **they lack legal weight if clinicians assess that treatment to be inappropriate”**

NB: NZMA:

- A. "Patients cannot demand or refuse anything in advance that they cannot demand or refuse when conscious and competent. Therefore, patients cannot refuse in advance compulsory treatment provided under the mental health legislation or demand euthanasia.
- B. Also although advance requests or authorisation of specific treatment can be helpful, they lack legal weight if clinicians assess that treatment to be inappropriate"

Q14 – spinal cord trauma management, 34.7%

40 yo requires laparotomy 10 days after an isolated traumatic spinal cord transection at C6. Outline key anaesthetic issues (50%), how would these influence your anaesthetic management? (50%)

Key anaesthetic issues

- A. possible unstable C-spine, difficult intubation with limited C-spine movement, pharyngeal oedema; or if in external fixation device.
- B. respiratory failure likely with intercostal paralysis below C6 (although diaphragm C3-5 should be intact).
 - Subsequent complications eg. LRTI/atelectasis, hypoxiaemic insult likely.
- C. initial neurogenic shock likely resolved by 10 days now, expect to see return of SNS tone + reflexes; but be prepared for potential unopposed vagal tone → cardiac instability
 - Blood loss poorly tolerated
- D. spinal shock present up to 4/52 likely with neuro deficit
 - Drugs: avoid sux (>72 hr = CI)
- E. altered thermoregulation, prone to hypothermia
- I. Higher risk of VTE/pressure sore, nerve injury due to prolonged immobility

Issues re: laparotomy

- Fasting status, acute abdomen? Septic? Metabolic/electrolyte derangement?

How it influences Management

- A. careful airway assessment + image review. MILI for modified RSI using VL/bougie to minimize C-spine movement and use rocuronium 1mg/kg; consider SEP to monitor spinal cord integrity above lesion; using C5 as testing point ie shoulder/elbow flexion)
 - If difficult airway anticipated, consider AFOI or awake trachy.
- Maintain optimal spinal cord perfusion pressure to limit secondary ischaemic insult
 - Normocarbia, adequate oxygenation using lung protective vent strategy,
 - If haemodynamic unstable, use IABP + CVL to guide management + fluid responsiveness. Maintain preload and MAP >65mmHg (or within 20% of baseline); with small fluid boluses + vasopressor.
 - Pretreat resting bradycardia/unopposed vagal tone with glycopyrrolate IV 200-400mcg.
- Maintain normothermia, normoglycaemia
- Multimodal DVT prophylaxis with SCDs + pharma ie clexane

- Optimize patient re: metabolic/electrolyte derangement as much as possible within limited time preop.

Postop:

- Multimodal analgesia to facilitate early chest physio and monitor for LRTI with timely antibiotic.

Q15 – preoxygenation; high FiO₂ use justification, 83.4%

Describe the physiological principles underlying preoxygenation prior to the induction of anaesthesia. (50%)

Discuss the advantages and disadvantages of using a high inspired oxygen concentration (>80%) during maintenance of anaesthesia. (50%)

Intro/Principle:

- Pre-oxygenation = Pre-oxygenation = denitrogenation of the lung by breathing 80-100% oxygen → increase oxygen content in FRC

Physiology:

- **FRC = 2.1L in 70kg man (30ml/kg)** Partial pressure of oxygen in lung breathing air = **~100mmHg** Oxygen content = $100/760 \times 2.1L = 276ml$
- PO₂ in lung breathing O₂ = ~660mmHg (alveolar gas equation) Oxygen content in lung at FRC = $660/760 \times 2.1L = 1.8L$
 - Provided patient has oxygen consumption rate of 250ml/min apnoeic period can be prolonged (**from just over 1 minute to 7 mins**) without developing hypoxaemia.
- Allows more time to intubate without hypoxaemia. If failed to intubate and ventilate = allows patient to wake up without significant outcome.
- Hyperventilation can speed process up (increases rate of nitrogen washout) ie vital capacity breath.

Pros/cons of high FiO₂.

- avoids/prevents hyperaemia
- useful in cases of **air embolism** when need to denitrogenate
- **augments antimicrobial and pro-inflammatory response** in alveolar macrophages
 - reduced incidence of surgical wound infection in colorectal resection patients

Disadvantages:

- resorption **atelectasis** -> shunt and impaired gas exchange
- increases **reactive O₂ species** - >causes inflammation and secondary tissue injury/apoptosis -. leading to cellular injury/death
- contributes to **CO₂ retention in some COPD patients**
- acute O₂ toxicity -> causes altered mood, vertigo, LOC, convulsions.
- LITFL >60% Causes tracheal irritation, sore throat, pulmonary congestion, dry mouth and nose

NB.

- With 100% O₂ for several minutes (2-3), alveolar gas equation predicts maximal pO₂(alveolar) of 660mmHg
 - = $[FiO_2 \times (760 - 47)] - 40/0.8$
- **Other ICU points: hyperoxia assoc w worse mortality in cardiac arrest, TBI, stroke**

causes unknown, but likely due to ROS (reactive oxygen species eg superoxide anion, hydroxyl radical, hydrogen peroxide) + hyperoxia-induced vasoconstriction (direct and indirect)

Oct-2014, 35.9%

Q1 – Neonatal management policy, 45.8%

An 8 week old baby is scheduled for an inguinal hernia repair on your list at a local general hospital tomorrow.

a) Outline the important issues when providing anaesthesia care for this baby. (70%)

b) Justify your decision to proceed with surgery at the local general hospital. (30%)

ANZCA PD

PART A:

Neonatal management requires special attention. Issues include:

Overcapping issues: (mentioned in report)

- *Question of does facility has the facilities / equipment / staff / experience to provide care for neonate?*
 - anaesthetist, anaesthesia assistant, surgeon, nurses, neonatal team? And depend on how ill the baby is, PICU?
 - If not equipped with above, then transfer to a tertiary centre should be considered.
- Routine/important AMPLE History – is baby normally healthy? Pre-term baby, what's baby's post-conceptual age?
 - hernias are common in pre-term infants
 - prematurity associated with other conditions such as lung disease
 - Prem baby (born <37/40) and postconceptual age <52 weeks ie if premature, should be referred tertiary centre.

General considerations of infant paediatric patient:

Patient:

- **altered respiratory anatomy & physiology –**
 - due diligence given to manage paediatric airway + less reserve to cope with apnoea, especially in ex-prem baby with chronic lung disease
- **cvs differences**
 - small ventricles with less compliance
 - CO is rate dependent
- **Fasting:** ideally 1st in list so to minimise delay in return to feeding.

Anaesthetic factor

- A. Probable gas induction with/without parental presence; complete focus should be on care of baby.
- B. Use of T-piece / high flow to minimise rebreathing for small baby with small TV on induction, then switch to paediatric circle circuit.
- D. have higher MAC, maintain age adjusted MAC of 1; eg. EtSevo 2.4-2.6.
- E. prone to hypothermia in baby, keep warm!
- M. full paediatric sized monitor

Justify decision to proceed at local hospital:

- Should refer to ANZCA PD on paediatric management considerations + local guideline.
- Eligibility for local care should include:
- **Adequate Staff training and experience**
 - Anaesthetist, anaesthetic assistant, nursing staff, surgeon, surgical nursing staff.
- **Equipment and Facilities**
 - Equipment – monitor, anaesthetic & surgical equipment, theatre set up with temperature control to maintain thermal neutral zone for paed patient,

Worth to mention:

- If proceed, **consider to involve another specialist anaesthetist** to assist and
- ensure all appropriate equipment and staff is/are available before proceeding with the case.

NB. Altered anatomy/physiology

Anatomy

- eg. large occiput
- small/narrow airway
- obligate nasal breathers
- large floppy epiglottis
- narrowest point of airway is sub-glottic

Phys

- eg. ventilation essentially diaphragmatic
- lower proportion type 1 muscle fibre (intercostal muscles) - prone to fatigue
- closing volume occurs within tidal breathing in neonates - prone to airways collapse
- higher resistance due narrower airway
- particularly prone to resp depressant effects of volatiles

Indication for 3rd center include:

- **neonates (<28 days old)**
- Prem baby (**born <37/40**) and **postconceptual age <52 weeks** ie if premature,
 - Also = indication for overnight stay in DSU; ther other being term infacnt <6/52 old.
- **Comorbidities:**
 - apnoeic episodes.
 - unusual and/or complex medical or surgical problems classified as ASA3 or greater.
- liaison with specialist paediatric facility so that authoritative advice available

Q2 – TBI, ICP management, 86.1%

A 25 year old man with a history of blunt trauma to the right side of his head has a fixed and dilated right pupil.

He has been intubated and ventilated in the emergency department after an initial Glasgow Coma Score (GCS) of 15 on admission had fallen to 3.

Evaluate the pharmacological and non-pharmacological methods to manipulate this patient's intracranial pressure?

Answer intro:

- -Normal ICP 5-15mmHg
- -The munroe-kelly doctrine describes, ICP change when volume inside the fixed skull changes.
 - Content = brain, blood and CSF; when any of these increase in volume to a critical point, beyond compensatory mechanism, ICP rises steeply
- -CPP= MAP – (ICP+ venous pressure), usually VP is zero therefore CPP= MAP-ICP

Pharmacological

- **-Brain/lesion (from OHA):**
 - mannitol 0.25- 1mg/kg over 15mins,
 - Frusemide 0.25-1mg/kg,
 - hypertonic saline (3%) 3 mL/kg over 10 min or 10-20 mL 20% saline; titrate to target of Na 150-155.
 - Ensure maintenance of CPP + oxygenation to minimise further ischaemic insult and subsequent infarct/oedema. Consider transfusion to keep Hb >70g/L.
- **Blood:**
 - consider muscle relaxation will prevent coughing, straining and allow controlled ventilation i.e./ reducing the amount of PEEP and PIP
- **reduce the cerebral metabolic rate**
 - propofol or thiopentone infusions; reduce CBF → reduce ICP.
 - advantageous in relative maintenance of autoregulation + anticonvulsant effect.
 - volatiles agents = relative uncouple metabolism esp MAC >1 → vasodilatory effect may increase CBF and ICP.
 - Adequate analgesia
 - treat seizures if occurs with phenytoin 20mg/kg or midazolam 0.5mg/kg
 - avoid pyrexia – use pharm + non-pharm antipyrexial measures.

Non-pharmacological

Blood:

- avoid hypercarbia & hypoxia, or hypertension Use IPPV to control PaCO₂ to 35mmHg and ensure good oxygenation >92%.

Avoid increasing venous pressure

- head up to 30 deg
- neutral head position
- ensure ETT tie not obstructing venous drainage. Consider using tape instead.
- If C-spine immobilization required, use sandbag/tape rather than neck collar restricting venous drain.

Surgical:

- External ventricular drain
- Decompressive craniectomy

NB. (report doesn't actually include 'evaluate – cf. worthiness...etc'.

- brain tissue (1500ml), blood (150ml) or CSF (150ml)

Q3 – prolonged Trendelenburg, 59%

A patient is scheduled to undergo prolonged steep head-down surgery.

a. Outline the potential anaesthetic implications of this position in this situation. (50%)

b. Describe how you would modify your anaesthetic plan to minimise these. (50%)**Anaesthetic implications**

- A. ETT can migrate to become endobronchial during position change.
- B: reduction in FRC, increased atelectasis, increased V/Q mismatch, decreased compliance. May need permissive hypercarbia.
- C: inc VR → CO/MAP → potential CHF;
- D: increased cerebral venous pressure and reduced CSF drainage → likely inc ICP
 - oedema of face, peri-orbital; inc IOP → blurry vision
- Risk of falling off table, arm fallen off → brachial plexus injury if not position/secured properly.
- Risk of DVT (report)

Risk minimization:**Pre-operative:**

- **Appropriate patient selection.** Patients with morbid obesity with significant restrictive lung disease, poor ventricular function, increased ICP, IOP isn't suitable for steep Trendelenburg position.
- CVS: poor ventricular function where increased VR can → HF
- D: eg. glaucoma, benign intracranial hypertension, space occupying lesions

Intraop:

- A: vigilant assess ETT position regularly throughout case esp with position change.
- B: PCV+PEEP to control PeakP and reduce atelectasis.
- Circulation: vigilance on MAP, esp each time with position check; also transducer height.
- position:-risk of slipping of the bed: strapping required
- VTE prophylaxis: SCDs +/- clexane.

Postop:

- Monitor potential airway swelling.
- Assess patient for blurred vision, headache or confusion, facial oedema.

Q4 – Dabigatran management, 53%

A patient scheduled for transurethral resection of the prostate is seen in the pre-admission clinic. He has non-valvular atrial fibrillation and was commenced on dabigatran 150 mg bd when he had a minor stroke three months ago.

a) Outline briefly the advantages and disadvantages of dabigatran as compared to warfarin for stroke prevention in elective surgical patients. (30%)

b) Describe and justify your plan for the perioperative management of this patient's anticoagulation. (70%)

Dabigatrin = direct thrombin inhibitor, reversibly inhibits both free and clot-bound thrombin.

- half-life 12-14 hours, longer w impaired renal function.
- 80% of the drug is excreted unchanged by the kidneys, relative contraindicated in patients with renal failure

Pros/Cons of dabigatran vs warfarin for CVA prophylaxis

Pros:

- -no routine monitoring required
- -kinetics dependant on renal clearance
- -predictable pharmacokinetics in normal renal function

Cons

- Unpredictable half life with renal impairment.
- Routine coagulation tests are unreliable in quantifying its degree of anticoagulation; thrombin time is likely more reliable.
- dabigatrin associated bleeding is at present very difficult to treat, although this may be improved once **idarucizimab** becomes more available.
 - warfarin can be more easily reversed by eg. PromX or FFP.

Management of dabigatran periop

- need to balance risk of perioperative bleeding versus arterial /venous thromboembolism – **CHA2DS2VASc** score should be calculated to risk stratify and surgical bleed considered
 - prostate surgery assc with significant bleed.
 - Recent **BRIDGE study** suggested no worse outcome with temporarily stopping anticoagulation without bridging therapy;
 - Risk of thromboembolism = **0.3% in control and intervention groups in study.**
 - However, the CHADS2 score in study was low (mean 2.3) and only 3% of patients had scores of 5 or 6
- Therefore I'd stop dabigatran 5 days prior surgery to restoration of surgical haemostasis
 - This is especially if neuraxial anaesthesia is chosen.
 - othrewise if normal RF, 48 hours window preop may be adequate.

Q5 – CPET principle, 48.5%

a) Outline the principles of cardiopulmonary exercise testing (50%)

b) Evaluate the role of cardiopulmonary exercise testing in a patient who is scheduled for oesophagectomy (50%)

Principles

- Cardiopulmonary exercise testing (CPET) = non-invasive method of quantitative assessment of functional capacity (report)
- Requires:
 - -exercise machine (usually a bicycle)
 - -a computer controlled incremental increase in workload
 - -a calibrated pneumotachograph to measure gas flow and composition
 - -continuous 12-lead ECG
 - -Trained person to conduct and interpret results
- -parameters obtained such as peak O₂ consumption, anaerobic threshold are helpful in risk stratification.
 - **AT** = point of oxygen consumption at which anaerobic metabolism starts
 - not altered by patient effort.
 - Useful for risk stratification:

- **>11ml O₂/min/kg** + test ECG no ischaemia = mortality **0%**
- **<11ml O₂/min/kg** + test ECG WITH ischaemia = mortality **43%**

(OHA/ceaccp)

- Peak VO₂:
 - correlates best with postoperative cardiopulmonary complication rate after oesophagectomy,
 - studies have shown >800 ml min⁻² m² being required to safely undertake this extensive surgery.
 - **Peak VO₂ <15ml/kg/min** = increased risk;

Part B role in risk stratification in oesophagectomy

oesophagectomy = major surgery involving double intra-cavity surgery (thoracotomy and midline laparotomy), long surgery, significant cardiopulm stress.

- CPET can help in risk stratification and informed decision making based on individual estimation of perioperative survival, as outlined above.
 - Also helps in:
 - **-diagnosis and quantification** of respiratory and cardiac disease
 - to allow for preop optimisation by guiding interventions before, during and after surgery
 - and **decision making on HDU/ICU** requirements

NB.

- **AAA** surgery, peak VO₂ <20 ml kg⁻¹ min⁻¹, low AT, assc with postoperative complications and 30 day mortality.
- **hepatic transplantation**: has demonstrated that peak VO₂ <60% predicted and AT <50% of predicted peak VO₂ are both associated with 100 day mortality.
- Also shown poorer outcome in **thoracotomy**. Peak VO₂ <15ml/kg/min = increased risk; <10, mortality in thoracotomy = 50%; >20 = no increased risk

Q6 – Fat embolism, 31.9%

You are called to see a 30 year old man with bilateral fractured femurs. He has been diagnosed with Fat Embolism Syndrome.

a. Outline the pathophysiology of Fat Embolism Syndrome? (50%)

b. Describe the principles of management of Fat Embolism Syndrome? (50%)

Intro:

- Fat embolism Syndrome (FES) is a rare (**incidence 1%**), multisystem disorder, variable presentation; **typically 24-72 hours** after trauma/long bone fractures
- Features include: classic triad in CNS/Resp/Haem system: confusion, altered level of consciousness, tachypnea and hypoxia, coagulopathy/petechial/DIC.
 - significant **mortality is 5-15%**.

Pathophys:

Exact pathogenesis is uncertain; two theories exist.

- **Mechanical** theory:
 - fat emboli gain direct entry into bloodstream via venules from disrupted adipose tissue or bone marrow → deposit in pulm circulation
- **Biochemical** theory of pathogenesis:

- production of toxic intermediaries of fat from fat globules entering plasma (globules hydrolysed into free fatty acids that triggers cascade of systemic inflammation → ARDS, pulm HTN, coagulopathy, DIC).

B – Management principles

Preventative Strategies

Surgical technique:

- Early **immobilization of fracture** (<24hr)
- reduce intraosseous pressure during orthopaedic surgery by drilling **venting hole** for drainage of intramedullary cavity
- **Cementless fixation** if possible

Mainstay of treatment is supportive.

- Early resuscitation and stabilisation.
- Resp: Early oxygen therapy may prevent onset of FES.
- Support haemodynamics as appropriate.
- Haematological: **Blood products** as needed (esp for anaemia/thrombocytopenia coagulopathy)
- **VTE prophylaxis**, consider **IVC filter** in high risk patient (may also reduce size of fat globules reaching heart)

NB:

- embolization fat occurs frequently, but syndrome is rare (1%).
- FES has major (triad) + minor diagnostic criteria (others).
- Know difference between:
 - **Fat**: pulm HTN/pulm oedema, CNS, rash
 - **Cement** implant: similar to FAT, but more CVS feature; similar to anaphylaxis + pulm HTN/RHF
 - **Air**: CO₂, hypotension, tachycardia, JVP, right heart failure.
 - **Amniotic** fluid: anaphylactoid
- BCIS=when cement used; although mechanism of this could be fat embolism; but air embolism or direct from cement also possible – hypoxia; hypotension to grade 3 severity = CVS collapse.
 - Prevent by: suction to bone cavity, rid of air/fat when inserting cement.
 - Preloading ; up FiO₂; stop N₂O.
- Steroid use is controversial
- FES resolves in ~7 days; most patients will recover fully (serious long term complications are uncommon).

Q7 – EVAR renal protection (repeat), 42.2%

An 80 year old man is scheduled for endovascular abdominal aortic aneurysm repair (EVAR).

- What are the likely risk factors for acute kidney injury in this setting? (30%)**
- Describe and evaluate the methods available to preserve his renal function in the perioperative period. (70%)**

Q8 – CHD, Fontan circulation, 31.9%

A 25 year old woman who is 30 weeks pregnant has been referred to your tertiary high risk obstetric clinic.

She has complex cyanotic congenital heart disease and now functions with a Fontan circulation.

a) How would you stratify the cardiovascular risk? (30%)

b) What are the issues relevant to anaesthetic care that will need to be managed for this patient? (70%)

Intro: these patients are at increased risk, which include HF and death; greatest risk is during labour and immediately postpartum due to stress, pain and autotransfusion → volume load.

a) cardiovascular risk stratify

Hx

- Hx of CHD, ischaemia, surgery; current treatment; effect;
- Hx of failure; or unexplained presyncope
- Functional capacity, NYHA grading?
- Pregnancy progress and impact on patient? Placenta, singleton pregnancy?
- Other relevant: GORD, allergy, access to regionals, venous access.
- Clinical letters from Cardiothoracic surgeon/Cardiologist.

Exam

- Vital signs: including Sats (**high risk if sats <85% on air**), RR, HR (arrhythmias?), BP.
- **Sats with exertion?**
- Cyanosis?

Investigation

- Echo, evidence of ventricular dysfunction?, ECG, CXR, labs (polycythaemia HCT >60%), pregnancy USS-baby growth.
- Appreciate the circulation (Auckland course)- residual lesion? Pulm HTN? Arrhythmia?

b) issues relevant to anaesthetic care

Preop (pre-delivery planning):

- MDT: Cardiology / Obstetric, midwifery Team consult / +/- intensivist re: antenatal plan; delivery plan and post-delivery plan.
- Patient will require additional monitor during antenatal period
- Consider elective delivery with epidural analgesia or gradual onset anaesthesia; anaesthesia will also require additional monitor with arterial line +/- CVP.

Other systemic patient considerations:

- Induction for GA needs to be done with **extreme care**.
- Breathing:
 - **Maintain SV**; if GA used, IPPV can result in fall in CO and poor pulm perfusion; **reduce inspiratory time or limit airway pressure**
- Circulation:
 - Labour pain, stress → catecholamines → LVF;
 - → epidural analgesia early to help.
 - **Systemic VENOUS pressure dependant** for pulmonary flow
 - Maintain preload; contractility
 - Avoid increase in PVR – CO₂, O₂, acid/base.
 - Risk of bleed

- Due to cyanosis associated thrombocytopenia
- Also due to higher CVP which these patients dependant on for pulm circ.
- Risk of air embolism and paradoxical air embolism; meticulous air with IVF/drug infusion to ensure minimal air bubbles.
- Consider monitor CVP using femoral venous route.
- Drugs:
 - Synto – vasodilate, drop in SVR risk
 - Ergo – vasoconstrict; potentially worsen PVR; carboprost is especially dangerous.
 - Patient's with fontan cir. May be anticoagulated, MDT peripartum plan on anticoagulation must be discussed.

Post-delivery: will require HDU level care or above; Conversely, autotransfusion post-partum puts patient at risk of heart failure, pulm oedema.

NB.

OHA note:

- cyanosis result in polycythaemia, increased blood volume, viscosity, impaired tissue perfusion, There's often thrombocytopenia and fibrinogen deficiency:

From MCQ: in Eisenmenger's syndrome:

A. an important goal is to maintain an optimal shunt, by preventing changes to pulmonary vascular resistance (PVR) or systemic vascular resistance (SVR) - true:

B. the patient's high haemoglobin should be maintained and blood loss monitored closely

C. a gaseous induction with sevoflurane presents an effective method for anaesthesia and avoids cardiovascular compromise

- Induction of anesthesia with a volatile anesthetic such as sevoflurane is acceptable but must be accomplished with caution; must maintain SVR:PVR ratio to avoid hypercyanotic attacks.

D. if general anaesthesia is required, ketamine is an appropriate choice of drug

- Induction of anesthesia in patients with tetralogy of Fallot is often accomplished with ketamine (3 to 4 mg/kg IM or 1 to 2 mg/kg IV). SNS stimulation with ketamine helps to maintain SVR; (I think this tends to offset inc in PVR by ketamine)

E. careful attention to intravenous infusions and drug administration is needed to prevent paradoxical air embolism

Q9 – Myasthenia Gravis, 69.9%

A 30 year old patient with myasthenia gravis presents for orthopaedic procedure and refuses a regional anaesthetic technique

What are the signs and symptoms of myasthenia gravis? (30%)

How does the disease affect your anaesthetic management? (70%)

A

Intro:

Myasthenia Gravis (MG) = autoimmune disease characterized by presence of anti-nicotinic Ach receptor antibodies → destruction of post-synaptic AchR at NMJ → spectrum of skeletal muscular weakness.

Clinical features:

- skeletal muscle weakness → worse with exercise = fatigability and improves w rest.
- 2 types: local vs. generalised
- Disease confined to eyes only in 15% of MG – ptosis, diplopia
- Other 85% have (systemic) ocular, facial, bulbar and mild resp muscle weakness
- Severe resp muscle weakness leading to mechanical ventilation = myasthenia crisis
 - More common in young females or old man – ‘sleazy couple’.

Associated with MG include:

- Thymus hyperplasia (thymoma) in 15% pts;
- Other autoimmune: Scleroderma, RA, Pernicious anaemia, hypo/hyperthyroidism, SLE

B: How does it affect your anaesthetic management?**Preop:**

- Careful risk stratification, in particular risk of risk failure or aspiration – severity grading score available: 1-5 (1=eye only, 5=crisis, 2,3,4 = mild/mod/severe)
- Consider risk factors (6) for requirement of postop mechanical ventilation:
 - Duration >6 years
 - Pyridostigmine dose >750mg
 - Co-existing disease: pulmonary disease such as COPD
 - Bulbar dysfunction
 - FVC <2.9L
 - Surgery of major body cavity
- Severe case: consider preop plasma exchange or referral for thymectomy. MDT input with Immunology
- Routine/important AMPLE history and airway, cardioresp exam; esp. if comorbidities such as rheumatoid, large thymoma present (affect airway + SVC obstruction).
- Consider suitability of regional anaesthesia.

Intraop:

- **A.** If GA used, modified RSI if bulbar weakness to minimize aspiration risk;
 - consider roc/sugammadex
 - Glycopyrrolate to reduce secretions if bulbar dysfunction.
 - GORD prophylaxis with ranitidine, Na citrate.
 - If no bulbar dysfunction, volatile alone may be enough to provide good intubation condition.
- **Drugs effect on NMJ need to be considered**
 - Consider TIVA in severe cases to avoid volatile effect on NMJ (as rapid emergence vs. clear end-point)
 - If need NDMR, use smaller dose ~30-40% of usual. (or 1/10 as given in another SAQ)
 - If suxamethonium is used – may need an increased dose of this (eg 1.5mg/kg), watch for phase 2 block. Check NMT.
 - Can prolong NDMR: BB (esp propranolol), phenytoin, Mg, aminoglycoside.
- Other Pharm considerations:
 - steroid supplements if on long term steroid

Post operative:

- Extubate if mild MG.
- Assess NMT, and reverse with appropriate agent (sugammadex or neo)
 - standard dose works fine, but watch for potential cholinergic crisis w neo.
- Continue all regular treatment; replace pyridostigmine with neo if no enteral route possible (20:1 ratio).
- Admit HDU – close monitoring of SPO2, resp function monitoring needed – monitor hourly FVC
- multimodal analgesia to opioid spare, as patient sensitive to sedative.

NB.

Aside: Eaton-Lambert syndrome:

- =Myasthenic syndrome=proximal muscle weakness; assoc w cancer esp SCC lung.
- Likely 2nd to reduced Ach release (Presynaptic failure);
- Not reversed by anticholinesterase
- Exercise helps improve muscle strength
- Dysautonomia may occur: dry mouth, blurred vision etc.
- Unlike MG; ELS pts sensitive to both NDMR and DMR.

Table I Classification of myasthenia gravis

Type	
I	Ocular signs and symptoms only
IIA	Generalised mild muscle weakness responding well to therapy
IIB	Generalised moderate muscle weakness responding less well to therapy
III	Acute fulminating presentation and/or respiratory dysfunction
IV	Myasthenic crisis requiring artificial ventilation

1-eye; 2-mild, 3-severe w resp dysfunction; 4-crisis

Do not respond to steroid or plasmapheresis.

Q10 – desaturation in PACU, 43.4%

As the on-duty specialist anaesthetist, you are asked to see a previously well 64 year-old man in the PACU with SpO2 of 85% two hours after laparoscopic right partial nephrectomy during which he lost 1 litre of blood.

a) List the likely causes of the desaturation? (30%) b) Outline your approach to managing the patient's hypoxaemia. (70%)

Likely causes

- Inadequate O2 supplement
- Airway – obstruction?
- Vent/Lungs

- Hypoventilation, lower resp drive, MSK impair
 - Drug effect: opioid, BDZ, residual NMBD
- Dead space, shunt, V/Q mismatch
 - Atelectasis, pulm oedema, aspiration, PE, pneumothorax
- Circulation – poor perfusion, shock, poor oxygen flux;
 - anaemia from blood loss. MI, decompensated heart failure
- Tissue uptake – hypermetabolism:
 - sepsis, thyroid, MH
- monitor error

Management:

- I'd support oxygenation and maintain MAP while simultaneously assess for causes.
- ABCD approach,
 - Open airway. Use LMA or ETT if not maintaining airway.
 - 100% O₂, support ventilation with BMV as required + PEEP for pulm oedema.
 - Rule out hypotension – support with fluid/vasopressor if hypotensive.
 - Is patient conscious? If altered sensorium eg GCS <8, would intubate to protect airway.
- consider differentials and treat accordingly;
- assess anaesthetic / PACU record for potential causative agents? Reversal appropriate?
 - Opioid – naloxone
 - BDZ – flumazenil
 - NDMR – neostigmine / sugammadex
 - Doxapram?
- Exam:
 - Auscultate chest – bronchospasm? Pulm oedema? PTX?
 - Bleeding? Drain output?
- Invx: CXR to assess for HF, pneumonia, aspiration.
 - ECG to rule out cardiac ischaemia.
 - Blood gas assess if type 2 resp failure? And hb level.
- If after differentials considered and patient still hypoxaemic, consider ICU input with ongoing assessment, management in ICU.
- Inform Surgical Team of progress.

Q11 – Statistics, RCT, 60.2% (repeat)

Defination and relevance of statistical terms in relation to results of a RCT

Q12 – hypomagnesaemia, 55.4%

A 55 year old patient is undergoing emergency laparotomy for acute bowel obstruction.

Intraoperative blood tests include the following result: Serum Mg++ 0.40 mmol/L (Normal 0.70 – 1.00 mmol/L)

a) Outline the potential causes for this result and the effects it may produce. (70%)

b) Describe the management of this abnormality. (30%)

Causes:

a. likely acute or chronic (need trend to be sure):

- ↓intake:
 - malnutrition
 - alcoholism
 - PN - poorly dosed
 - malabsorption - chronic pancreatitis, prev bypass surgery, IBD
- ↑ed loss (GI or Renal or binder)
 - GI eg vomiting, diarrhoea
 - ↑ed renal tubular flow:
 - diuretics - osmotic or loops
 - renal tubular dysfunction:
 - ATN
 - ↑Ca (Mg antagonist)
 - hyperaldosteronism (too much Na/K exchange, so low K, low Mg)
- Other:
 - burns
 - acute pancreatitis

Clinical signs: (mainly CVS / CNS)

- symptoms generally when $<0.5\text{mmol/L}$
- CNS:
 - neuromuscular irritability
 - generalised weakness
 - vertical nystagmus
 - myoclonus, stridor, dysphagia, or abdominal pain. Seizures late.
- CVS:
 - arrhythmias esp torsades - resistant to cardioversion
 - ECG similar to ↓K
 - dig toxicity
- Metabolic:
 - resistant ↓Ca, ↓K (should always replace Mg first)
 - PTH resistance
 - vit D deficiency

Management:

Resuscitate and stabilize cardio/resp/CNS system if manifestation seen.

Maintain oxygenation, perfusion and sinus rhythm.

Replacement via:

- IV Mg supplements:
 - 10mmol or 5mls 49.3% MgSO₄ given over 20 mins.
 - Care with bradycardia, hypotension, arrhythmia.
 - post administration should re-check levels.

Seek and treat underlying cause

NB. LITFL ECG changes in hypokalaemia

Changes appear when $K^+ < 2.7\text{ mmol/L}$

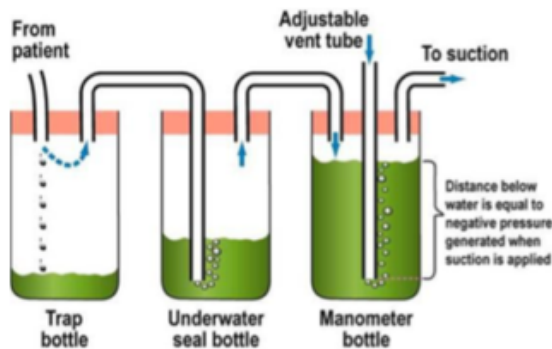
- Increased amplitude and width of the P wave
- Prolongation of the PR interval
- T wave flattening and inversion
- ST depression
- Prominent U waves (best seen in the precordial leads)
- Apparent long QT interval due to fusion of the T and U waves (= long QU interval)

Cf. hyperK changes:

P wave flatten/widen, PR longer, QRS widen, AV block, sinus, asystole.

Q13 – 3 chamber UWSD, 9%

a. Describe the function of a three-chamber underwater seal chest drainage system. (a diagram may be useful) (50%)
b. Evaluate the use of this system in the management of haemopneumothorax secondary to blunt chest trauma? (50%)



3 major parts:

- Drainage/collection bottle
- underwater seal
- application of controlled negative pressure
 - function is to allow controlled variable negative pressure to be applied to chest drain

Mx of haemopneumothorax.

- if bronchopleural fistula or large air leak
 - use of suction to minimize recollection of PTX
 - variability allows 'weaning' from chest drain as leak resolves
 - suction independent of amount of drainage in collection bottle = advantage over single bottle collection/suction system.
- Haemothorax:
 - Collection of blood in trap bottle
 - Allows measurement of output and monitor of progress
 - If >100ml/hour continuously then indication for surgery.
- safety features:
 - volume capacity of drain tube should exceed half of pts max inspiratory volume to prevent sucking back bottle content.
 - volume of H₂O in bottle B should exceed half pts max insp volume to prevent air indrawing
 - drain should stay 45cm below pt; not tilted
 - clamp drain when moving
- complications:
 - kinking
 - occlusion
 - retrograde flow of fluid if collection chamber is raised above level of patient
 - any clamping may cause tension PTX
 - breakage of glass bottles

Q14 – Laser safety + notes on laser, 80.7%

A patient presents for a microlaryngoscopy and laser of a 5 mm nodule on his left vocal cord.

(a) Outline the risks associated with the use of lasers in airway surgery. (50%)

(b) Discuss the precautions that should be taken to manage these. (50%)

Risks of laser in airway surgery

airway fire - 0.4%

damage to healthy tissue:

- laser smoke in lungs
- direct thermal damage

injury to theatre staff and patient.

- eyes
- vaporisation of cancers gas

Risk minimisation

- all staff familiar with laser surgery and local safety policies
 - laser officer, warning sign outside theatre 'Laswer on', opaque window cover,
- protection of staff + patient.
 - eye protection
 - special face masks - papillomas can seed virus laden particles across room
 - suction to remove smoke.

Fire prevention:

- anaesthetic precautions to prevent fire: (fuel, ignition source, combustible gas/oxidizing gas)
 - ensure antiseptic is dried before laser; no pooling on drape, body surface, floor.
 - avoid high FiO2 - use ~21%; avoid nitrous oxide,
 - airway options:
 - use laser resistant ETT (low flammability index, metal coating) -
 - resist damage & dissipate energy of laser \Rightarrow \downarrow risk of fire & adjacent tissue damage
 - fill double cuff with sterile saline & methylene blue
 - high frequency jet ventilation via Stolz suspension bronchoscopy (avoids using cuff & tube)
 - apneic ventilation technique via O2 flow.
- fire drill:
 - turn off laser
 - pre-filled 50ml syringe of 0.9% saline available ready to flood field
 - wet gauzes for eyes
 - suspend ventilation, disconnect circuit, flood airway site with saline, remove ETT immediately (check for damage)
 - remove all other flammable material – drape, gauze
 - if fire persists, use CO2 extinguisher
 - post fire extinguished:
 - ventilate with 21% & BMV

- bronchoscopy to assess endothelial damage, fragments/debris in airway
- consider bronchial lavage & steroids + reintubation early.
- +/- ICU bed

NB.

Examples of medical lasers:

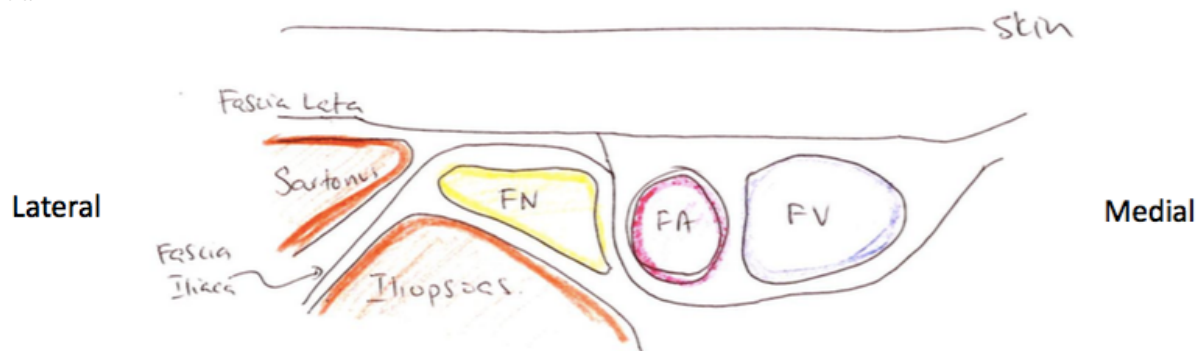
- Pulsed dye laser – targets RBC; treating port wine skin lesions; minimal epidermal scar. Postop pain likely require opioids.
- Carbon dioxide laser – outside of visible spectrum; used mainly in ENT airway lesions or aesthetic facial surgery; line of sight via microscope and surgical laryngoscope.
 - Long wavelength, dissipate superficially.
- Nd-YAG – outside visible range; multiple uses eg airway, vascular malformations, ophthalmic surgery; as can be directed down an optical fibre placed through the working channel of a fibroscope.
- KTP (potassium titanyl phosphate (KTP) laser is also focused through an optic fibre but photo-ablates much more superficially, so can be used in the airway with local anaesthesia +/- sedation, potentially in an outpatient setting.
 - Different to pulsed-dye laser

Q15 – FNB, 69.3%

a .Describe the anatomy relevant to performing a femoral nerve block at the level of the inguinal ligament (50%)

b. Outline the advantages and disadvantages of performing a femoral nerve block at this site as part of an analgesia plan for a patient undergoing total knee arthroplasty. (50%)

A.



at level of inguinal ligament, FN lies beneath fascia lata / iliacus, lateral to vein/artery, separated by fascia layer.

B. Pos and cons for analgesia in TKJR

Advantages:

- high success rate
- low complication technique
- single shot 20mls 0.5% bupiv can provide analgesia to ant knee for up to 12 hours.
- Relatively easy, and superficial to perform in supine

disadvantages:

- spread of LA is unreliable to cover obturator N.
- Not providing analgesia to posterior part of knee

- -femoral nerve (ant joint capsule & ant skin)
- profound motor block to quadriceps preventing early mobilisation
 - ↳ use of nerve catheter can ↓ motor block while gaining analgesia by using low concentrations with slow infusion
- standard nerve block risks:
 - infection
 - nerve damage
 - LAST
 - ↳ although with sterile technique & US guidance = exceptionally rare

May-2014, 53.1%

Q1- Discussion of T-piece JR modification (repeat), 23.3%

Outline the advantages and disadvantages of using the paediatric circle system and the Jackson-Rees modification of Ayre's T-piece (Mapleson F) for anaesthesia in a 15 kg child.

(report)

Key components; should mention: Resistance – valves; Dead space; Fresh gas flows
 Better candidate will mention: Humidification, scavenging, weight/bulk, provide more and point out there is less difference between contemporary systems.

Q2 – cardiac electrophysiology anaesthesia, 55.3%

An otherwise well 35-year-old woman is scheduled for ablation of an accessory atrio-ventricular pathway in the Cardiac Electrophysiology laboratory.
 What are the implications for anaesthesia and how would you manage them?

(report)

Key components, as a minimum, mention of likely duration of procedure, location [isolated] and possible intra- and post-procedural life threatening complications was expected.

OHA chapter incorporated.

Preoperative implications:

- **Environment:** remote location.
 - Experienced anaesthetic technician
 - Familiarity with the environment (type of trolley patient will be induced on, transfer of patient from induction trolley to EP table, disconnection of tube by cardiology staff)
 - Contingency plan for unanticipated difficult airway
 - Emergency drugs and ease of access to them
- **Patient:**
 - exact rhythm disturbance and symptoms.
 - Patient may have compromised cardiac function due to malignant cardiac arrhythmias.
 - If implantable defib is placed – give IV AB; VF induced few times to test device → sedate patient in this phase. Eg propofol TCI.
 - Placing defib under muscle can be stimulating.

- Watch for hypoTN; avoid prolonged VF arrest and support with drugs.
- Medications taken for rate / rhythm controlling of the rhythm disturbance e.g beta blockers, Na channel blockers, Calcium Channel blockers
- Other routine preassessment + prep. Assess the airway: review prior anaesthetic records for difficulty with BVM ventilation, laryngoscopy.
- Procedure:
 - Position, special points – duration typically long (up to 6 hours), patient need to be still for ablation process, so eg. GA, ETT and remi/NMBD/NMT monitor beneficial.
 - Conversely, short procedures can be done using sedation. Or LMA/SV.
 - Cardiologist access to vein needs to be considered.

Intraoperatively:

- All routine monitoring for remote anaesthesia as per ANZCA guidelines + consider arterial line, IDC.
- Have external defib pad on.
- If treated for AVNRT (AV nodal re-entrant tachy), then Volatile agents can suppress this rhythm – TIVA may be more appropriate

Post Operatively:

- PONV/analgesia although not expected to be too sore.
- PACU care – will need cardiac monitoring; organized.
- Be aware of risks of ablation procedures – cardiac tamponade, pericardial effusion, atrial perforation (Post operative TOE can identify above).
 - oesophageal perforation, arrhythmia, embolic complications.
- HDU admission may be needed if significant arrhythmia intra-procedure or difficult procedure

Q3- QA to improve efficiency in OT, 65.8%

Operating theatres starting late have been identified as a problem in your hospital.

How would you design and implement a quality improvement program to assess and improve operating theatre starting times in your hospital?

(report)

Key components – planning, implementation, review and standard setting with relevance to late start times.

PS58

Planning:

- very careful planning
- comprehensive data collection -
 - time & motion study following different theatre stakeholders and their priorities in the morning
 - collect data & review results
 - compare performance to other theatres of similar demographics & size
 - involve key stakeholders in planning setup

- consult on proposed changes to ensure engagement & feedback

Implementation

- present proposed changes widely and frequently to all involved
- local 'champions' to drive changes forward
- set time scales and review times
- put in place data collection ability to assess improvement
- take feedback during implementation - be ready to make fine adjustments if required

Review:

- monitor how changes have affected start times
- feedback to group

Standard Setting:

- write improvements into official policies

Q4- AF bridging, 60.3%

A patient with chronic atrial fibrillation on warfarin is scheduled for elective surgery. Outline how you decide if bridging therapy is needed? (70%)

Describe how you would bridge anticoagulation if necessary. (30%)

(the best answer here is to crack open you iOS NZ warfarin blood app)

A). Intro sentence: balancing risk of thrombosis versus bleeding, therefore should consider factors such as:

- Patient Factors - need to perform risk assessment
 - What is indication for warfarin:
 - mechanical valve
 - AF
 - VTE
- Any thrombosis risk factors (some use CHADS2 1= low risk, 2 = medium, >2= high risk):
- Isn't this for annual stroke risk in non-valvular AF? Rather than ANY? And periop use of CHADS2 is not helpful as per BRIDGE study?
 - none
 - Congestive heart failure (1)
 - HTN (1)
 - Age >75 (1)
 - DM (1)
 - Stroke or TIA (2)
 - (rheumatic valve disease)
- Risk of bleeding (BleedMAP 0=low (0.8%), 1-2= standard (2.5%), >2 = high (10%):
 - Bleed prior
 - Mechanical mitral valve
 - Active cancer
 - P thrombocytopenia
 - HAS-BLED – hypertension, abnormal renal/liver, stroke, bleeding diathesis, labile INR,

eldery, drugs (antiplatelet, coag).

- **Surgical Factors:**
 - Low risk eg minor skin procedures, minor dental.
 - Standard risk eg most surgical procedures
 - High risk:
 - eg TURP, cardiac surgery, neurosurgery, surgery in liver, spleen, major joint surgery
- **Decision: Bridging should be decided on**
 - **thrombosis** risk:
 - low - no bridging
 - medium = can bridge or not. Recommended to bridge with low dose enoxaparin
 - high = bridge with enoxaparin - consider twice prophylactic dose or 80% of full treatment dose
 - **bleeding** & surgical risk:
 - if low bleeding & surgical risk could consider not stopping warfarin

NB: BRIDGE study, NEJM 2015:

Bottom line: In patients with chronic (permanent or paroxysmal) atrial fibrillation or atrial flutter, stopping warfarin peri/operatively for short duration does not result in an increased risk of thromboembolism and reduces the incidence of minor bleeding. Patients with mechanical heart valves were excluded from this study.

- major surgeries w high rates of VTE or bleed eg cardiac or neurosurgery, were not included in this study.
- Periop risk of stroke = 0.3% across both groups by 30 day.

B). Principle of bridging:

- stop warfarin 5 days prior to surgery
- usually bridge with LMWH:
 - literature unclear on dose ranges can be prophylactic dose to full treatment dose (see above)
 - if therapeutic dose give last dose 24hrs prior to operation
 - if prophylactic give last dose 12 hr prior to operation
- Australians have additional protocol for people with stable INRs in preceeding 2-4weeks:
 - don't stop warfarin
 - give IV vit K 12-18hours before surgery
 - achieve INR <1.5 in 94% of people
 - see low level of major bleeding & low rates of warf resistance

NOTE:

About CHADS2: (but it's not that good, don't swear by it).

- 0 = 0.8-3.2% annual risk; can take aspirin (325mg) rather than warfarin
- 1-2 = 2.7% annual stroke risk.
- 3 = 5.9% annual risk
- 4 = CHADS2 of 4 = 8.5% (MCQ)
- 6 = up to 18.2% annual stroke risk.
- score >2 be started on warfarin, as the benefits of ischemic stroke prevention outweigh the bleeding risk.

OHA: stable AF, risk of CVE is 4% per year at 75 yr, halved by anticoagulation; ie daily risk = 0.01% (4/365); as per MCQ.

(report)

balancing risk of thrombosis versus bleeding, therefore should:

1. Mention patient and surgical factors:

Under patient factors

AF in the absence of other co-morbidities is low risk for bridging (AHA/ACC guidelines) CHADS2

Under surgical factors – mention high / intermediate / low risks

2. Principles of Bridging

Cease warfarin 5 days pre-op

Usually bridge with LMWH – mention dose range from prophylactic to therapeutic If using therapeutic dose – cease 24 hours pre-operatively

If using prophylactic dose – cease 12 hours pre-operatively

Q5- Bariatric surgery airway, hypoxia minimisation, 87.2%

A 40 year-old male is scheduled for elective bariatric surgery. For this patient:

List the important features of history and examination that may identify a potentially difficult airway. (30%). How could you modify your anaesthetic technique to minimise hypoxia at induction. (70%).

a) **History:** (this one is tricky in deciding breadth of answer for this open question; approach should be just name some important/common examples)

- PMH
 - comorbidities eg OSA, RA, neck pain, DM, syndromes
 - previous surgeries eg max fax surgery/dental surgery/head & neck surgery
 - prev radiation to head & neck
 - Anaesthetic records - review of previous C&L grading, easy BMV
- risk of aspiration & starvation - is RSI really necessary
- Dental problems incl loose teeth

Exam:

- general observations incl facial hair
- mouth opening >2.5cm
- neck AROM
- thyromental distance >6.5cm
- MP score
- prognathion A-C
- neck circumference

b) technique to minimize hypoxia on induction.

Pre theatre:

- avoid sedative pre-medication

In theatre:

- Pre-oxygenation -
 - need to denitrogenise FRC such that $ET_{O_2} > 80\%$, $> 90\%$ is better & specific to bariatrics (report)
 - full vital capacity breaths - at least 2mins
- Positioning:
 - ramped position such that
 - at least tragus > height of sternum

- better would be increased sitting angle - ↓transmitted pressure from abdominal weight into thorax, but care w reduced VR.
- Minimise apnoeic time:
 - gas induction with spontaneous ventilation - consider. may be time consuming cf w IV; but in theory, reduced FRC reaches Fi/FA equilibrium quicker.
 - if RSI required use modified technique with no apnoea
 - Any BMV should be performed through OPA/NPA to minimise inspiratory pressures & prevent gastric insufflation
 - Consider using high flow nasal cannula to maintain apnoea oxygenation
- Minimise attempt at laryngoscopy –
 - Consider video laryngoscopy to get best first view
 - If major concerns re airway:
 - AFOI
- could use ultrasound to prelocate cricothyroid membrane if problems occur

(report)

As a minimum, answers should mention:

- historical issues like previous anaesthetic problems, symptoms suggestive of OSA, neck circumference and mallampati score
- The role of awake intubation if concerned, positioning and preoxygenation [ET O₂>80] better candidates will say ETO₂>90 is specific for bariatric surgery?

Q6- postop MI discussion, 57.1%

A patient is complaining of central chest pain in the post anaesthesia care unit (PACU) following femoro-popliteal artery bypass surgery.

Outline the diagnostic criteria for acute myocardial ischaemia on an ECG? (30%) Describe your management of acute myocardial ischemia in PACU in this patient. (70%)

a) diagnosis of MI on ECG.

ischaemia = NSTEMI; as opposed to infarction

- NSTEMI
- unstable angina
 - ↳ differentiation between these is generally retrospective or biochemical

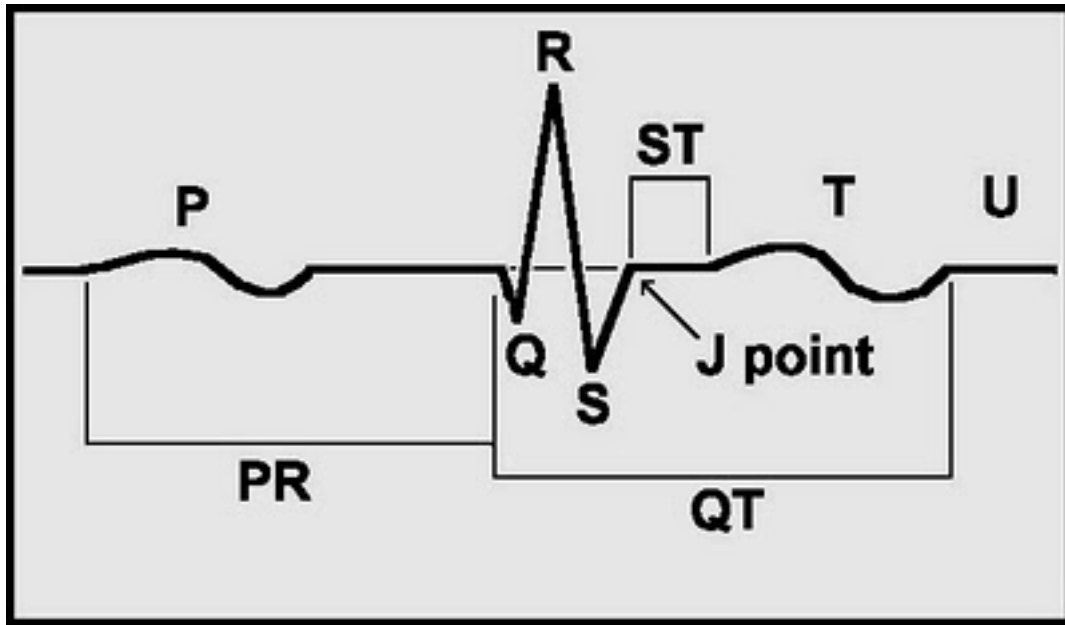
ECG criteria: (LITFL)

- ST segment depression:
 - horizontal or down sloping ST depression (upsloping is non specific)
 - ≥0.5mm at J point in ≥2 contiguous leads
 - The J point is the the junction between the termination of the QRS complex and the beginning of the ST segment.
 - (according to the 2007 Task Force Criteria).
 - ≥1mm is more specific & suggests worse prognosis
 - ≥2mm in ≥3 leads = high probability of NSTEMI
- T wave inversion:
 - ≥1mm deep; ≥2 contiguous leads
 - dynamic ie not present on old ECG or changing over time
 - ↳ only relevant in leads with upright QRS (dominant R waves)

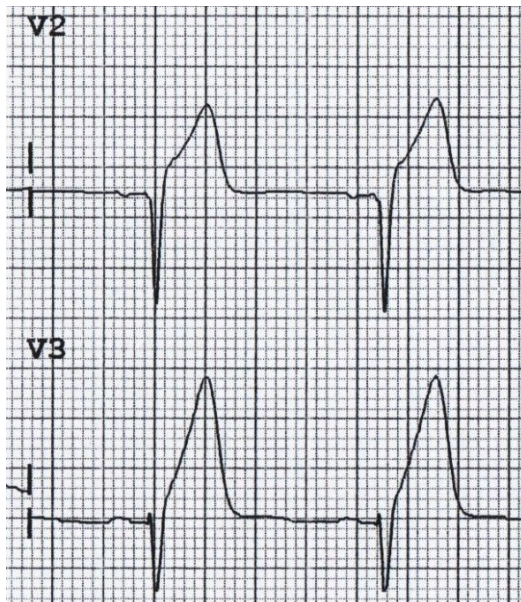
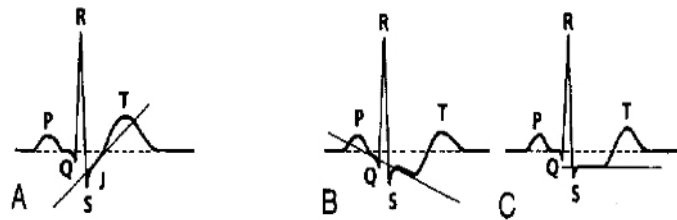
- ↳ also can be a normal variant in III, AvR, V1
- hyperacute peaked T waves or pseudonormalisation of prev inverted T waves
 - Broad, asymmetrically peaked or 'hyperacute' T-waves are seen in the early stages of ST-elevation MI (STEMI) and often precede the appearance of ST elevation and Q waves.
- U wave inversion

b) mx of acute MI in PACU

- overarching principles are increase myocardial O2 supply & decrease myocardial O2 requirement:
 - ↓ **consumption**:
 - analgesia - morphine/fentanyl
 - extreme measure would be to reintubate - ↓ myocardial workload with IPPV
 - if cardiogenic shock - consider IABP placement to offload LV work
 - tachycardia ↓s O2 supply to myocardium & increase demand
 - esmolol titrated very slowly to effect
 - ↑ **supply**:
 - ensure adequate SpO2 - supplemental oxygen. Hyperoxaemia is now discouraged
 - Hb - if Hb <70 should:
 - search for causes of bleeding - graft rupture
 - transfuse immediately
 - **Ensure MAP** consistent with myocardial perfusion:
 - target MAP 65-75 - use vasopressors or ephedrine **cautiously**
 - if refractory ↓MAP consider inodilators eg milrinone +/- adrenaline
 - if MAP >75 start GTN infusion (if happy not RV infarct - loss of preload can be catastrophic)
 - Aim for euvolaemia
 - Monitoring:
 - Serial 12 lead ECGs
 - bedside ECHO - to assess myocardial performance & volume status
 - Treatment:
 - Anticoagulation: Need to urgently discuss with surgeon due to risk of bleeding post op:
 - Antiplatelets: 300mg aspirin, 600mg clopidogrel
 - Heparin: LMWH, IV heparin
 - Referral:
 - Cardiology r/v
 - Consider PCI be of benefit - need to consider need for post op surgical patient and anticoagulation required to make PCI be of benefit



A=upslope
B=downslope
C=horizontal



hyperacute T wave.

(report)

- a description of ECG changes of ischaemia and NOT infarction
- a description of immediate "standard management" of infarction as well as managing

issues specific to this patient [setting of vascular surgery, heparinisation, “normal” BP etc]

Q7- CVL, CLAB bundle discussion, 43.4%

You are inserting a central venous line (CVL) as part of your anaesthetic management for a laparotomy.

Outline the perioperative measures you should consider to minimise central venous line sepsis.

- **before** CVL insertion, consider the pros/cons of using it in the current situation
 - other factors: lumen no., TPN/burn?, immune-compromised? antimicrobial coating (eg. Chlorhex, silver sulphadiazine) required? (usu. used if duration >7days or presence of factors for increased infection)
-
- **during** insertion: I’d follow the recommendations from ANZCA endorsed guideline: ANZICS on CVL insertion and maintenance:
 - proceduralist’s preparation-glove/gown/mask/hat
 - patient preparation-site (subclavian>IJ>femoral)/skin/drape.
 - use ≥0.5% chlorhexidine in 70% alcohol (unless in chlorhex hypersensitivity), alternative: 5% povidone iodine in alcohol
- **post** insertion, for ongoing CVL care, which include daily inspection of insertion site, dressing site, patient’s condition as a whole (pain, red, swell, fever etc) and be aware of duration the CVL has been in.
 - disinfect port adequately before its use
 - remove CVL as soon as it’s no longer required
 - if lumen is blocked, then CVL should be removed within 24 hours
- Facility’s skill maintenance: staff involved in caring of patient’s with CVL should have education on it’s care

(report)

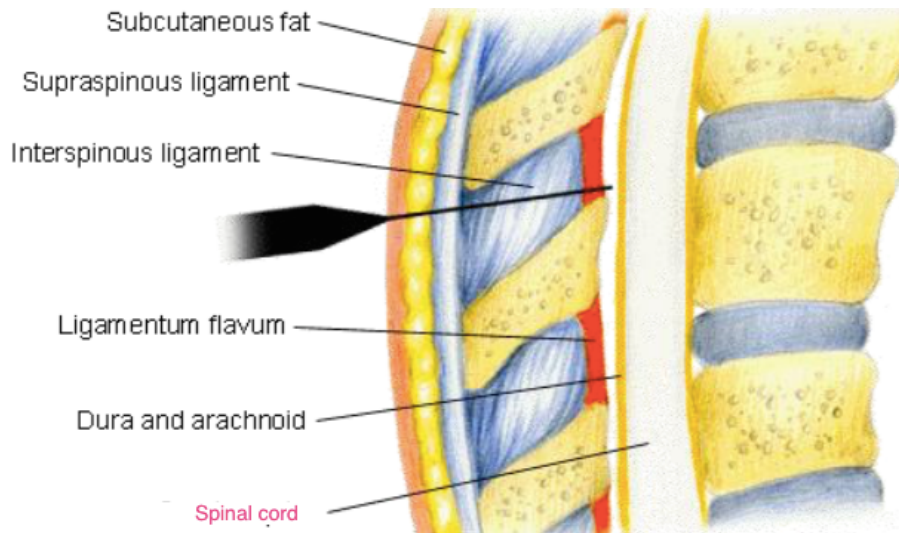
- mention of risks/benefits, of using a central line at all
- discussion of aseptic technique
- following agreed protocols for the insertion procedure
- complying with hand hygiene recommendations
- use of adequate skin antiseptic
- choosing the best CVC insertion site
- use of adequate port disinfection prior to use
- education of medical and nursing staff
- removal of CVC as soon as it is not needed.

Q8- Thoracic epidural discussion, 71.2%

A patient has a mid-thoracic epidural inserted preoperatively prior to anaesthesia for open AAA repair.

Describe the relevant anatomy including surface landmarks for insertion of a mid-thoracic epidural. Use of diagram(s) may be helpful. (50%)

List reasons for persistent leg weakness 4 hours after emergence from anaesthesia in this case. (50%)



Content of epidural space include:

- Connective tissue; Lymphatics;
- Arteries
 - Branches of vertebral arteries, anterior spinal arteries
- Extensive plexus of veins; Increase in thoracic and abdominal pressure will lead to distension of vessels → prone to cannulation by epidural catheter.

List Reasons for leg weakness:

- persistent nerve blockade
- spinal cord ischaemia – AAA surgery may compromise Artery of Adamkiewicz, or other segmental radicular arteries, contributing to cord ischaemia.
- spinal cord injury related to epidural – haematoma / trauma
- cerebral vascular event eg hypoperfusion ischaemic stroke

(report)

- demonstrate recognition of surface landmarks relating to thoracic spinal cord levels
- outlining layers between skin and epidural space
- mention of contents of the epidural space
- reasons for leg weakness included
 - spinal cord injury related to epidural – haematoma / trauma
 - persistent nerve blockade
 - spinal cord ischaemia

Q9- issue of pneumoperitoneum, 96.8% (repeat)

An otherwise well patient presents for a laparoscopic right hemicolectomy. What are the issues related to the carbon dioxide pneumoperitoneum? How would your intra operative management address these issues?

Q10- blood product management in OT, 55.7%

Outline the steps to ensure the safe storage, handling and administration of blood to a patient once the packed red blood cells (RBC's) have arrived in the theatre suite.

Storage

Blood products must be stored in a **dedicated blood fridge**. Fridge must meet NZBS standards:

1. **Dedicated** Fridge for blood products only
2. Clean and **secure**
3. On **essential power supply**
4. **maintained**, calibrated and serviced
5. record of **temperature measurement (RBC 2-6C)** with suitable **alarms**
6. **policy** for management and protocols for dealing with temp alarms

Minimise time out of fridge. Must record cold chain times in and out of fridge. Once px leave OT complex blood should be returned to BB.

Handling

- Must **record time** in and out of BB and blood fridge.
- Time outside **not to exceed 30mins**. Keep blood in **cool box** when not in fridge
 - o Otherwise unit has to be either used for this patient or discarded
- If a unit is not going to be used it should be **returned to BB** for restocking or disposal. Must record the fate of each unit (used / returned) in chain of custody.

Need to **check that unit matches** prescription and patient. **Two person** check of

1. Patient **identity** (Name / DoB / MRN)
2. Check **unit number** against tag (**Number I Expiry / ABO type**)
3. Check **integrity** of packaging

Record in px notes number of units transfused. **Sign prescription** and file with notes.

Administration

- Transfusion should be started **within 30 mins of issue** / removal from fridge.
 - o Otherwise, return to fridge / blood bank for restocking
- If the unit is out of the fridge for > 30 mins and not going to be used the unit should be returned to blood bank for **safe disposal**
 - o unless it can be used (and transfusion complete) in 4 hours.
 - o Transfusion must be **complete within 4 hours of issue** / removal from controlled fridge.

Timings of products

Product Type	Storage	Time out of Storage	Use By
RBC	Blood Fridge	30 mins max	4 hours after issue / removal from blood fridge
FFP	Blood Fridge	30 mins max	4 hours after issue / removal from blood fridge
Cryo	Controlled Room Temp	30 mins max	4 hours post thawing
Platelets	Platelet Warmer	1 hour	within 1 hour of issue

- Use blood giving set with **filter**. **warming** as need
- Set up as **sterile no-touch technique**

- Monitor patient for adverse reactions
- Document each unit given, document any reactions
- Monitor K⁺ / Glucose / Ca levels in large, rapid transfusions

Re: line set up recommendations: In summary, the recommendations are:

1. All fresh components (rbcs, plts, ffp, cryo) should be infused through a blood filter (built in to the giving set).
 - a. platelet should not infuse through a set with previous RBC transfusion, as RBC debris can trap plts
 - b. RBC however can be given after plt transfusion through same set.
2. Not recommended to infuse plts through a rapid infusion device.
 - a. As per Sandy, can cause PHTN and RVF
3. For red cells, the pressure should not exceed 300mmHg.

Unless in Massive transfusion:

4. Ideally the line should be flushed between different components.
5. Platelets must be transfused through a new blood administration set

(report)

Processes to ensure the right patient received the right pack of the right product and that it was stored safely. Aspects of administration including filtering and non mixing of infusions.

Q11- Free flap circulation discussion, 61.6%

Outline the physiological determinants of blood flow through a myocutaneous free flap? (50%). Evaluate the use of vasoconstrictors for support of blood pressure following reanastomosis of a myocutaneous free flap? (50%).

Q	Flow rate
P	Pressure
r	Radius
η	Fluid viscosity
l	Length of tubing

$$Q = \frac{\pi P r^4}{8 \eta l}$$

Determinants of flow (summary from OHA)

- Hagen-Poiseuille formula (perfusion pressure, vessel caliber, blood viscosity)
- flow also can be described by Ohm's law = pressure / resistance
- in clinical terms: hypoperfusion, hypoxia, hyperviscosity, vasoconstriction, vasospasm, fluid deficit, fluid excess/oedema, etc all compromise flow
 - monitor temp; UO +/- CVP;
 - keep patient warm, volume loaded, pain free, normocarbic.
 - Drugs: consider in high risks (arteriopathies): nifedipine 10mg tds, chlorpromazine 1-2mg IV, papaverine directly given to vessels to prevent spasm; pethidine for shivering 25mg IV, epidural best for flow condition (vasodilate, SNS block);

Evaluate vasopressor's role in free flap anastomosis

- All other factors should be optimized first (see above)
- -increased perfusion pressure from vasopressor use is balanced with decreased blood flow from vasoconstriction by vasopressor
- Recent systemic review on vasopressor use and flap outcome has not shown increased risk of flap failure.
- Noradrenaline use when indicated for treatment of hypotension, is associated with improved flow through the flap.
- -on balance, modest use of vasopressor is associated with improved flow through myocutaneous free flap, and its benefit in improving perfusion pressure overall achieves improved flap blood flow

(report) acknowledging that vasoconstrictors had a role to play but should be considered after other parameters had been optimised.

Q12- Beach chari position (repeat), 44.3%

A patient is scheduled on your list for arthroscopic shoulder surgery. The surgery is to be performed in the beach chair position.

List the problems associated with this position and describe how you could minimise them.

✓ (Sep-2007 Q5) A 50 year old, 110kg builder is on your list for an arthroscopic acromioplasty which is to be performed in the beach chair position. List the problems associated with this position and describe how you could minimise them.

Intro: (mentioned in exam report)

Positioning needs to be done by both surgical team and anaesthetic team to ensure optimal and safe position. Position needs to be checked regularly throughout the case.

- **Environmental factors**
 - **Poor access** to patient and loss of an airway
 - ✚ Reinforced endotracheal tube and ensure good securing of the tube (both tape and tie)
 - ✚ HME filter should be well padded where it lies on patient
 - **Circuit disconnection**
 - ✚ Circuit connection point should be well checked and tightened
 - **Loss of monitoring:** BIS on forehead, temperature probe
 - ✚ Monitoring should be taped over the device and have a layer of cover so it does not stick to surgical drapes
 - **Head malposition and injury to cervical spine** from vigorous movement (neck flexion and excessive lateral flexion)
 - ✚ Head ring (or equivalent) should be used and head well secured with broad non-sticking tape
 - **Compression of eye and loss of vision**
 - ✚ Plastic eye protection goggle
 - ✚ Constant check throughout the operation that surgeon of equipment is lying on patient's face
 - **Brachial plexus injury** from excessive turning of the head
 - ✚ Head position should be checked regularly so it is not overrotated
 - **Poor arm support** and arm falling off the table with associated injury
 - ✚ Arm should be well tucked-in as it does not fall off the bed
 - **Pressure sores**
 - ✚ Bony prominences and joints are well padded (elbow for protection of ulnar nerve; hand; ankles)
- **Physiological related**
 - **Perfusion pressure:** position of brain higher relative to heart, and pressure is lower than actual measurement leading to **cerebral ischaemia** ensure CPP maintained, venous drainage unobstructed
 - **Low perfusion pressure** to coronaries and eye: leading to **myocardial ischaemia** and vision loss

Report also mentioned:

- ulnar N, auricular/occipital nerve compression → prevent by avoid stretch+appropriate padding+ensure neutral neck
- Sciatic nerve → avoid stretch by flex knee slightly
- sacral, eye, vascular compression → appropriate padding, protection

- Head up position, hypotension → gentle induction, slow attainment of position, fluid/pressor, compression stocking
- > BP to brain likely 15-20mmHg lower than that measured on arm, therefore take into account
- Limited access to IV → extra secure
- > or use arterial line and place transducer at level of tragus; also advantageous in prolonged procedure, patient with co-morbidities, esp CNS/CVS;
- > Cerebral oximetry - sudden reduction may indicate reduced cerebral perfusion.
- > Hypocapnia causes cerebral vasoconstriction (and impaired perfusion) therefore avoid if IPPV.
- Venous air embolism → vigilance to VAE, avoid hypovolaemia, some PEEP, avoid nitrous, bony source waxed; in arthroscopy, usu not a problem as irrigation fluids are present

Q13- acromegaly discussion, 77.2%

A 53 year-old man with acromegaly presents for a transphenoidal resection of his pituitary tumour. Outline the features of acromegaly. (50%)

How does this diagnosis influence your anaesthetic management? (50%)

Acromegaly:

- **chronic, progressive multi-system** syndrome caused by overproduction of **growth hormone** from anterior pituitary (often as result of macro adenoma).

Features, related to:

- Local mass effect:
 - enlarged **sella turcica**, visual disturbance, headache (papilloedema and incr ICP), rhinorrhea
- GH excess:
 - skeletal overgrowth
 - soft tissue overgrowth (lips, tongue, epiglottis, VC)
 - connective tissue overgrowth (recurrent laryngeal nerve paralysis)

- peripheral neuropathy
- glucose intolerance
- OA and osteoporosis
- Hyperhidrosis (= excessive sweating)
- skeletal muscle weakness

Associated co-morbidities: hypertension, diabetes, OSA (due enlargement of upper airway soft tissue)

- also LVH, IHD, arrhythmia, heart block, cardiomyopathy

OHA summary:

- Local mass effect
- +
 - -too much GH from ant pituitary
 - -airway: head/jaw/tongue/larynx big/vocal cords stricture/possibly narrow cricoid ring/chondrocalcinosis;
 - -nerve entrapment syndromes → protect pressure areas; - peripheral neuropathy, recurrent LN palsy; proximal myopathy
 - -resp: OSA; kyphoscoliosis causing restrictive lung dx
 - -CVS: HTN/LVF/arrhythmia/valvular dx
 - -others: DM, thyroid, renal impair,
 - -CNS: raised ICP likely
 - -MSK: skeletal muscle weakness
 - -drugs: somatostatin analogues (octreotide), bromocriptine (dopamine agonist) to lower GH levels (watch for postural hypotension).

May have other endocrine dx: (from Chang)

- Diabetes: assess control and medications
- Thyroid problems, etc: Measure Thyroid function
- Prolactinaemia
- Cortisol deficiency/excess: synecthan test, assess symptoms and signs of these
 - Will therefore need: BSL, electrolytes checked

Anaesthetic Management:

Pre-op:

- thorough airway assessment
- optimisation of co-morbidities - particularly BP and diabetes
- ECHO to assess LV size and function and pulmonary pressures
- routine pre-op bloods and ECG, BSL
- involve endocrinology team

Intra-op:

- airway/ventilation management
 - BMV - usually ok, although distorted facial anatomy may make mask fit difficult - have different mask size/shapes available
 - intubation - can be difficult due to combination of macrognathia, macroglossia and expansion of upper airway soft tissues
 - prepare for potentially difficult airway (video laryngoscope, GEB gum elastic bougie, difficult airway trolley); AFOI if signs indicators of difficult intubation
 - ventilation - resp fnx may be additionally compromised by kypho-scoliosis and proximal myopathy - may need to tolerate higher airway pressures

- **extubation** - may be difficult (as per intubation) - need plan (?AEC), extubate sitting up and awake if OSA
- use of **peripheral nerve stimulator** to guide non-depolarising muscle relaxant use (esp if muscle weakness present)
- drug considerations - somatostatin analogues (**octreotide**) may cause **Ds + Vs**; **bromocriptine** can cause **severe postural hypotension**
- **positioning** - excess peripheral soft tissue increases risk of nerve entrapment syndromes - careful positioning required; may need wider/longer table
 - head-up/beach chair position
- analgesia - minimise opioids if OSA
- IV access may be difficult due excess peripheral soft tissue deposition - may need USS
- Regional may be difficult due skeletal/soft tissue changes

Post-op:

- analgesia - minimise opioids if OSA
- monitoring/disposition - HDU if OSA; nasal CPAP contraindicated post-op in trans-sphenoidal surgery
- **hormone replacement** will need to be started post-op
- monitor for post-op neuroendocrine problems (e.g. **diabetes insipidus**)

Q14- acid/base analysis, discussion, 59.4%

A patient's arterial blood gases include

pH 7.1, pCO₂ 27, HCO₃ <15.

A. What is the acid-base status of this patient and briefly justify your differential diagnosis list.

B. Describe how other biochemical parameters would help identify the cause

PART A:

pH of 7.1 indicated acidemia. Low HCO₃ indicated this is a primarily metabolic disorder. The low pCO₂ indicates some degree of respiratory compensation for this. Hence the patient has a metabolic acidosis with some respiratory compensation.

Results from either:

- gain of a ~~strong~~ acid - endogenous or exogenous
- loss of base (HCO₃ via bowel or kidneys)

Differential diagnoses include:

High anion gap: (**LTKR**)

- lactate
- toxins (**IGMS**) – **isoniazid**, **glycols**, **methanol/ethanol** **salicylate**
- ketones (DKA/**HONK**) **alcoholic ketoacidosis**; NB HHS is mentioned in report
- renal/uremia

Normal anion gap ~ hyperCl acidosis: (**USED-CRP**)

- ureteroenteric fistula
- saline
- endocrine (addison's, spironolactone_
- diarrhoea
- carbonic anhydrase

- renal tubular acidosis
- pancreatitis

If had actual HCO_2 , could calculate expected pCO_2

- using figure of 15, expected pCO_2 is ~ 30 (= 1.5 (actual $[\text{HCO}_3]$) + 8mmHg)
 using cheat sheet; expected pCO_2 = last 2 digit of pH ie 10 (but James's calculation is more accurate, this cheat sheet rule is shit)

PART B:

In order to identify the cause, further test results that would be helpful:

- Find out if HAGMA or NAGMA – $[\text{Na} + \text{K}] - [\text{Cl} + \text{HCO}_3]$
 - Electrolytes - Na, K, Cl - allows identification of abnormalities, also allows to calculate anion gap
- Glucose and ketones (plasma and urine) - identify if DKA/HONK
- Lactate - confirm if lactic acidosis
- Renal function (urea and creatinine) - confirm if renal failure is cause
- Drug levels (methanol, EtOH, salicylate) to confirm/rule out overdose/poisoning
- Urine - ketones, drug levels
- Amylase-pancreatitis, cortisol level-Addison's

Q15- persistent post surgical pain (repeat), 85.8%

Define persistent post surgical pain

Outline the interventions that are efficacious in reducing the transition of acute post surgical pain to persistent post surgical pain

Persistent Post Surgical Pain

- Definition: no consensus
- usually = pain that lasts at least 2 months after surgery and not due to other causes of pain, in particular pain from a condition preceding the surgery.
- Some argue should be 3-6 months
- often neuropathic in nature

Risk factors: for PPSP

PATIENT

- Pre-operative chronic pain. This can be either at the operative site or elsewhere in the body
- Possible genetic pre-disposition
- Psychological Factors: depression, psychological vulnerability, stress, and late return to work

SURGICAL

- nerve damage intra-operatively (poor positioning, surgery insult, intra-neuronal LA injection, ischaemic injury).
- repeat surgery
- adjuvant chemo or RT
- High risk surgery: amputation, thoracotomy, prolonged surgical tourniquet; large area of trauma to tissues.

ANAESTHETIC

- **poor acute analgesia** (controversial). There is a positive association between high acute pain scores and development of PPSP

Interventions to minimise PPSP

PATIENT

- (**Identify**) Risk assessment and informed consent / counselling is important in assessing patients most likely to be at risk and setting in place coping mechanisms.
- **Pre-emptive** psychological therapy may have a role.
- Early mobilization and goal planning for timely discharge from hospital.

ANAESTHETIC

- **Regional** anaesthesia may be useful especially where nerve damage likely (amputation, thoracotomy, colectomy, hysterectomy, mastectomy, CS etc.).
- **Pre-emptive analgesia** is known to reduce acute pain and pain in patients post prostatectomy.
- **Preventive Analgesia**: i.e. NMDA receptor antagonists (ketamine) and alpha-2-delta modulators (gabapentin, pregabalin)
- **Acute pain multimodal analgesia**: especially 1-3 weeks post-operatively when would expect decrease in acute pain post operatively

SURGICAL

- **?Diathermy > scalpel** incision. Some evidence for less postop pain.
- Surgically placed **wound catheters** adjacent to nerve endings may reduce phantom limb pain in amputation

Definitions from Anaesthesia Review:

- **Pre-emptive analgesia**, = given before the surgical incision, is intended to attenuate the physiological sequelae of nociception, and works better than given after surgery.
 - The rationale = block of development of central sensitization before nociception
 - lack of evidence for its benefit (regional or systemic analgesia) on acute postoperative pain, or on chronic pain.
- **preventive analgesia** = aimed to block the development of sustained pain; broader definition includes given at any time during the perioperative period to prevent pain-induced sensitization.
 - provides analgesia beyond the expected duration for that agent, which has been defined as more than 5.5 half-lives

(report)

Key components of an answer for this question:

- A definition of PPSP

Chronic pain = pain persist despite having recovered from initial tissue injury. ie persistent pain >12 weeks.

- Must develop after surgical procedure

- Pain of at least 2 months duration

- Other causes have been excluded

- The possibility that the pain is from a preexisting condition has been excluded

Oct-2013, 36.6%

Q1- Periop mx of ACEi + metformin, 68.1%

A 68-year-old man is scheduled for total knee replacement next week. He has hypertension, for which he is prescribed enalapril, and type 2 diabetes, for which he is prescribed metformin.

Justify your perioperative management of his medications.

Enalapril

- ACEi used to treat chronic HTN, HF, diabetes with proteinuria to prevent progression to diabetic nephropathy.
- Current pre op recommendations are to stop ACEi 24 hours prior to surgery or WH on the morning of the operation [?source](#)
- TKJR –GA or spinal with sedation → can produce significant hypotension, esp w blood loss
 - ACEi use on the day of surgery can increase the degree of hypotension at induction of anaesthesia as well as post operative hypotension.
- Post operative – restarting the ACEi depends on volume status, oral intake, urine output and renal functions post operatively.
- If patient is tolerating oral intake, has adequate urine output with normal electrolytes and creatinine, normotensive, it is safe to restart the ACEi post operatively.

Metformin:

- Oral hypoglycaemic agent used to treat T2DM;
- **biguanide**; excreted unchanged in the urine and doesn't undergo hepatic metabolism.
- Metformin doesn't lower blood glucose levels.
- Metformin doesn't worsen renal function but risk of lactic acidosis is higher in patients with impaired renal functions.
- There is no evidence for stopping metformin pre-operatively or for duration of metformin withdrawal.
- [No universally accepted recommendation for continue or stop metformin periop; however, generally accepted that risk of lactic acidosis is higher in patients with impaired renal functions, and those undergoing major surgery eg. hepatic resection, CABG. For these patients, stopping metformin is generally recommended. Incidence of lactic acidosis is 0.03 per 1000 patient years but mortality is high.](#)
- Check BGL preop and if BGL is unstable, [check frequently eg hourly. If BGL is stable ie consistently within 6-11, may extend frequency up to 4 hourly.](#)
 - [If BGLs are >11mmol/L eg over 2 consecutive measurements – consider treatment with either IV or SC insulin depending on local policy.](#)
Hyperglycaemia is asss w increased risk of wound infection, poor wound healing, increased risk of MI etc
- If BGLs are well controlled and patient has normal urine output, renal function and is able to tolerate oral medications, and has restarted eating – restart metformin.

(report)

Periop risk stratification

Maintain physiological “normality” for patient

Making use of guidelines / recommendations
Risk / benefit calculation of stopping vs continuing agents

Q2- stats, definitions, 26.9% (repeat)

In a large clinical trial, patients were randomised into two groups to study the impact of BIS monitoring on the incidence of awareness. The table shows the results.

Groups	Sample Size	No. of cases of awareness
BIS	1250	2
Routine	1250	11

Data analysis found that the difference in the incidence of awareness had a p value of 0.022. The study reported that BIS guided anaesthesia reduced the risk of awareness by 82% (95% CI 17-98%) with an odds ratio of 0.2 and a NNT of 140.

Define the following terms and explain their meaning in relation to this study:

- P value
- Risk reduction
- Confidence interval
- Odds ratio
- Number needed to treat

Q3- SVV discussion, 42.9%

- Outline the principles of stroke volume variation (SVV) measurement. (50%)
- Describe how SVV measurement can be used to assist haemodynamic optimisation in a patient undergoing major elective abdominal surgery. (50%)

References: Life in the fast lane,

Answer:

A.

In spontaneous breathing, on inspiration SPB decreased by <10mmHg and there is slight increase in HR.

- On inspiration → inc capacitance of pulmonary vasculature.
- Also, inc RV VR → interventricular dependence → dec LV preload.
- All of above reduce LV SV, MAP → increase in HR mediated via Baro Reflex.
- **Digress: LITFL: Pulsus paradoxus is a phenomenon in which the difference in systolic blood pressure (BP) between inspiration and expiration is more than 10 mmHg.**

PHYSIOLOGY

Spontaneous breathing increase in negative intrathoracic pressure during inspiration

-> blood pools in pulmonary circulation

-> left heart filling reduced and lower stroke volume

- The reverse occurs during mechanical ventilation, left ventricular stroke volume increases during inspiration because left ventricular preload increases while left ventricular afterload decreases
 - ie pulm blood 'pushed back' into LA by positive pressure
- right ventricular stroke volume decreases during inspiration because right ventricular preload decreases while right ventricular afterload increases
 - ie pressure gradient to RV preload and afterload

SVV Principle:

- Stroke volume variation (SVV) = $(SV_{\max} - SV_{\min}) / SV_{\text{mean}}$; over a respiratory cycle or other period of time. SVV represented as a %
- Digress: pulse pressure variation (PPV) = $(PP_{\max} - PP_{\min}) / PP_{\text{mean}}$ over a respiratory cycle or other period of time
- SVV or PPV >10% suggests that the patient is fluid responsiveness as indicates that stroke volume is sensitive to fluctuations in preload caused by the respiratory cycle.
- Report: change in SV or pulse pressure during the respiratory cycle is measured before and after a fluid challenge and its response assessed and interpret the change.

B: guidance of fluid management in major abdo surgery: FLUID RESPONSIVENESS

- SVV and PPV are not indicators of actual preload but of relative preload responsiveness or fluid responsiveness.
 - If a patient has low cardiac output that requires correction eg in context of signs of hypoperfusion – where metabolic acidosis or reduced creatinine clearance is evident, fluid administration likely will help improving CO to improve oxygen delivery.
- SVV has a very high sensitivity and specificity when compared to traditional indicators of volume status (HR, MAP, CVP, PAD, PAOP), and their ability to determine fluid responsiveness.

Limitations:

- Just because a patient is fluid responsive does not mean they actually need fluid. Eg. in SIRS where patient may show responsiveness but very transiently due to ongoing distribution of intravascular volume; in such context, combined treatment with vasopressor should be used.

SVV is limited in the following settings:

- small tidal volumes (tidal volume must be at least 8 mL/kg)
- spontaneous breathing (patient must have 100% controlled mechanical ventilations at a fixed rate)
- ARDS and low lung compliance (false negatives more likely)
- PEEP (may increase SVV)
- arrhythmia (R-R interval must be regular on ECG)
- low heart rate/respiratory rate ratio
- open chest
- right ventricular systolic dysfunction
- norepinephrine (may decrease SVV)
- vasodilators (may increase SVV)
- b-blocker medication

(report)

- a. Ability to recognize that the change in SV or pulse pressure during the respiratory cycle is measured before and after a fluid challenge and its response assessed and interpret the change.
- b. Recognise the use of SVV to optimize preload and use it to assist in deciding between fluids and / or inotropes.

Better responses acknowledged some limitations, and the described goal of avoiding tissue hypoperfusion.

Q4- QA to minimize intraop drug errors, 81.9%

Outline methods available to minimise intraoperative drug errors

- drug error incidence = 1/135 anaesthetic
- significant harm to patients
- need to recognise and adopt techniques to minimise such events

ANZCA PD doc on injectable drug in anaesthesia

Individual action

- write legibly
- good communication
- minimise distraction when drawing up
- adequate light

Prior to drawing up and admin

- Read labels (check name / dose)
- Regular checking for expired drugs
- Draw up 1 drug at a time and label
- If uncertain of drug drawn up → discard
- Check drug before admin with 2nd person or automated device esp intrathecal drugs
- 1 ampoule to 1 patient. Don't share ampoule.

Labels

- Colour coded by drug class pre-printed labels

Storage during anaesthesia

1. tray for emergency drug vs tray for routine drug.
2. Different routes stored separately eg. epidural vs. IV

Storage

- Tidy, organized, standardized, appropriate trays
- Emergency drug drawer
- Store apart look-alike ampoules

System

- Avoid look-a-like packaging
- Change of packaging must be widely communicated
- Standardize concentration of drug
- Use prediluted formulation; avoid need for dilution esp high risk drugs eg. insulin.
- Inventory should minimize drug error – don't make ampoules look like

Infusion drugs

- Standardized drug concentration.
- Label patient end of infusion line.
- One way valve to avoid siphoning of infused drug.

(report) Recognising that drug is a broad term and could mean wrong drug, dose, patient etc. Some mention of the various strategies such as:

- Recognise multiple factors involved- target these to minimise errors
- Drug labelling options

- Checking procedures
- Minimal distractions when drawing up drugs
- Drug storage options
- Pharmacy involvement
- Documentation
- Policies
- Audit

Q5- Anatomy of forearm, wrist, 57.7%

An adult patient is scheduled for formation of an arterio-venous fistula at the wrist.

- Describe the nerve supply relevant to this surgery. (30%)
- Discuss the suitability of an interscalene block in this situation. (70%)

(report)

The need to:

- demonstrate that this operation usually involves creating a fistula between the radial artery and cephalic vein at the wrist.
- communicate an understanding that the C5-6 dermatomes need to be blocked, AND that the musculocutaneous nerve is the relevant peripheral nerve.
- communicate that to adequately cover a tourniquet will require something else/extra (although use of tourniquet infrequent).

The need to:

- define what an interscalene block is
- note that a successful interscalene block will cover C5-6 as required
- make some comment on how to manage a tourniquet
- discuss the suitability of the block with reference to other sensible anaesthetic option for this operation (GA, local anaesthetic at the wrist, axillary block)

A

- Operation = making a fistula between radial artery & cephalic vein at wrist
- ∴ need sensory coverage at lat - ant forearm extending to wrist
- relevant nerves:
 - lat cutaneous nerve of forearm ⇒ from musculocutaneous nerve (C5/6)
 - (medial cutaneous nerve of arm C8,T1 if surgical field spreading to medial side of arm & forearm)
- If wish to use tourniquet can be very difficult to cover tourniquet pain with regional:
 - interscalene/infraclavicular can offer partial coverage
 - possible to perform intermittent or no tourniquet
 - sedation

Matt Levine's take on Tourniquet pain:

- Not really painful, that's why people do Bier's block.
- If painful, it's painful cuz it pinches skin, so deflate cuff and check
- 45mins SNS stimulation is not blocked by Nerve block.
- Matt: tourniquet pain isn't an issue to nerve block, as no one can really block it.

Exam: may need to talk about covering upper arm cutaneous branches, which can be covered by supraclav/interscalene/infra, but not axillary.

B

interscalene block is a neck block

- commonly now performed with ultrasound
- nerve roots found between ant scalene & mid scalene
- commonly able to see C5,C6, C7 roots -
- can sometimes see C8,T1 but often separated from block by muscle bridge
- optimum block achieved at C5/6 - C7 can be partial

adv:

- excellent coverage of C5/6 supplying musculocutaneous nerve
- ~~good but not perfect coverage of tourniquet pain of all UL blocks~~
- good sonoanatomy with easy needle access

disadv:

- phrenic nerve block in 100%
- rLN block ⇒ hoarse voice
- some feel subjective dyspnoea
- Horner's syndrome
- risk of vessel puncture
- PTX
- neuraxial injections
- ↓ coverage of hand - but should not be a problem here

alternative options:

supraclavicular –

- less phrenic nerve palsy, good total arm coverage, good sonoanatomy, risk of PTX

infraclavicular - can be difficult sonoanatomy, risk of PTX

axillary block –

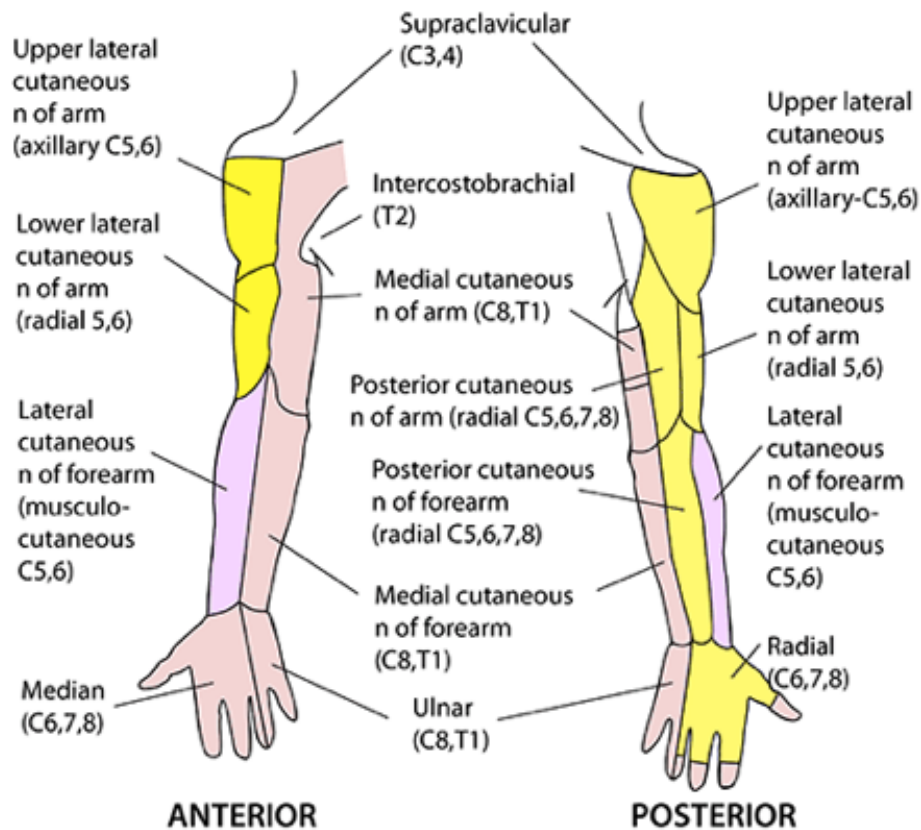
- removes risk of PTX. need to block musculocutaneous nerve separately.
- will not cover tourniquet pain at all

GA:

- often high risk patient group with multiple co-morbidities:
- IHD, CHF
- ↑BMI
- DM
- renal failure - systemic analgesia required
- local + sedation - often hard to achieve without a lot of time spent instilling large volume of local & sedation. Regional will have higher success rate

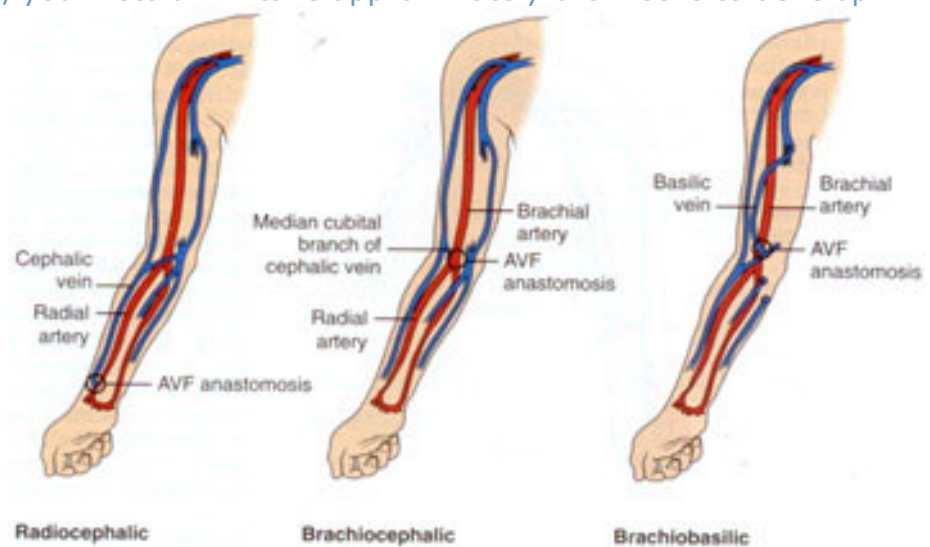
[J Cameron teaching, Oxford Handbook, Adam's Regional Notes (from the physio world & wikipedia)]

CUTANEOUS NERVES OF UPPER LIMB



Note: there is no lateral cutaneous branch of T1. The intercostal nerve T2, intercostobrachial, & T3 have anterior & posterior branches that anastomose with medial cutaneous nerve of arm to supply medial arm & floor of axilla

After the operation, your fistula will take approximately 6-8 weeks to develop



Q6- ABG discussion in vascular surgery, 71.4%

A patient is undergoing femoro-popliteal artery bypass grafting for intermittent claudication under spinal anaesthesia with no sedation.

Discuss this patient's intraoperative arterial blood gas result.

FiO ₂	0.5
Patient temperature	35.6
pH	7.235
PaO ₂	145
PaCO ₂	50
HCO ₃ ⁻	15
Base Excess	-6
Lactate	3.5

(report)

Diagnosing a mixed respiratory and metabolic acidosis; the mild A-a gradient, the respiratory hypoventilation; with the better responses discussing possible aetiologies in the described patient.

- pH = acidaemic
- HCO₃⁻ = low = metabolic component due to buffering (especially given PaCO₂ is high)
- BE = -6 = confirmation metabolic component
- PaCO₂ = 50 = high demonstrating mixed resp & metabolic component
- A-a gradient = PAO₂ - PaO₂ (normal: 5-15mmHg)
 - $PAO_2 = PiO_2 - (PaCO_2 / 0.8) = (0.5 \times 760 - 47) - 50/0.8 = 356.5 - 62.5 = 294$
 - A-a gradient = 294 - 145 = 149 ie clearly much higher than 15mmHg
 - *Ie patient has significant level of shunt/VQ mismatch or diffusion abnormality*
- PF ratio = PaO₂/FiO₂ ie = 294 / 0.5 = 588
 - at sea level normal = >500
 - can give an indication of potential ARDS and severity:
 - < 300mmHg - ALI
 - 200-300mmHg - mild ARDS (27% mortality)
 - 100-200 = moderate (32% mortality)
 - <100 = severe (45% mortality)

A-a gradient (Brandis) tells degree of V/Q mismatch/shunt, factors of gradient include: V/Q scatter, shunt, diffusion abnormality.

Acidosis causes:

- would be nice to have other data from ABG to allow calculation of anion & osmolal gap to aid diagnosis

respiratory acidosis:

- given spont vent & metabolic acidosis would normally expect to see attempted compensation
- not present here
- causes of hypercarbia = *too much production vs too little elimination*.
 - hypoventilation - most likely - high spinal might be effecting intercostals
 - V/Q mismatch ie deadspace - hypoperfusion or PE;
 - ↑FiCO₂ - unlikely as spont venting
 - ↑CO₂ production eg MH - a concern here as mixed acidosis however should be no trigger (except stress) present

metabolic acidosis:

- many causes of met acidosis
- given known vasculo-path with ischaemic limb most likely hypoperfusion based acidosis
- this is partially confirmed with raised lactate
- should support this by calculating it is a raised anion gap acidosis

mixed resp & met acidosis:

- should in particular consider sepsis induced hypoperfusion, MH as other causes

[Fernando's ICU notes, Adam's ICU notes, LITFL]

Q7- tourniquet discussion, 33.5%

Discuss the safe use of arterial tourniquets for orthopaedic procedures.

(report)

- Discussion of the size of the tourniquet and its relevance.
- Mentioning that there are some contraindications to the use of tourniquets and include AV fistulas and severe PVD in this.
- Discussion of the potential complications from tourniquet use: Systemic and localised.

I think what's required are:

- Intro
- Potential complications that can happen
- Recommendation to avoid above complications – size, duration, and avoid in contraindications.

-
- Used in peripheral limb surgery; pneumatic device with inflatable cuff, allows controlled arterial compression and distal circulatory stasis, and create bloodless surgical field.
 - Contraindication to use: peripheral vascular disease, AV fistula, severe crush injuries (?Sickle-cell disease - controversial).
 - Site: upper arm and thigh (calf for short period).
 - Cuff: length should exceed circumference of extremity by 7-15cm, position at point of max circumference of limb.

Physiological effects: (this is digressing)

LOCAL - due compression and ischaemia

- muscle
 - ↓pO₂, ↑pCO₂, anaerobic metabolism, ↑lactate, intracellular acidosis
 - fibre necrosis and microvascular injury (causes leaky capillaries)
- nerve
 - physiological conduction block (15-45min)
 - 'tourniquet paralysis' block (>1hr) - due direct mechanical compression (can last 6/12)

SYSTEMIC

- CVS

- Inflation: ↑SVR and circ. blood vol. → ↑CVP and systolic artery pressure (transient)
- second and gradual ↑arterial pressure (due pain) - attenuated by ketamine
- Deflation: post-ischaemic reactive hyperaemia - transient ↑blood vol. in limb, metabolites released → temporary ↓CVP and systolic pressure
- Respiratory
 - Deflation: → ↑CO₂ (peak w/in 1 min); due: hypercapnia blood in ischaemic limb → ↑mixed venous pCO₂; and ↑C.O. with deflation (in response to ↓arterial pressure)
 - spont breathing - ↑MV rapidly; IPPV - slower correction unless alter ventilation
- CNS
 - Inc PaCO₂ → ↑CBF (↑ICP in patient with HI)
- Haematological
 - hyper coagulable state, no ↑incidence DVT however; brief ↑fibrinolytic activity after deflation
- Temperature
 - inflation: gradual incr. core temp (due reduced heat transfer to and heat loss from limb)
 - deflation: transient decr core temp (primarily due redistribution; but also cold blood from limb)
- Metabolic
 - deflation: ↑K, lactate, CO₂ → acidosis; re-perfusion → brief ↑O₂ consumption and CO₂ production

Complications:

Nerve injury

- mechanical pressure (more impt) vs. ischaemia
- large diameter nerve more susceptible (relative sparing of sensory vs. motor)
- compression at tourniquet site may incr risk of injury at distal site (double crush)

Muscle injury

- post-tourniquet syndrome
- lasts 1-6/52, swollen, pale, stiff limb with weakness (but no paralysis)
- rarely → compartment syndrome
- rhabdo very rare

Skin injury

- chemical burns - skin prep under tourniquet
- friction burn

Vascular injury

- uncommon; plaque rupture → acute vascular insufficiency
- ?avoid in patients with PVD (relative contra-indication)

Intra-op bleeding

- poorly fitted tourniquet
- blood via intermedullary vessels of long bones

Tourniquet Pain:

Exact mechanism unclear

Theories:

- predominately mediated by unmyelinated slow C-fibres (less affected by compressive

effects of tourniquet c.f. larger fibres)

- selective transmission by cutaneous C-fibres (continuously stimulated by skin compression from tourniquet and no dorsal horn inhibition from large nerve fibres whose transmission is blocked)
 - prolonged analgesia with EMLA to skin
- smaller unmyelinated C-fibres are resistant to LA-induced conduction block
 - C-fibres start conducting impulses before A-fibres as CSF LA decrease -> dull tourniquet pain

Solution?

- ↑density of central neuraxial block with adrenaline/morphine/clonidine
- pre-op gabapentin
- low-dose iv ketamine

Tourniquet-Induced HTN:

- exact mechanism unknown.
- ?due activation of SNS response to tourniquet pain
- clonidine blunts response.

Safe Tourniquet Use

Controversial.

Pressures:

1. Ortho: set either 250mmHg UL and 300mmHg LL; or 100 above systolic pressure (arm), 100-150 for leg.
2. limb-occlusion pressure (LOP) plus safety margin:
 - LOP <130 -> add 40mmHg
 - LOP 131-190 -> add 60
 - LOP >190 -> add 80

Duration

- minimum possible
- <1.5-2hr recommended by most (in healthy adult)
 - ~3 fold incr risk neurological complication with each 30min incr in time
- If duration >2hr - deflate for short period (mim 10-15min) before re-inflation
 - must re-exsanguinate limb after re-perfusion

Q8- Mediastinoscopy for mediastinal mass, 72.4%

You are asked to evaluate a 35-year-old patient who has been scheduled for mediastinoscopy to biopsy a symptomatic anterior mediastinal mass

- a. Discuss the features specific to this condition that need to be considered when planning an anaesthetic for this patient. (50%)
- b. Describe how you may need to adapt your anaesthetic plan in response to each of these features. (50%)

(report)

Key components:

Discussing symptoms, signs and investigations of the features that are

- a. attributed to mass effects caused by the tumour,
 - b. those attributed to pathologic process that may be unrelated to the tumour mass, for example myasthenia gravis with thymoma with, or haematologic changes with lymphoma.
- Esp. mention features which can be potentially life threatening was considered important

The second part of the answer required a clear articulation that the biggest concern is collapse at induction, either cardiovascular or respiratory obstruction, and that this may be attributed to loss of spontaneous ventilation. In addition they need to discuss the risks of paralysis, how this can be managed and salvage plans. The need to ensure pre-op condition is optimized, and for invasive monitoring was also required.

A. Features to consider preop

- Take a full history - what symptoms are they having
 - high yield questions:
 - **Resp**: do they have orthopnoea/wheeze/cough/stridor – ie airway compromise, wheeze/infection etc indicate tracheobronchial compression
What position relieve / trigger SOB.
 - **CVS**: chest pain/syncope/headaches/cyanosis/ - ie VR compromise, tamponade,
 - **SVC syndrome**: facial swelling (esp am), SOB, dysphagia, headache, stridor
- examination:
 - **Pemberton's** sign-
 - elevate arms straight up bilaterally & wait 1 min
 - look for facial congestion incl swollen tongue, cyanosis & resp distress
- Investigations (4Ts – thyroid, teratoma, terrible lymphoma, thymus):
 - **CT** - compression of trachea, size of mass in ant mediastinum
 - **PFTs** in lying
 - **bloods** - endocrine screen, electrolytes, Hb, WCC
- systemic effects from un-diagnosed ant mediastinal mass:
 - haematological malignancy eg NHL, Hodgkins, ALL ⇒ ↑ thrombotic risks
 - thymic tumour eg
 - **Myasthenia** gravis - sensitive to NDNMBs & variable response to depolarising
 - **Eaton** Lambert - sensitive to all NMBs
- Planning:
 - local mass effect:
 - as defined by above process
 - risk of difficult ventilation when loss of chest wall tone & cephalad displacement of diaphragm ⇒ ↓distending transmural pressure in airways ⇒ complete airway obstruction
 - ↑ing ITP in attempt to generate ventilation ⇒ ↓VR ⇒ cardiovascular collapse
 - life threatening esp in supine & paralysed
 - systemic effects:
 - as defined by causes above

B Mx

- Major concern is cardio-resp collapse at induction & OHA: potential for haemorrhage esp in SVC obstruction
- preoperative:
 - risk stratify, and consider pre op radiotherapy & steroids to shrink mass (watch for tumour lysis syndrome)
- intraoperative:
 - **invasive blood pressure** monitoring, **Sats probe on R arm** as monitor of cerebral perfusion ie as blood has to get through innominate artery first.
 - Ie if brachiocephalic artery compressed by scope, may get flow compromise
 - **Large IV in lower leg** if SVC obstruction.
 - full pre-oxygenation

- low threshold for gas induction with **vital importance placed on spont ventilation**
- attempt to **avoid any positive pressure breaths as much as possible**
- avoid coughing
- If severe airway compromise: **consider LA** for biopsy, or a SV technique using 2nd gen LMA would be useful; **avoid NMBD**, deep asleep fiberoptic to avoid stimuli of laryngoscopy while spont venting with ketamine to cover analgesia
 - why do this? LMA isn't really suitable as high Pmax, aspiration risk,
 - why deep fiberoptic? If cough/strain/stimulate, increased ITP could further worsen SVC obstruction → arrest
 - common practice = depth of anaesthesia, modest use of IPPV, ensure paralysis/blunting of airway reflex.
- **rescue plans:**
 - team in theatre ready to tilt or **move to full L lateral** if cardio-resp arrest
 - will remove pressure effect of mass on airways
 - **rigid bronchoscope** available to **bypass distal tracheal/carinal obstruction**
 - avoidance of NMBs useful given risk of airway compromise from loss of airway splint from negative transmural pressure in SV + systemic effects: if required ↓ed doses of **rocuronium & suggamadex** would be ideal combination given risk of residual effects on emergence given possible MG or EL
 - **personnel/Equipment for CPB** should be available.
- Extubation: awake in high sitting.

NB: from MCQ:

Anterior mediastinal masses in children.

- GA – spont venting only
- "Children may not tolerate the supine position, especially after induction of anesthesia; turning the **child** to the L decubitus or prone position restores ventilation and cardiac output"
- Re Adults: Millers p 1922: Anterior mediastinal masses
- Diagnostic biopsy should be done under local anesthesia
- In need a GA – evaluate the airway and consider LA and fiberoptic first
- GA – semi sitting position
- Spont vent throughout – avoid NDMR
- "The operating room team should retain the capability of changing the patients position rapidly to the lateral or prone position"
- "A rigid ventilating bronchoscope should be on hand to bypass distal tracheal and carinal obstruction and the appropriate personel and equipment for CPB should also be available"

[Adams notes Paeds & thoracics - Fernando, Oxford Handbook, CEACCP]s

Q9- penetrating eye injury discussion, IOP, 46.2% (repeat)

A 25-year-old boilermaker is scheduled for repair of a penetrating eye injury on the emergency list.

- a. List the determinants of intraocular pressure in general. (30%)
- b. Discuss the perioperative measures available to minimise increases in intraocular pressure in this patient. (70%)

Q10- cerebral palsy discussion (repeat), 57.7%

A 7-year-old nonverbal girl with severe spastic cerebral palsy is scheduled for cystoscopy.

- a. Describe the important features of cerebral palsy relevant to planning anaesthesia for this procedure. (70%)
- b. What are the advantages and disadvantages of inhalational induction in this child? (30%)

Intro:

Cerebral Palsy is a collective term used to describe a diverse group of neurological disorders characterised by varying degrees of motor, sensory, and intellectual impairment.

Anaesthesia planning:**Preop:**

- History and review of notes, exams and investigations, in particular assess:
 - Airway
 - TMJ dislocation due to spasticity / poor dental hygiene, loose teeth may increase difficulty of intubation
 - ETT to protect airway should be considered in view of GORD, hypersalivation, oesophageal dysmotility
 - Respiratory compromise
 - May have chronic lung disease secondary to neonatal respiratory distress syndrome.
 - Increased risk of aspiration pneumonia may consequently lead to chronic lung scarring.
 - Spastic truncal muscle —> scoliosis, restrictive lung defects, pulmonary hypertension, and ultimately cor pulmonale and respiratory failure.
 - Cardiac problems – right heart failure
 - Intellect – comprehension ability / non-verbal communication techniques should be explored, to allow establishing rapport and anaesthetic management.
 - Epilepsy and anti-epileptics
 - Anticonvulsants should be continued
 - Avoid epileptogenic drugs (tramadol, pethidine etc).
 - GORD – consider airway protection, RSI may be required in which case sux can be used (CEACCP).
 - Scoliosis / spasticity
 - May have difficulty with positioning
 - If patient's on baclofen, this should be continued to reduce spastic pain as well as risk of benzodiazepine withdrawal.

Others: Thermoregulation: Patient may have altered thermoregulation and prone to become hypothermic under anaesthesia, worsening spasticity.

Active temperature management is required.

b. inhalational vs IV induction:

- Inhalational: main advantage = alternative induction method when IV access is difficult and would otherwise cause excessive patient / guardian distress.
- Disadvantages:
 - will still cause patient distress during induction;
 - induction speed is slower than IV, so inhalational induction shouldn't replace IV technique when a RSI is absolutely required eg. Bowel obstruction, high aspiration risk.
 - Severe laryngospasm requiring rapid IV medication treatment – although IM sux is a commonly used alternative

Q11- tramadol discussion, 24.7%

Evaluate the role of tramadol in acute and chronic pain management.

Key components of an answer for this question related to:

This should be a very straightforward question and as a result a good standard was expected it is a drug widely used in the practice of anaesthesia!

As a minimum, candidates were expected to demonstrate:

- Awareness of serotonergic and noradrenergic actions
- Awareness of renal excretion – therefore need for modification of dose
- Awareness of drugs interactions – mainly SSRI's
- Potential for reduced resp and GI side effects
- Statistically significant place in neuropathic pain

Q12- POCD, 46.7%

Three days after a patient has undergone hemiarthroplasty under general anaesthesia, his relatives ask to see you because of concerns that the patient does not recognise family members. This was not present preoperatively.

- a. What features would distinguish between delirium and dysfunction in this setting? (50%)
- b. What you would advise the family to be the expected outcome? (50%)

Features distinguishing delirium and POCD

Delirium

- = acute, fluctuating severity of mental disturbance and inattention;
 - Pattern: either hypoactive/hyperactive, shows wax/wane pattern throughout day
 - Other features = distress, anxiety, hallucination, dissociation from reality sense of time/place/people
 - Time: Onset usu. <3 days postop
- Cause = multifactorial
 - Patient –
 - preexisting cognitive impairment, elderly, sensory impairment (audiovisuo);
 - Drug use: ETOH, substance withdrawal, BDZ/opioids, steroid, anticholinergic etc (thiazide diuretics, digoxin also have mild anticholinergic effect)
 - Acute Physical illness: hypoxia/ LRTI, hypotension, increased ICP, CVA/TIA, hypothermia, electrolyte disturbance, UTI, liver failure, thyroid dx, pain
- Diagnosis: clinical feature + diagnostic tools eg. CAM questionnaire – confusion assessment method.

POCD:

- = reduced memory and ability to handle intellectual challenges (report), in particular those require higher level executive functionings eg. learning new tasks, multi-tasking.
 - Tends to be slower onset than delirium, from days to weeks postop.

- May improve over time, however may take long time and reduced function may be long-lasting.
- Causes:
 - **Patient** – increasing age, preexisting cognitive impairment, physical insult: LRTI, infection.
 - **Anaesthesia** – GA rather than RA, long duration.
 - **Surgery**: duration of surgery, degree of surgical trauma; higher risk with major vascular, orthopaedic and cardiac surgery + CPB use.
- **Diagnosis: clinical + neuropsychological testing.**

Current setting:

- Patient is at risk for both delirium + POCD.
 - common risk factors here include: postop, physical insult of hip fracture, GA, opioids + patient likely is elderly who has suffered #NOF, with preexisting cognitive impairment.
- Acute onset, disorientation without apparent symptoms of delirium, suggests patient has POCD, however further assessment with diagnostic questionnaire will help to confirm working diagnosis.

Tx advice (report):

- Largely expectant, supportive;
 - Likely need increased level of care postop until reasonable recovery of cognitive dysfunction
- chance of recovery are reasonable, particularly of memory related issues, but that some risk of overall reduced function
- recovery can take a long time – many months.
- Medications are NOT indicated.

NB. CEACCP:

- Risk of prolonged POCD ~10% after major surgery in >60yo; incidence may be up to 1/3 in >80yo.
- Prolonged POCD (months) tends to be predisposed by higher age only. Other POCD risk factors are implicated mainly in 'early POCD'.

Q13- PET discussion, 69.2%

You are asked to assess a 35-year-old woman on labour ward. She has uncontrolled hypertension at 34 weeks' gestation. Her blood pressure is 180/110 mmHg and urinalysis shows 3+ of protein.

Her obstetrician wants to deliver her by caesarean section as soon as feasible. Outline your management to optimise her status prior to transfer to theatre.

Issues:

-Patient should be treated as having severe PET

Management:

Multiplinary team management involving midwife, anaesthetic and obstetric and Paediatric team

Patient factors:

-obtain severity of PET – history, examination, investigations

- History: vision, headache, abdo pain
- Exam: airway, pulmonary oedema, RR/sats, BP/P, clonus, hyperreflexia, level of consciousness, CNS irritability, UO, abdo pain,
- Investigations: Bloods-PET screen, LFT, FBC, UECr, Coags, screen for HELLP.
- CTG.

-obtain rest of AMPLE history, and antenatal history; treatment for PET so far?

-Preop optimisation:

- BP: Hydralazine 5mg titrated every 10-15 minutes, Labetolol 5mg titrated every 5-10 minutes, GTN if not controlled; SNP last resort; not ideal due to cyanide toxicity to mother and fetus
 - Aim BP <140/90 mmHg
- Consider seizure prophylaxis, or CNS protection:
 - Magnesium loading dose of 4g followed by 1g/hr
 - Aim for level of 2-3 mmol/l
- Ranitidine +/- metoclopramide and sodium bromoglycate
- Establish IV access, ideally at least 16G
- Fluid management – despite hypertension, patient likely to have decreased intravascular volume due to increased capillary permeability, but care should be given regarding fluid management to avoid pulmonary oedema
 - Meticulous fluid management
 - Small fluid boluses if oliguric.
 - look out for pulmonary oedema
- Gestational age is 34 weeks, so consideration for steroid for fetal lung maturation and requirement for expeditious delivery of baby needs to be made by Obstetric team.
- Patient should be consented for neuraxial anaesthesia if no contraindication, such as coagulopathy, thrombocytopenia, increased ICP, time allowance etc.

Q14- VAP discussion, 28%

Intensive care patients may be at risk of ventilator-associated pneumonia (VAP).

a. Describe the likely aetiology of, and risk factors for, VAP. (50%)

b. Outline prevention strategies that reduce the incidence of VAP. (50%)

Resource = LITFL VAP

VAP = loosely defined as pneumonia occurring in people who had mechanical ventilation (tracheal tube + IPPV) within 48 hours of the onset of infection. (There's not yet gold standard for its definition)

a. aetiology, risk factors for VAP:

Aetiology: Colonization of the upper airway, tracheal tube/circuit with pathogenic organisms → aspiration or microaspiration → infection of lower airway ie VAP

Risk factors:

- **Host** related: comorbidities such as COPD, obesity, GORD, burn, trauma, immunosuppression, malnutrition; supine position, excessive sedation.
- **Device** related: MV > 48 hours
- **Health personnel** related: improper hand hygiene.

b. prevention strategies to reduce VAP

Organisational:

- **Minimise intubation**/reintubation when appropriate.
 - Use NIV if appropriate (decreases VAP)
- **MDT** approach (doctors, nurses, ID team, PT)
- **Infection control**: hand hygiene, cross control of infection, surveillance
- **Blood conservation strategies** (transfusion independently increases VAP)
- **Protective lung ventilation** strategy
- **Antibiotic** cover: when given AB, choose adequate cover to reduce risk of multidrug resistant organisms
- **Environment**: **targeted** environmental sampling, **disinfection** during outbreaks

Patient Care

- **Prevent colonization** of the upper respiratory and gastrointestinal tract
 - **Good oral care** (use 0.12-0.2% chlorhexidine BD sponge swab, brushing teeth)
 - **Stress ulcer prophylaxis only when indicated** (i.e. high risk: burns, traumatic brain or spinal cord injury, severe sepsis, coagulopathy and those receiving steroids equivalent of hydrocortisone > 250mg/day; or active peptic ulcer disease)
 - **Silver coated ETT shown** to decrease the rate of VAP (consider in particular in high risk patient – prolonged IPPV, burn, immunocompromised)
 - **Probiotics** (decreases VAP)

NB: re: Oropharyngeal decontamination or selective digestive decontamination – this strategy reduces VAP rate but generally not used due to concern over MDR organism selection.

- **Prevent aspiration**
 - **Head up** at 30-45° unless contraindicated (decreases VAP)
 - **Subglottic secretion drainage (SSD)** (decreases VAP with NNT=11 if ventilated for more than 24-48h)
 - **ETT cuff pressures between 20-30 cmH₂O**, check q4h
 - Consider **early gastrostomy if indicated** (may decrease microaspiration)
- **Minimize the duration of mechanical ventilation**
 - Assess readiness for extubation daily
 - Optimize use of sedation and analgesia (avoid oversedation, decreases time on mechanical ventilation and thus VAP)
 - Early mobilization
 - Early tracheostomy (data controversial, only applicable to selected patients e.g. neurosurgical patients, high spinal patients)

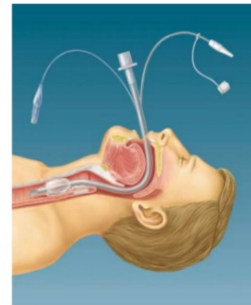
○ Endotracheal suction, humidification and care of the circuit

- Endotracheal suction to clear secretion/sputum
- Humidification and heating of the inspired gases (HME vs heated humidifiers: data conflicting, considered equivalent if heated humidification with heating wire in the inspiratory or both limbs of the circuit is used to prevent condensation)
- Avoid routine ventilator circuit change (frequent changes doesn't change VAP rate)

Key components:

- Sit them up!
- Clean the mouth!
- Suck them out!
- Keep the cuff up!

Continuous Removal of Subglottic Secretions



Use an ET tube with continuous suction through a dorsal lumen above the cuff to prevent drainage accumulation.

CDC Guideline for Prevention of Healthcare Associated Pneumonias 2004 ATS / IDSA Guidelines for VAP 2005

(report)

- Discussion of role of aspirating colonised secretions in aetiology
- Mechanical ventilation/ETT is central & mention of important patient factors and ICU factors.
- In prevention strategies
 - Importance of Avoiding /minimising intubation
 - Importance of common, daily ICU practices in managing ventilated patients
 - Positioning
 - Medication strategies
 - General ICU protocols [hand hygiene, equipment care]

Q15- C5-6 quadriplegia discussion, 75.3%

A 25-year-old female with longstanding C5-6 quadriplegia requires ureteric stent insertion. Outline the implications for anaesthesia.

Long standing C5/6 quadriplegia:

Main issue include potential difficult airway, reduced respiratory function from long term intercostal muscle paralysis (hypercarbia, hypoxia) + autonomic dysreflexia and CVS instability.

Systemic considerations in anaesthetic mx:

Patient factors: obtain appropriate history, exam, investigations

- ample history - nature of the initial injury?
- resp, neuro exams; patient in severe sepsis?
 - May have long term respiratory infection or respiratory failure, from poor cough, sputum clearance, chronic aspiration, intercostal paralysis.
 - Truncal spasticity may lead to scoliosis, potential of further compromising respiratory function
- Labs including inflame markers, blood gases; CXR, ECG.
- Any room for optimization? Eg. Chest physio, antibiotic, bronchodilators.

Anaesthesia implication:

- **Airway:** **potentially difficult airway** if patient's had previous C5-6 fusion limiting range of movement in neck.
 - If intubation is required, videoscope or fiberoptic scope assisted intubation should be considered, either awake or asleep depending on patient's condition – aspiration risk if surgery is urgent due to severe urosepsis.
 - If **RSI is indicated, sux use needs** to be carefully evaluated, although studies have pointed out that severe **hyperK is rarely seen in chronic tetraplegia after 9 months**, alternative option such as rocuronium may be preferred.
- **Breathing: potential long term hypoxia/hypercarbia, atelectasis/chronic LRTI, bronchitis, COPD, bronchiectasis due to intercostal paralysis + poor absent cough.**
 - Evaluate baseline blood gas values; CXR, sputum cultures.
 - Intraop preoxygenate carefully, lung protected ventilation strategies,
- **Circulation:**
 - **Autonomic dysreflexia** – may see exaggerated response to stimulation from intubation/extubation or from surgery.
 - Severe HTN crisis may ensue if left untreated: pulm oedema, MI, cerebral haemorrhage, death.
 - Remove trigger such as urinary retention, obtund stimulation with opioid, alpha1 agonist; inhibit ascending impulses with neuraxial LA.
 - Treat HTN with peripheral vasodilator (eg. a-blockers)
- **D:** Patient may not have sensation below level of injury; however most **patients have retained sensation and require anaesthesia.**
- **GI:** **delayed gastric emptying and risk of aspiration needs** to be considered.
- **Thermoregulation:** **impaired thermoregulation** often seen in chronic quadriplegic; monitor temperature and actively maintain normothermia.
- **Pressure sore, thromboembolism**
- **Spasticity/scoliosis.** may render positioning difficult; IV access may be difficult.
 - Neuraxial anaesthesia may be difficult.
- **Chronic neuropathic pain** is a common problem and occurs together with muscle spasm
 - Multimodal analgesia and consider regional technique; gabapentin, amitriptyline
 - Continue anti-spastic treatment.
- **Other:** patient may have latex allergy (high incidence of latex allergy with repeat IDC) – and latex free periop management may be required: remove latex gloves, clear sign accompanying patient indicating latex free requirement.
- **Psychological disturbances** are more likely - Depression, anxiety, and confusion are common in this group and consideration to involve early liaison psychiatry input should be made.

(report)

issues to cover with clear anaesthetic implications include nature of the initial injury, implications of injury on respiratory function, autonomic dysreflexia and its implications peri-operatively, temperature regulation issues, musculoskeletal and positioning, issues related to DVT prophylaxis and pressure care and association of treatment of the condition

[high incidence of latex allergy with repeat IDC]. Discussion of drug / technique choice especially use of suxamethonium would be expected.

May-2013, 50%

Q1- MILI of neck discussion, 68.3%

- a. How is the need for manual in-line stabilisation of the neck determined? (50%)
- b. What are the implications of inline stabilisation for endotracheal intubation of the airway (50%).

a. how's need for in-line stabilization determined

when **there's suspected / confirmed C-spine injury that affects C-spine stability**; and there's absolute requirement to prevent further spinal cord injury from excessive C-spine movement.

- History: injury mechanism, increased risk factors: eg. High speed MVA, fall from height > 1m, age >65yo..etc, ejection from car, especially when patient c/o symptom of neck tenderness.
- Examination: neck tenderness, neurological deficit, reduced GCS.
- Useful guidelines to help in clinical assessment: **Nexus, Canadian C-spine** rule.
- Investigation: CT C-spine, X-ray;
- if patient is obtunded, CT C-spine has potential to 'clear C-spine injury', however this is only done with experienced Radiologist's report, with careful consideration to risk/benefit of C-spine clearance versus the small, but potential risk of SCIWORA
- if in doubt, keep in-line stabilization on.

b. implication on intubation

- difficulty in airway **assessment**
- limited range of **movement** allowed and
- limited range of movement aimed – have to balance need to maintain safety with minimal movement AND view of laryngoscopy. **Video laryngoscopy, boogie** are useful equipments.
- need **assistant** designated for **bimanual inline** immobilization- assistant's hands need to be away from laryngoscopist's working field.
- intubation condition makes difficult intubation more likely, and subsequent airway **plans** need to be well considered – incorporating adjuncts like LMA/proseal; cricothyroidotomy airway.
- hard-collar, if left on, will limit **mouth opening** – could be removed and apply bimanual immobilization instead.

(report)

Discussion of the need to use the history, physical examination and investigations when determining the need for manual inline stabilisation (MILS).

Acknowledging that MILS was necessary for patients requiring endotracheal intubation where there is concern of instability of the cervical spine and potential spinal cord injury due to neck movement during intubation.

mentioning the need for MILS in clinical situations other than the trauma and mentioned criteria for clearing the cervical spine in trauma situations such as NEXUS and the Canadian C-spine rule. It was considered impressive if a candidate had enough time to write a very brief discussion of the controversy surrounding MRI versus CT scan to clear the cervical spine in the obtunded patient.

b. Acknowledgment of difficulty in assessing the airway, the technical increase in difficulty and the logistics of the need for additional staff and potentially equipment, along with management of collar were considered important

Q2- Safety feature of gas delivery in machine (repeat), 28.3%

Outline the features of the anaesthetic machine that ensure safe gas delivery to the patient.

(note very similar to April 2009 Q2 – model answer from Chang, Louise Speedy/Allannah McKay, Chch primary course added here)

- 'Dangerous gas mixture' = hypoxic, high inhalational anaesthetic conc, high insp CO₂; (or insufficient inhalational conc due to potential for awareness)
- Features to ensure safe gas delivery to the patient.

Gas outlet from the wall

- Colour coded
 - Oxygen – white
 - Nitrous oxide – blue
 - Air – black and white
- Non-interchangeable socket = NIST (non-interchangeable screw threaded)
- Gas checked by pharmacist
- Pressure at 4 Bar

Gas Inlet into anaesthetic machine

- Colour-coded and non-interchangeable

Gas inlet from gas cylinder

- Pin-indexed
- Visible pressure gauge on cylinder & O₂ reserve.

Anaesthetic machine Pressure monitor/regulation/alarm visual and audial/flowmeters/anti-hypoxic device

- Pressure monitoring and regulation
 - Visible Aneroid manometer for each gas from the wall outlet (air, O₂, N₂O)
 - Visible aneroid manometer for gas from the cylinders (O₂ and N₂O)
 - Pressure regulator to pressure reduction distal to vaporiser, but proximal to rotameter ??
- O₂ should be the last gas added to the gas outlet ie the common gas manifold at top of flowmeter tubes
- If manual gas regulator, the O₂ knob should be different from other gas
- FiO₂ monitoring and safety feature
 - Minimum O₂:N₂O ratio regulator (avoid hypoxic mixture)
 - Cut-off of other gases on loss of high pressure O₂
 - O₂ disconnection alarm – visible and audible
 - Should have oxygen analyser and Low FiO₂ alarm

Emergency oxygen flush - control protected from accidental activation

Circuit

- Regular circuit, unidirectional valve, CO₂ cannister, sample tube and HME filter
- Pressure regulation
 - Pressure monitoring of the circuit
 - Ability to adjust pressure release valve (APL valve)
 - Pressure alarms (high and low pressures) and disconnection alarms which should be audible and visualised
- Other gas
 - Low/High CO₂ alarm and monitor
 - Low/High anaesthetic gas concentration alarm and monitor; interlock system to allow only 1 vaporiser on.

Should perform level 2 anaesthetic machine check beginning of every session

Should perform level 3 anaesthetic machine checks beginning of every case

(report)

- Supply of gas to the machine and circuit
- Ensuring safe pressures delivered to the machine and in the patient circuit
- Monitoring of gas content

Q3- arterial line discussion, 69.3%

An elderly patient is to undergo operative fixation of a fractured neck of femur. A radial arterial line is inserted prior to induction, and when transduced, the trace appears damped

- a. What are the possible causes for the trace to appear damped in this patient? (50%) b. Outline the steps you would take to ensure the accuracy of your arterial line (50%)

PART A:

Causes for damped arterial trace:

actually damped (source, tube, transducer/integrator, output, monitor)

- arterial spasm or thrombus
- kinked cannula or tubing, incorrect tubing (should be low-compliance)
- bubbles in tubing
- pressure bag deflated so that constant column of fluid not maintained
- connectors not correctly attached, caps loose
- calibration error
- faulty transducer/hardware

inaccurate reading

- not in artery
- transducer in inappropriate position - i.e. not at level of right atrium

accurate reading but clinical condition causing appearance

- i.e. hypotension

PART B:

Steps to ensure accuracy:

assess clinical picture decide if actually damping or not - HR, ECG, SpO2, NIBP

- is patient hypotensive, and damped appearance due to clinical condition
- check NIBP and see if correlates with arterial line measurement

If damped, ie NIBP doesn't correlate with IABP: stepwise check of equipment

From patient -> machine

- is cannula occluded or kinked - aspirate and flush
- is tubing correct non-distensible tubing; kinked? Bubbles? loose connections?
- Transducer: pressure bag at enough pressure? to ensure continuous flow present to maintain patency; transducer at correct level? Zero'ed?
- dynamic response test
- Output: adjust scale on monitor
 - o if concern re electronic component, try using new cable to monitor, or new monitor if able
 - o if concerned about placement of cannula, or artery spasm/thrombus, use USS to visualise cannula in artery.

- Radial artery may be non-dominant artery, and therefore of smaller calibre compared to ulnar artery (Allen's test)

(report)

a. Possible causes for damp trace

- Actually damped and causes
- Inaccurate reading
- Accurate reading but clinical condition causing appearance

b. Steps to ensure accuracy of reading

- Exclude damping
- Check calibration
- Compare arterial line and NIBP
- Clinically assessing the patient

Q4- airway neuroanatomy, nasal intubation 85.1%

a. Describe the sensory innervation of the respiratory passage from the nostrils to, and including, the vocal cords (50%).

b. List the indications and contraindications for nasal intubation (50%).

a.

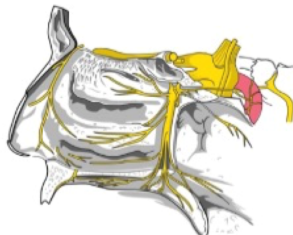
Neuro-Anatomy of the Airway

For an awake intubation to be well tolerated and ultimately successful, gag and cough reflexes need to be suppressed effectively and laryngospasm prevented.

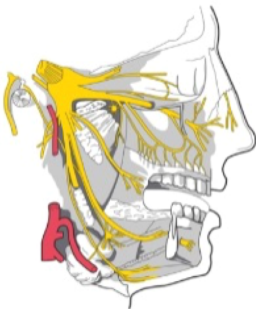
Airway topicalisation for awake fiberoptic intubation involves anaesthetising two or three nerves that innervate the airway at different levels depending on whether a nasal or oral intubation is being performed.

1. Trigeminal nerve branches - Sensory innervations of the nasal cavity.

- Nasociliary nerve (V1)
- Nasopalatine nerve (V2)
- Posterior branches of Maxillary nerve (V2)

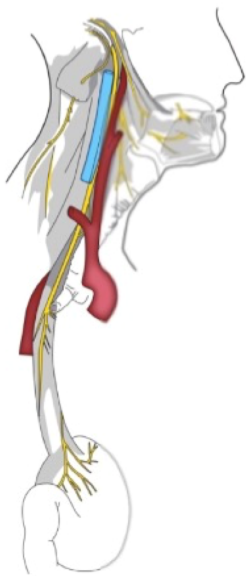


2. Glossopharyngeal nerve - Sensory innervations of the posterior two thirds of the tongue, fauces, tonsils, epiglottis and the pharynx.



3. Vagus nerve branches

- **External branch of the Superior laryngeal nerve** - Motor innervation to Cricothyroid muscle.
- **Internal branch of the Superior laryngeal nerve** - Sensory innervation to the larynx above the vocal cords.
- **Recurrent laryngeal nerve** - Sensory innervation to the larynx below the vocal cords and upper trachea. Motor innervation to most of the vocal musculature.



b. (resource: LITFL)

indication:

- **improve access** to the mouth for surgeon, commonly used in oral/maxillofacial surgery.
- When **oral intubation is not feasible**
 - angioedema of the tongue
 - mechanical obstructions to mouth opening/trismus; from mandibular fixation or other oral pathology
 - Blind nasal intubation is potentially useful in situations where laryngoscopy is impossible due to mouth opening obstruction. However, a fiberoptic intubation probably is even better in this situation.
 - **fixed neck contracture and limited mouth opening**

Contraindication

- **epistaxis, coagulopathy**, anticoagulation
- abnormal anatomy with **tumour** invasion, **stricture** from previous naso-cranial surgery/**radiotherapy** etc.
 - disruption of the **midface**, nasopharynx or roof of the mouth
- suspicion of **basal skull** fracture / **CSF rhinorrhea**
- significant **hypoxia** or other situation requiring **emergency cricothyroidotomy**

Q5- epilepsy, 53.5%

What are the perioperative concerns for the anaesthetist managing a patient with epilepsy?

Ref: OHA

Periop Concerns:

Pre – assess + prepare

Patient factor:

- **Control** explored (nature of seizure, timing, frequency, history of status epilepticus requiring ICU admission previously?; usual treatment regimen)
- **MDT**: if unstable or with complex history, will need consultation with Neurologist
- **Systemic effects**: other systemic effects from anticonvulsants explored eg.
 - **Hyponatremia** from carbamazepine,
 - **postural hypotension, arrhythmia risk** from phenytoin etc;
- **Electrolytes / glucose levels** investigated, as these could alter seizure threshold
- **Hepatic enzyme inducing or inhibiting**
 - **Depth of anaesthesia monitoring useful – BIS, NMT.**
 - **Muscle relaxant: consider atrac which has organ independent metabolism**
 - May have increased analgesia dose requirement to achieve effect.

Anaesthetic / surgical factor

- **Seizure trigger periop needs to be minimized**:
 - **Stress**: periop stress could potentially trigger seizure;
 - **Analgesia/PONV**: important to have adequate analgesia and antiemetics – also help to reduce PONV and ensure timely return to antiepileptic treatment postop
- **Avoid drugs which lower seizure threshold**:

- tramadol, haloperidol, pethidine, enflurane, etc.
- **Dystonias care:**
 - So not to confuse with seizure: eg. metoclopramide, droperidol, prochlorperazine etc. (even propofol can do this, however abnormal movements assoc w propofol use hasn't been shown to be epileptic activity; consider co-induction w Benzo if there's concern with abnormal movement w propofol).
- **Fasting, if prolonged** → disruption
 - Minimize disruption; continue regular + early return to PO intake, if not practical, NG postop or IV + monitor blood level
- **Regional** technique, if appropriate, may assist in early return to oral intake.
- Breathing: avoid **hypocapnoea** as lowers seizure threshold.

Intraop:

Watch for seizure under anaesthesia, esp if masked:

breakthrough seizure may be difficult to detect if patient's paralysed. EEG/BIS monitor, high index of suspicion with sudden increased HR, BP, pupil dilation, increased EtCO₂, muscle tone, oxygen consumption, could indicate seizure activity.

- Propofol / thiopentone are useful anaesthetic medications with anticonvulsant activity.

Postop: patient needs to have adequate postop monitoring to monitor

53.5% of candidates passed this question.

Key components of an answer for this question related to

- -knowing that epilepsy is a common condition and
- -indication of knowledge of importance of maintaining anti-epileptic medications peri-operatively
- -awareness of risk factors for having a seizure related to anaesthesia
- -awareness that anaesthesia and drugs used in association with anaesthesia can modulate seizure threshold
- -knowledge that treatment with antiepileptic drugs can effect enzyme activity, drug metabolism and anaesthetic drug requirements
- -awareness of some common associated medical conditions
- -indication of a management plan if a seizure occurs

Q6- management of 'unknown severe allergy', 37.1%

A fit 37-year-old female presents for laparoscopic appendicectomy. She reports a "severe allergic reaction" during her a laparoscopy 5 years ago. There were no tests performed and the records are not available.

a. Outline your strategy for managing this case. (70%)

b. List the investigations that are recommended following any suspected anaphylaxis and when they should be performed. (30%)

PART A:

- allergic reaction = hypersensitivity of the immune system in response to exposure to a

certain substance.

- broad spectrum of syndromes from mild adverse reactions (eg isolated cutaneous erythema) to true anaphylaxis (bronchospasm, angio-oedema, CVS collapse)
- Incidence of peri-operative **anaphylaxis is 1 in 10 000** (Oxford handbook).
- Bear in mind that similar symptom/signs can may be due to non-allergic reactions:
 - **exaggerated pharmacological** response
 - pseudo allergic or **anaphylactoid** reactions
 - **localized histamine release** eg from morphine, atracurium
 - **non-drug** mechanisms
 - medical cause – eg bronchospasm in asthma
 - blood loss
 - vasovagal episode

Strategy for managing this case:

pre-op: risk assessment

- **detailed history/exam** - previous reaction details, other reactions/reaction tendency, FHx, co-morbidities and other medications
 - - obtain thorough history from patient', especially allergy history - agent, type of reaction, management from previous allergic reaction.
 - - identify antibiotic agets that have already been given from previous drug chart.
- **d/w surgeon risk** for potential reaction
 - - urgent for surgery? - see if records can be tracked from other hospital, or further history can be obtained from family members, GP.
- **discuss risks with patient** - chance may have another reaction, if so will need follow-up to confirm precipitating factor

intra-op:

- **avoid exposure to high-allergenic** substances if possible
 - anaesthetic - low-risk drug choices - inappropriate to completely avoid induction agents and muscle relaxants in this case
- surgical - skin prep choice; latex free
- **monitoring** for potential reaction - vigilance; watch for CVS/resp signs, cutaneous signs; routine monitoring +/- arterial line
- prepare for possible reaction:
 - allergy box in OT
 - adrenaline drawn up
 - defibrillator in theatre
 - team members all aware
 - help aware and available if required

3. post-op:

- monitoring - PACU/HDU
- Referral to Allergy Specialist
- investigations if any reactions - as below

PART B:

Investigations

- If allergy happened: serum tryptase
- 1, 4 and 24 hours following reaction (ANZAAG)
 - (new Ox handbook: immediately after resus, at 1-2hr (not later than 6hr) and 24hr or later (for baseline))

If agent suspected:

- Skin prick or intra-dermal tests - 6 weeks after reaction
- Challenge testing:
 - graded exposure from small to clinically relevant quantities orally, subcutaneously, or intravenously.
- Blood tests: CAP (fluorescent detection system) has largely superseded RAST (Radioallergosorbent test); only useful confirming penicillin, sux, chlorhex and latex allergy; low sensitivity.
- After testing: patient education, letters for patient/GP/clinical records, ?MediAlert bracelet

(report)

- History of previous episode; allergic risk/tendency; discuss with surgeon; inform patient of likely risks; make low risk plan for this case including drug choice's; monitoring and contingency plans if problems.
- b. serum levels of reaction / anaphylaxis markers [histamine; tryptase]; skin testing and timing of all.

Q7- morbid obesity obstetric care, 52%

A 25 year old woman at 28 weeks gestation, with a body mass index (BMI) of 45 attends the high risk obstetric clinic

Outline the pathophysiology of morbid obesity affecting pregnancy and describe the implications for obstetric anaesthetic care.

- BMI 45 is severe obesity (class III; morbidly obese).
- Pathophysiology of obesity, coupled with physiological changes that occur during pregnancy may imply difficulty/failure of anaesthetic techniques as well as peri-op morbidity and mortality → poorer outcomes for mother and baby.

Pathophysiology:

Airway:

- Intubation, BMV more difficult in obese
 - 30% greater chance of difficult/failed intubation, although predictors for difficult laryngoscopy are same as for non-obese (large neck circ good indicator)
- pregnancy also assoc. with increased incidence of difficult airways

Respiratory:

- reduced FRC (30%), atelectasis, shunting in dependent lung regions, but
- increased RMR, WOB, minute O₂ demand.
 - → prone to rapid desaturation with cessation of breathing
- sleep-disordered breathing

- OSA/OHS

CVS:

- increased BP, CO, cardiac workload
- increased incidence of arrhythmia, with increased risk of sudden cardiac death.
- increased prevalence of IHD and heart failure.
 - The increase in SV, HR and pulse pressure in pregnancy → poorly tolerated in obese parturient,
 - especially during labour and with postnatal auto-transfusion
- prone of aorto-caval compression.
- increased incidence Pul HTN and cor pulmonale, HTN, PET.
 - → risk of peripartum cardiomyopathy.

Endocrine:

- insulin resistance, GDM

GI:

- increased gastric volumes, raised intra-abdominal pressures, higher incidence hiatus hernia.
- coupled with labour-related slowed gastric emptying and reduced barrier pressure → GORD

other:

- thrombosis: obesity is pro-thrombotic state, as is pregnancy.
 - post-op risk VTE up to 10x higher in obese women.
- increased risk of obese women having labour induced, and requiring instrumental delivery, CS
- Fetal outcomes poorer in obese women.
- Wound infection

Implications:

- airway management - careful airway assessment and plan
 - may require difficult airway trolley, AFOI
 - positioning – ramped;
 - antacid prophylaxis important, fasting guidelines (as per non-obese), RSI/cricoid
 - extubation sitting up and awake
 - ventilation - may require increased pressures; preoxygenate in ramped position.
- ### 2. equipment/personnel
1. suitable equipment for obese patient (table, hover mattress, extra people to assist with manual handling)
 2. positioning/pressure area protection
- monitoring - may be difficult cannulation, NIBP may be inaccurate due body habitus - may require arterial line, USS may be needed for cannulation
 - post-op - ?monitoring in HDU
 - Regional Anaesthesia -
 - may be difficult SAB/epidural
 - long needles
 - may fail - may need GA for LSCS, or remifentanyl PCA for labour analgesia
 - increased risk of dural puncture

- USS may be required
- CSE instead of SAB in LSCS due possible prolonged surgical time (difficulty due obesity)
- can use epidural for post-op analgesia instead of systemic opioids

pharmacology

- drug dosing intra-op - TBW vs IBW
- analgesia post-op - avoid systemic opioids in OSA/OHS
- pregnancy associated with increased vol distribution and reduced albumin concentration
 - may affect pharmacokinetics
- decreased PO, SC, intradermal, IM
- decreased uptake of volatile
- delayed off of certain drugs eg sevo
- VTE prophylaxis important - use non-pharmacological and pharmacological

surgical

- increased risk of operative and post-op complications - PPH, long operative time, infective complications (endometritis and wound infection).

Q8- acute neuropathic pain, 75.2%

- In a patient who complains of post operative pain, which features of the history and examination suggest a diagnosis of acute neuropathic pain? (50%)
- How would the diagnosis affect your postoperative pain management plan? (50%)

Acute neuropathic pain (ANP) =

- Pain related to disease of the somatosensory nervous system.
- Mechanism involve CNS changes → increased peripheral nerve excitability.
- Can occur with nociceptive pain also.
- Causes include: iatrogenic, traumatic (patient or surgeon induced), inflammatory or infective.
- Incidence ANP 1-3%.
- Often part of chronic pain state, but can occur acutely.
 - Majority have persistent pain at 12 months
 - diagnosis and subsequent appropriate treatment may prevent development of chronic pain.
- Surgeries associated with ANP: sternotomy, cancer surgery, mastectomy, amputation, hernia repairs.
- Other states assoc. with ANP: pelvic trauma, after spinal-cord injury, Burns, MS, HIV/AIDS.

Hx/Exam features suggestive of ANP dx:

Features:

- clinical circumstances assoc. with high risk nerve injury (surgeries/states listed above)
- pain descriptors such as burning, shooting, stabbing, freezing, formicating (ants crawling on skin)
- phantom phenomena
- paroxysmal nature of pain (may have no clear precipitating factors)
- presence of:
 - Allodynia (pain following normally innocuous stimulation),

- **Hyperalgesia** (pain disproportionate to a noxious stimulus),
- **Dysaesthesias** (spontaneous or evoked unpleasant abnormal sensations), and/or; signs (variable):
- **trophic** changes - hair loss, skin thickening, calluses, ulcers, dryness
- **vasomotor** - temp and colour differences, oedema
- **MSK** - muscle wasting, deformity, osteopenia

Post-op pain mx plan:

= drugs to **reducing neuronal hyper-excitability** and reducing activity of **the NMDA R**
(Management based on extrapolation data from chronic neuropathic pain setting)

Preferred treatment based on faster onset of effect:

- opioids (including **tramadol** and tapentadol in particular),
- alpha-2-delta ligands (**gabapentin, pregabalin**),
- **ketamine** (some studies suggest IV followed by oral)
- based on experience in chronic neuropathic pain, seems reasonable to also use **TCAs** and **serotonin-noradrenaline-re-uptake inhibitors** (ANZCA 2015 Pain Book)

also:

- salmon calcitonin
- IV lignocaine
- **alpha-2-agonists** (clonidine/dexmedetomidine)
- **Multi-modal approach - regional** as adjunct if appropriate

Identify and give **preop analgesia** for ongoing postop pain mx eg. gabapentin

Use of Non-pharmacological therapies:

management of **psychosocial stressors** that may contribute:
relaxation/diversion, CBT, stress management
physiotherapy, acupuncture, TENS

-ongoing APMS input.

Q9 – evidence based medicine, 53%

a. What is evidence based medicine. (30%)

b. Describe the features of a systematic review, indicating how it may influence your practice of anaesthesia. (70%)

PART A:

Evidence based medicine (**EBM**) is defined as the **conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients.**

Key components:

- ask specific and relevant **question** arising from clinical practice
- access and **critically appraise** up-to-date knowledge
- use **clinical experience and judgement** to determine whether the **evidence robust and is applicable** to a clinical setting
- apply evidence to clinical practice
- **evaluate** performance

Use of proven effective treatments should improve patient outcome.

Ox Handbook

PART B:

A **Systematic review** is a **highly structured** process in which an **attempt is made to answer** a

specific clinical question **by collating and analysing the data from all relevant trials.**

- Level 1 evidence; gold standard form of research evidence.
- Explicit; transparent methods used.
- Accountable, replicable, updateable.

Key elements/features:

- Focused clinical question (FCQ)
- Inclusion and exclusion **criteria - clearly defined**, only include studies which address FCQ
- other considerations: **type of trial, language, outcome measures, methodology** etc
- Sources for the search - decided beforehand, clearly documented; likely include online **databases**, hand search of anaesthesia journals, reference lists from journals, citations and personal consultations with experts.
- Outcome measures - define specific measure to be used
- **Validation** - of each article, done by 2 individuals;
- to assess validity - adequacy of Rx allocation, blinding, consistency of mx, patient withdrawals, other bias etc
- Assessment of **heterogeneity**
 - clinical heterogeneity - significant differences in patient demographic between studies
 - methodological heterogeneity - difference in conduction and methods between studies
 - statistical heterogeneity - difference in results of studies due above factors
- **Meta-analysis** - mathematical process by which data from several trials are combined to give a single pooled estimate of effect
- **Reliability** of pooled result - reliable if:
 - large difference shown
 - statistical significance shown
 - consistency across the studies
- 3. **Sensitivity Analysis** - re-assessment of the papers with alternative mathematical model
 - if findings are consistent, then the overall finding is ROBUST.
 - if the findings disappear, then the conclusions should be expressed more cautiously
- **Conclusions** drawn and **discussion**

Influence on practice:

- Systematic reviews have a role in changing practice - used in **development of guidelines based on best care and evidence.**
- If certain anaesthetic techniques or pharmacotherapies are shown to be useful in certain situations, should influence your practice, so that patients receive most up-to-date, proven effective treatments, from high level of evidence.

(report)

a. defining EBM as a process of identifying a clinical practice; reviewing the evidence for clinical practice robustly and then modifying practice as a result of the review.

b. features of systematic review – framing question; identifying relevant work; assessing quality of studies; summarizing evidence; interpreting findings / drawing conclusions. Role in changing practice: development of guidelines based on best care and evidence and review effectiveness of same.

Q10- hypothermia prevention, 66.8%

List methods to prevent hypothermia in paediatric patients during anaesthesia and surgery, commenting on the effectiveness of each.

Intro: Paediatrics:

- high surface area to volume ratio; minimal subcut fat and poor insulation
- vasoconstrictor response is limited
- neonate (44 weeks PCA) is unable to shiver
- non shivering thermogenesis is achieved by metabolism in brown fat (back, shoulders, legs and around major vessels)
 - deficient in premature neonates
 - premature infants also have non-keratinised skin

Methods to reduce heat loss

Radiative / convective

- preop warming (covered with clothing, jackets or blankets, bear-hugger forced air warming blanket)
- OT warming - raise the ambient temperature/wall surface temp
 - 28 degrees for older children
 - 30 degrees for infants
 - to meet thermoneutral zone
- use of radiant heaters
- minimise exposure: cover head, body parts with blanket / bear hugger air blanket

Evaporation (15%)

- minimise amount of time with open body cavities or pack with warm saline soaked gauze
- avoid pooling of blood/saline/next to patients body

Respiration (10%)

- humidify and warm anaesthetic gases
- HME filters for airway

Conduction: (5%)

- warmed IV fluids + IV fluid warming device
- circulating water mattress

Effectiveness of each:

- Radiative / convective heat loss known to contribute to largest proportion of heat loss in OT (40% + 30%); therefore prewarm OT and minimise surface area exposed is likely most effective in preventing hypothermia. This would apply to phase 1 and phase 2 of heat loss under GA
 - 1 Redistribution: reduced core-peripheral body temp difference reduces heat loss from this phase
 - 2 Gradual decline/linear phase: reduced temperature gradient between patient and environment; through raising OT temp and covering body parts; reduces heat loss in this phase.

(report)

Forced air warming

Insulating layer

Warming OR

Circulating water mattress

IV fluid warming
Humidification of gases
Preop warming
Radiant heaters

Q11- systolic murmur assessment, 52.5%

A 25-year-old male scheduled for elective surgery is found to have a systolic murmur on the day of surgery

- What are the clinical features and ECG findings in this patient that would prompt you to postpone the case to allow further investigation? (70%)
- What are the likely causes of this murmur? (30%)

Part a – redflag clinical features:

Heart murmur are related to increased blood flow, turbulent flow, which may be physiological or pathological.

History

- fatigue, diaphoresis, angina, exertional dyspnoea, palpitations, syncope, peripheral oedema, paroxysmal nocturnal dyspnea, orthopnoea.
- assess functional capacity using Duke Activity Status ie. <1-4 METs: eating, dressing, walking around the house
- PMH or cardiac disease? Cardiology intervention? Any medication/substance which may produce cardiac pathology? Eg. chemotherapy, very excessive ETOH,

Examination:

- high grade murmur 3+/6 or greater, associated with a thrill and
 - no variation in posture are more sinister examination findings
 - pansystolic, or late systolic more likely pathological
 - quality = harsh;
 - location = widespread, radiation to other areas of precordium or
- abnormal peripheral pulses
 - -bounding= patent PDA
 - -radio-femoral delay= coarctation of the aorta

NB: if mistaken as systolic murmur: diastolic murmur is always pathologic in nature

- Abnormal features associated with particular syndromes
- Clubbing (may be associated with cyanotic lesions)
- CVS and RS
 - Poor central and peripheral perfusion
 - Displaced apex
 - Pathologic murmur On auscultation
 - Palpable thrills
 - Signs of failure: peripheral oedema, pulmonary oedema
 - 100% O2 test
- ECG findings that would prompt you to postpone would include:
 - arrhythmia of any sort other than the presence of the occasional premature atrial or ventricular complex
 - conduction defects including prolonged PR interval, QRS duration or prolonged QT interval

- evidence of LVH/LAD
- ischaemia

Part b. what are the likely causes of the murmur? (repeat)

Innocent murmur:

- -for eg. Venous hum:
 - soft continuous murmur which increases in intensity with upright position, decreases with lying down and compression of jugular veins
- -examples include: vibratory murmur, flow murmur and stills murmur
 - -soft, early systolic Grade 1-2/6
 - -variation with posture

Pathological murmur:

- -diastolic murmur is always pathological
- -for example: VSD, ASD, PDA, or rarer causes:
 - pulm stenosis, HOCM, coarctation of aorta.
 - -high grade 3+/6, harsh in nature
 - -associated thrill
 - -no variation in posture

Q12- prone discussion (repeat), 37.6%

What are the hazards of the prone position for patients under general anaesthesia and how can they be minimized?

(May-2005 Q10) What are the problems with the prone position for surgery?

During transfer:

- Loss of monitoring, IV access, airway
- Need to stop ventilation, and monitoring
- Patient injury during transfer – arms and legs being caught
- Turning may cause significant haemodynamic changes leading to hypotension

Loss of an Airway

- Intubate with endotracheal tube
- Securing airway with two tapes and tie
- Armoured tube does not spring open once it is bitten, ~~so insert a bite block prior to turning prone~~
- Make sure all connection part is tightly secured

Ventilation issues

- Prone decreases chest wall compliance and abdominal compression decreases diaphragmatic compliance
- If the patient has poor lung function and restricted chest wall movement from arthritis, this can further worsen compliance
although proning also assoc w increased FRC and is beneficial in oxygenation

Inability to perform chest compression

- In the event of cardiac arrest, chest compression is difficult, unless he is turned supine which will decontaminate surgical field

Position related mechanical injury

- Compression of eyes – use of square foam with space in the middle to prevent compression of eyes, nose and mouth; ensure eye is free of compression; use of eye goggle is not recommended
- C-spine injury: ensure natural alignment of C-Spine, avoid hyperflexion or extension.
- Nerve damage from malpositioning of arms – abduction and external rotation < 90 of shoulder, mild flexion of shoulder, and avoid hyperflexion of elbow
- Excessive lordosis of the spine may lead to injury
- Pressure sores – iliac crests, knees and feet – padding is mandatory

Q13- hypoxaemia in OLV (repeat), 71.8%

a. Why can hypoxaemia occur after changing from two lung to one lung ventilation? 50% b. Describe the treatment of hypoxaemia in one lung ventilation (50%)

(Aug-2000 Q3) Outline your management of an oxygen saturation of 82% during one lung ventilation.

Notify staff member:

- Anaesthetic assistant
- Surgical team: temporarily stop the surgery if safe to do so

Check machine make sure ventilating and delivery FiO₂

- 100% FiO₂ and Check equipments
- Check circuit – disconnection

Airway

Ensure tube no occlusion of tube and correct placement of airway

- Suction down the tube for mucus secretion
- Auscultate the lung and ensure position of the DLT with bronchoscope and rule out any other pathology – bronchospasm, etc.

Optimise ventilation

- Ensure muscle adequate muscle relaxation
- If the cause is secondary to V/Q mismatch due to isolation
 - Provide 100% to non-ventilated lung: some air movement occur due to translational movement from opposite lung ~50-100ml
 - Provide CPAP to non-ventilated lung 5-10cmH₂O. It distends the lung ~100ml. Does not interfere with the surgery
 - Recruit ventilated lung and make sure there is no atelectasis and consider PEEP.
 - ✓ Must be balanced between prevention of collapse and creating west zone 1 diverting blood to non-ventilated lung
 - PA occlusion of non-ventilated lung if patients RV can cope with increased load
 - May need to ventilate both lung intermittently if all else fails.
 - If complicated and continued hypoxaemia consider Cardiopulmonary bypass.
 - But accept low 90s saturation if patient otherwise well
- Optimise CO with inotropes and Hb
 - This increases SvO₂ and shunted blood will have less effect on desaturating the arterial blood

oxygen flux = chemical O₂ delivery + dissolved O₂ delivery
 = [CO x [Hb] x SaO₂ x k] + [CO x PaO₂ x 0.003]
 CO in unit of dL/min; Hb g.dL

Q14- LAST, 67.3%

You perform multiple intercostal blocks using 300mg ropivacaine for flail chest

a. What features would make you suspect systemic local anaesthetic toxicity? (50%) b. How would you manage the situation? (50%)

References: Stoelting Pharmacology, Oxford Handbook

Features are: site of block known to be assc w higher systemic absorption, large dose,

Other clinical features: perioral/tongue numbness,

- Sytemic absorption of LA depends on the site of injection, agent used and presence of added vasoconstrictor. Highest systemic concentrations are seen with Intercostal blocks.
 - (intercostal>caudal>epidural>brachial plexus>subcutaneous)
- 300mg of ropivacaine = large dose for an average sized (70-80kg person). Maximum dose of ropivacaine is 2-2.5mg/kg

- Lower levels of LA in plasma produce initial symptoms of perioral and tongue numbness reflecting high vascularity of these regions.
- **CNS changes:** Restlessness, vertigo, tinnitus, difficulty in focusing.
 - slurred speech and twitching of facial and muscles of extremities occur followed by tonic clonic seizures.
- **Cardiovascular:**
 - instability follows last as cardiac cells are more resistant to toxic effects of LA.
 - Prolongation of PR interval, widening of QRS followed by cardio-respiratory arrest.

B)

= Severe LA toxicity is an anaesthetic crisis.

Call for help

- A – patent airway to ensure oxygenation; will probably need endotracheal intubation to secure airway.
- B - oxygenate with 100% oxygen, hyperventilation may be needed to compensate for acute metabolic acidosis
- C- if cardiac arrest – follow adult ACLS algorithm. Chest compressions 30:2, check rhythm once defibrillator available, follow the algorithm for shockable or non shockable rhythm.
 - Intralipid 20% 1.5ml/kg as a bolus over 1 minute followed by an infusion of 15ml/kg/hr.
 - Bolus can be given x3; infusion can double rate after 5 mins.
 - Max cumulative dose = 12ml/kg.
- D - Control seizures with IV benzodiazepine – midazolam 3-10mg iv or lorazepam 0.1mg/kg

Likely to need prolonged CVS support – keep effort up (as per report)

Cardio pulmonary bypass or ECMO should be considered. (quite important as per report)

Q15- preop anaemia management, 66.8%

A female patient scheduled requiring a total knee replacement is seen in clinic. A date has not yet been scheduled for surgery.

On investigation she has a haemoglobin of 105 g/L

1. What are the most likely causes of this result, and how would confirm this? (50%)
2. What preoperative treatment would you undertake and why? What advice would you give for scheduling time of surgery? (50%)

A. Differentials + investigation:

- Hb 105 in a female represents anaemia (<120; <130 in males).
- Cause often multifactorial. Consider Haematologist advice.

Possible causes of anaemia in a female include:

- Chronic blood loss
- Nutritional deficiencies
- Anaemia of chronic disease.

Work up = hx, exam, investigation:

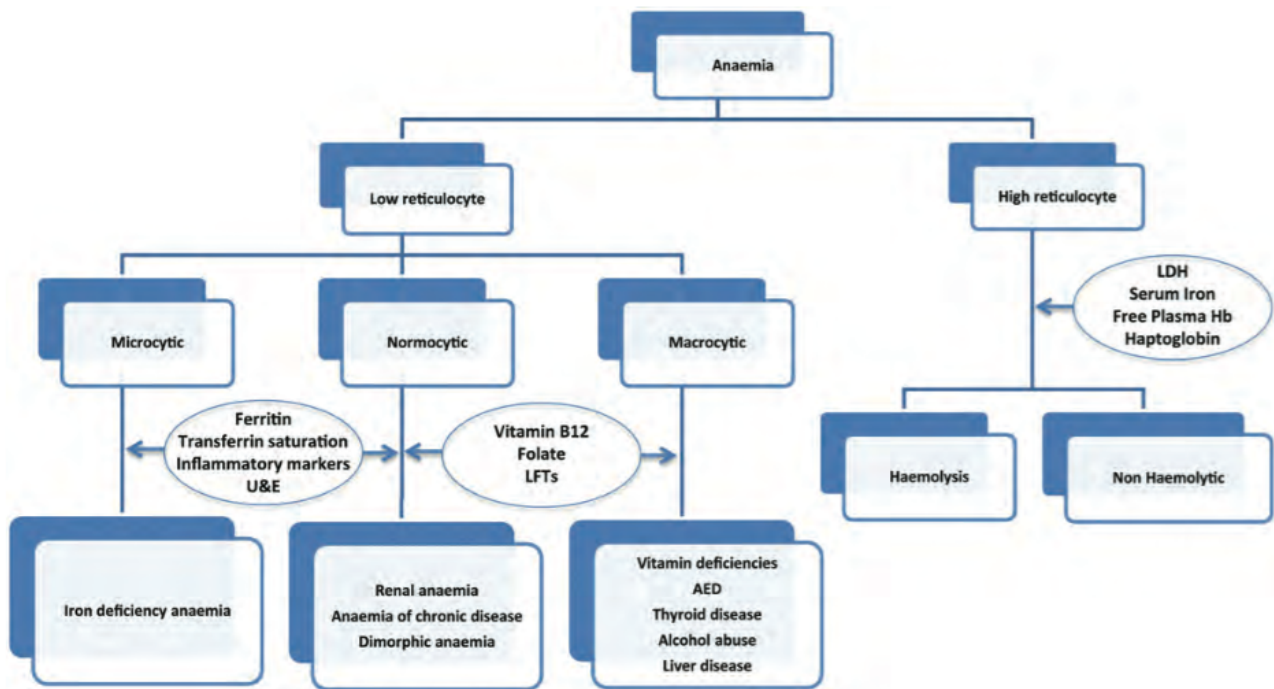


Fig 3 Suggested algorithm for the aetiological diagnosis of preoperative anaemia. U&E, urea and electrolytes; LFTs, liver function tests; LDH, lactate dehydrogenase; AED, anti-epileptics.

Confirmation of diagnosis:

Careful history and exam –

- blood loss (GI, GU, menstruation, epistaxis)
- PMH of anaemia? Thalassaemia, spherocytosis, sickle-cell disease, ETOH, liver disease, renal disease.
- Med history: AED
- nutrition deficiencies – eg iron intake maybe deficient in vegetarian diet?
- Function? Previous transfusion requirement?

Investigations:

reticulocyte count -

- **Low reticulocyte count** - poor bone marrow response, further classified according to MCV:
 - **microcytic** –
 - IDA (confirmed by low ferritin level and low transferrin saturation);
 - Thalassaemia
 - **normocytic** –
 - kidney and liver disease,
 - anaemia of chronic disease (usually charc by high ferritin level and inflam markers),
 - dimorphic anaemia (iron and B12 or folate deficiencies), early iron and B12 deficiencies, acute blood loss, myelodysplasia.
 - **macrocytic** - megaloblastic
 - (folate and B12 deficiency,
 - certain anticonvulsants and cytostatic medications);
 - non-megaloblastic (excessive EtOH intake, liver or thyroid disease)
- **High reticulocyte count** indicates regenerative anaemia –
 - blood loss w no assoc. iron deficiency, or
 - haemolytic anaemia.

- High LDH, serum iron, free plasma Hb, and low haptoglobin confirm dx haemolysis.
- Direct and indirect Coombs tests allow distinction between immune and non- immune haemolytic anaemia.
- Other investigations may include Imaging (CT) and GI endoscopy – for GI bleed or anaemia of chronic disease.

PART TWO – preop preparation – treatment, timing of surgery

- Pre-op anaemia independently associated with multiple perioperative adverse outcome; in addition to increased need for blood transfusion requirement.
- Given elective nature of surgery, it's advisable to delay surgery for work up and optimization of anaemia.

Pre-op treatment - depends on aetiology of anaemia, and urgency of surgery.

- Iron supplementation if iron deficient
 - po: slow, often poor compliance;
 - iv infusion: one off pre-op, quick.
- Replacement/supplementation if other deficiencies (B12, folate)
- Erythropoietin (if renal disease or anaemia of chronic dx).
 - Nephrologist / haematologist consult
- Treatment/optimisation of other conditions (kidney and liver disease).
- Reduction/abstinence from EtOH.
- Immuno-modulation/suppression if immune aetiology.
- RBC transfusion of acute blood loss.

Should have RBC available at time of surgery.

Oct-2012, 27.5%

Q1- pain management in elderly dementia (repeat), 37.6%

You are asked to anaesthetise an 80-year-old lady with dementia and a fractured neck of femur. She is on no other medication.

1. What are the issues in assessing pain in this patient? (50%)
2. What would you prescribe for postoperative analgesia and why? (50%)

(from Auckland course)

Issues of assessing pain in elderly patient with dementia:

- Difficulty in assessment due to likely non-verbalising patient
- Patient likely will underreport pain due to dementia
- Patient likely experiencing complications that exacerbate cognitive dysfunction eg. UTI, MI, dehydration.

Assessment should include:

- Collateral info from caregiver/family is valuable – for baseline physical/cognitive function; severity of dementia; pain level
 - Familiar faces also help stabilize patient / engagement of care
- Objective assessment required eg. FLACC or PAINAD (pain assessment in advanced dementia); tailor assessment tool to degree of dementia + allow time!

- PAINAD = Breathing, vocalization, facial expression, body language, consolability.
- VAS
- Wong-Baker FACES pain rating scale.

Mx should include:

- Treat complications -> for general well-being of patient + helps with assessment
- Consider effects of aging on Pk and Pd.
 - Pk – lower TBW, higher adipose tissue, reduced metabolism, excretion.
 - Hence morphine may have initial higher plasma conc due to hydrophilic; fentanyl may have prolonged half-life due to lipophilia.
 - Principle = 'start low, go slow' + opioid spare whenever possible.
- Analgesia therefore =
 - Regional – spinal (3ml 0.5% bup + 50mcg morphine); to opioid spare.
 - Timely reduction of # -> expect reduced pain post reduction.
 - Regular postop pain review (subjective+objective) eg. Q6H and titrate analgesia requirement
 - Multimodal analgesia, PO. Para 15mg/kg qid + for break through pain:
 - Oxynorm 2.5mg prn/Q4H + lactulose 10ml bd.
 - If ongoing pain, consider adding in 2 day course of low dose NSAID providing no absolute contraindication; but balance this with risks.
 - Eg. etoricoxib 90mg od with PPI.
 - NB. Would avoid tramadol, gabapentin, ketamine in dementia due to risk of increasing postop confusion.

NB.

Liver mass dec by 40% by age of 80; CrCl dec by 40% by age of 80.

Q2- DAPT and DES discussion, 63.8%

A 75-year-old man presents for right hemicolectomy for an obstructing lesion of the ascending colon that has failed to settle with conservative management. He had a drug-eluting stent placed eight months ago, and is currently on clopidogrel and aspirin. Discuss and justify your plan for perioperative management of his antiplatelet therapy?

Q3- weaning from cardiopulmonary bypass, 59.1%

1. What are the prerequisites for separation from standard cardiopulmonary bypass after uneventful coronary artery bypass surgery? (50%)
2. What are the likely causes of hypotension in the immediate post-separation period? (50%)

Intro:

- CPB replaces heart/lung function while heart arrested for bloodless, stable surgical field
- separation from CPB = **team effort**: surgeon/anaesthetist/perfusionist; aim = wean off CPB and restoring normal physiological function
- **venous line progressively clamped and heart gradually refilled and achieving ejection**

10 items; 3 categories:

(report) restoration of native cardiac output and re-institution of ventilation

- **Heart** (ensure function intact)
 - Deair
 - Rhythm – defib ready;
 - Pacemaker ready; atropine ready.
 - Slow filling and not overly distending
- **Lungs** (ensure function intact)
 - Slow recruit of lung / ventilation

(report) restoration of the perturbations caused by surgery and extracorporeal circulation

- **Bloods:**
 - Acid/base normal; K 4.5-5; Glucose
 - Temperature rewarmed
 - Hb adequate
 - Coag disturbance checked

Others:

- Ensure **anaesthesia** / **analgesia**
- Ready for reversal with **protamine**

Part 2

- primary or secondary **pump failure**
 - contractility (cardiac stunning, ischaemia)
 - acidaemia
 - obstructive shock with air embolus, tamponade, pneumothorax
- **cardiac rate or rhythm** disturbance
 - bradycardia, AF
 - malignant tachycardia: VT/VF
- **preload or afterload** disturbance
 - hypovolaemia
 - drug causing low preload: **protamine**, **anesthesia**, **morphine**
 - insufficient afterload to maintain coronary perfusion or SVR:
 - vasopressor

Q4- aortic stenosis, 49.7%

1. What is the natural history of aortic stenosis? (30%)
2. What are the key echocardiographic features in haemodynamically significant aortic stenosis? (70%)

Q5- strabismus surgery discussion in day surgery, 74.5%

You are asked to assess a 4-year-old child who is scheduled for a strabismus (squint) correction as a day case procedure.

1. What are the issues relevant to anaesthesia? (70%)
2. What would prevent you from discharging this patient home after surgery? (30%)

(from Auckland)

Issues:

- Airway

- OC reflex
- Emergence – TIVA/remi (BIS); clonidine
- PONV – up to twice as common as adult.
- Analgesia – subtenons, multimodal

Prevention from dc:

- Safety concern: responsible guardian?
- Distant from medical assessment: contact, traffic
- SEs from surgery/GA eg.
 - PONV, not tolerating PO intake
 - Pain,
 - Excessive sedation
 - Apnoea

NB.

- Ondans/dex dose = 0.15mg/kg
- Cyc 1mg/kg up to 50mg
- Drop 25mcg/kg up to 0.625mg (= maximal antiemetic dose).

PART ONE:

Issues relevant to squint surgery in child:

Pre-op

- Hx and exam
 - ?cause of squint
 - FHx of medical problems, anaesthetic issues
 - associated conditions
 - eye prob may be part of chromosomal or metabolic disorder with anaesthetic implications:
 - ?just developmental delay, behavioural problems
 - syndromes may be assoc. with difficult intubation (mucopolysaccharidoses, craniosynstosis disorders, craniofacial syndromes)
 - congenital phakomatoses (group of neuro-oculo-cutaneous disorders, incl Sturge-Weber, neurofibromatosis etc)
- Auckland (can be assoc w Downs, cerebral palsy, muscular dystrophy, CHD)
- Medications:
- ?topical agents - beta-blockers etc

Intra-op

Airway

4. intubation

- possibly difficult if child has a syndrome (as above)
- airway choice
 - lack of access to airway once surgical drapes placed –
 - need to be **secure**
 - **oral RAE preferred** - faces away from surgical site
- usually require 'quiet eye' - **paralysis and controlled ventilation**
- one of most painful ophthalmic procedures; but usually opioids unnecessary
 - and try to avoid opioids - PONV;
 - should get adequate analgesia with paracetamol and NSAID.
- Consider sub-tenons block at end of procedure (risk of globe perforation and retrobulbar

- haemorrhage usually rules out use of peri-bulbar block in children)
- **High PONV**: - 60% if no anti-emetic; squint surgery associated with higher incidence of PONV (precise mechanism unknown)
 - Multimodal antiemetics:
 - avoid opioids if possible (incr risk PONV)
 - need to balance with need for adequate analgesia
 - 8yo (>3yo) additional RF for PONV

Oculo-cardiac reflex

- bradycardic response to extra-ocular muscle traction or pressure on globe
- usually resolves once stimulus removed
- may precipitate sinus arrest or other dysrhythmia (rare)
- can give **prophylactic atropine** at start of case
- **norm EtCO₂** to reduce incidence/severity of OCR.
- propofol has bradycardic effect - can incr risk of reflex occurring intra-op (despite being an anti-emetic)
- children with positive reflex, more likely to develop PONV
- some relaxants appear to attenuate OCR (rocuronium)

Other:

- **rare, but increased incidence of MH** reported in parents with a squint (controversial) - high index or suspicion

Post-op

Emergence delirium - prevention with propofol/clonidine

PART TWO:

Factors preventing discharge home after procedure - **based on PS15:**

4. **environment/access**: place of discharge >1hr from appropriate post-op medical attention, without access to telephone
5. **no responsible adult** to transport home, manage post-op care, stay with patient overnight
6. no suitable mode of transport home
7. **unstable vital signs**
8. inadequate **pain** control
9. ongoing **PONV**
10. **unable to tolerate oral** food and fluid
11. ongoing **bleeding**

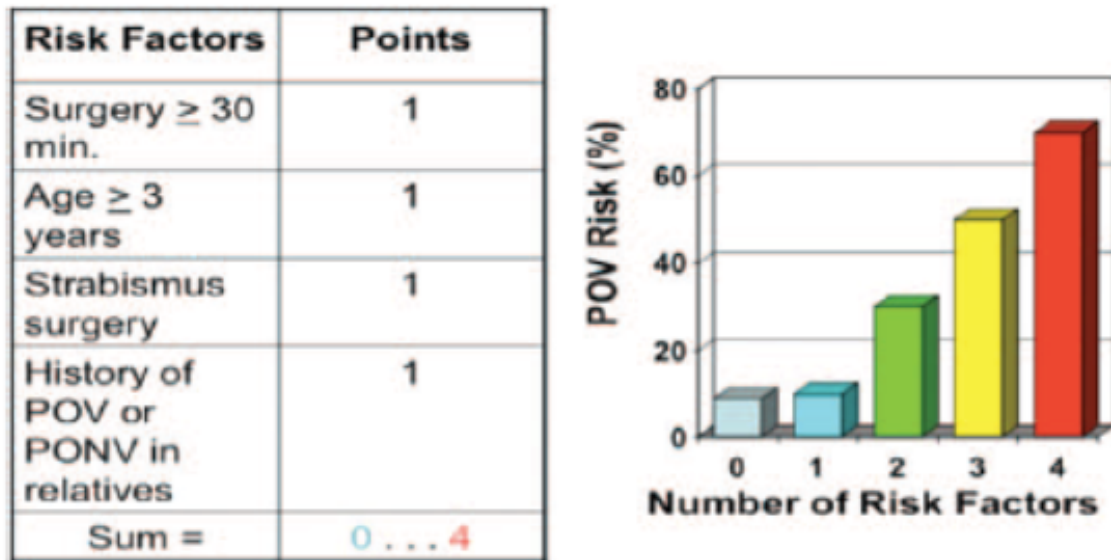


Figure 3. Simplified risk score for POV in Children. Simplified risk score from Eberhart et al.⁴⁸ to predict the risk for POV in children. When 0, 1, 2, 3, or 4 of the depicted independent predictors are present, the corresponding risk for PONV is approximately 10%, 10%, 30%, 50%, or 70%, respectively. POV = postoperative vomiting; PONV = postoperative nausea and vomiting.

Q6- surgical safety checklist, 43.6%

You are the consultant who has been tasked with introduction of the WHO SSCL (surgical safety checklist) to your hospital.

1. What are the principles behind the checklist that enhance patient safety, with reference to each component? (70%)
2. What do you expect the barriers to its effective implementation to be? (30%)

Key components of a response to this question related to:

1) Principles

- improved team communication and performance
- a tool to ensure teams consistently follow a system to minimize the most common and avoidable risks
- a culture that values patient safety
- adaption to local practice
- leadership

Components

- Sign in
- time out
- sign out

2) Barriers to effective implementation may relate to

- "protocol fatigue" - repetition and inattention
- complexity and a lack of commitment to the system by all members of the team

- inability to adapt to individual or institutional preferences or practices

Part 1

Intro:

- by the World Alliance for Patient Safety (WHO)
- aim to reduce surgical complications/deaths across the world.
- -It was adapted from Aviation checklists
- Aim to provide:
 - a simple, efficient system of priority checks
 - -detect a potential error before it leads to patient harm.
 - and facilitating team work and communications
 - - to encourage a culture that values patient safety
- -Validated in pilot study across multiple developed and developing countries which revealed an overall reduction in mortality and morbidity.
- -it is composed of a Sign In, a Time Out and a Sign Out
- adapted to local policy
- requires leadership and participants (report)

-Sign In

- -patient ID, planned procedure and surgical site marking confirmed against OT list and consent form and the patient, allergies, metalware, fasting status, foreign body remained.
- -anaesthesia facilities (airway equipment, machine and drugs) are confirmed) and checked
- Surgeon's concern? Significant blood loss, availability of blood products
- Nursing check ensure availability of equipment.

-Time Out

- Introduction and roles to facilitate teamwork
- final confirmation of ID, procedure and consent
- imaging available
- antibiotic and VTE prophylaxis
- specific concerns

Sign Out

- swabs and instruments confirmed
- specimens
- -brief discussion of any specific requirements for post-op care and patient safety

In addition:

- Staff are also encouraged to have a pre-briefing at the beginning of the day to discuss any concerns regarding the patients, the procedure or equipment
- followed by a De-briefing at the end of the day to discuss things that went well or did not go well. There should be a closed feedback loop for this.

Part B

-The general process for implementation of a change is to;

1. Involve stakeholders

2. Design project adapted to local policies
3. Educate
4. Implement change
5. Audit

In a report prepared for the health quality and safety commission new Zealand

- **lack of understanding** of purpose of SSCL
- **Ego**: senior staff may see the checklist as more of a compliance document than a safety tool; thinking that no SSCL doesn't contribute to improved safety
- **Time pressure**: perception that SSCL leading to delays and pressure to proceed to surgery; either pressure from busy day routine or emergency nature of surgery.
- **Lack of teamwork**: for the checklist to be effective it needs to be adopted by all staff (nursing, anaesthetic and surgical)
- **No immediate benefit seen** therefore it might be harder to convince staff of the utility of the checklist
- **inability to adapt** to individual or institutional preferences or practices
- **"protocol fatigue"** - repetition and inattention

Q7- TPN discussion, 34.9%

In regard to total parenteral nutrition:

1. What are the indications? (30%)
 2. What are the complications? (70%)
- (report)

1) Indications

- treatment of malnutrition due to malabsorption from any cause
- prevent muscle wasting
- improved wound healing and clinical outcomes

2) Complications relate to

- delivery: early and late catheter issues
- metabolic disturbances: acidemia, hypo- and hyperglycaemia, liver dysfunction, hypo- and hypervolaemia,
- lipaemia, immunosuppression, vitamin and trace element deficiencies.

Answer:

Def = Total parental nutrition is the complete provision of nutrition intravenously, bypassing the GI tract.

Part 1

- -Parenteral nutrition is given into a central vein.
- -May be **partial or total**
- -Indication:
 - treatment of **malnutrition** of any cause (inadequate oral intake, inadequate GI absorption, increased GI losses), eg (from litfl)
 - prolonged bowel obstruction and ileus
 - short bowel syndrome with severe malabsorption
 - severe dysmotility
 - high output intestinal fistulae

- anastomotic break down
- intolerance to EN
- Esp important in periop setting to also prevent muscle wasting, improved wound healing

Part 2

- -requires dietician involvement
- -complications related to **central venous access** including insertion risks (damage to adjacent structures (PTX), bleeding, incorrect placement), late complications (thrombophlebitis, infection, catheter migration)
- **-complications related to TPN**
 - hypo/hypervolaemia
 - refeeding syndrome: electrolyte abnormalities esp hypophosphataemia, K/Mg
 - acid-base disturbances particularly metabolic acidosis
 - liver dysfunction and steatohepatitis
 - cholelithiasis
 - lipaemia
 - immunosuppression
 - hypo/hyperglycaemia
 - vitamin/trace element deficiencies. esp w >2-4 weeks of poor nutrition.
 - copper: anaemia, neutropenia
 - iodine: hypothyroidism
 - chromium: glucose intolerance
 - zinc: mental apathy, diarrhoea, rash
 - selenium: cardiomyopathy

Q8- general consent discussion, 51%

Outline the key steps in gaining informed consent for anaesthesia in a competent ASA 1 adult undergoing minor elective surgery.

Key components of a response to this question related to steps to gain informed consent for anaesthesia. The document PS26 outlines the general principles, elements and documentation of consent in detail.

Reference PS 26

Answer

Intro:

Definition = The process by which a patient is informed and voluntarily allowing a procedure or investigation to be performed on themselves, having considered the risks and benefits.

- **Truly voluntary:** and without coercion.
 - Refusal or withdrawal of consent must be a realistic option.
 - The **environment** and **timing** of the consent process, and **presence of support** people if desired by patient are important in this regard.
- **Competent:** Consent may only be given by a person capable of doing so – this patient is competent.
- **Can be withdrawn:** It must be recognised that the patient can change his/her mind and withdrawal of consent must be respected.

- **Consent must be informed.**

- **Material risks:** The patient should be provided with the information that a reasonable patient in the position of that patient might wish to know.
- **Conduct:** Basic information about the proposed treatment should be provided, even if the patient requests no information.
 - If the patient refuses explanation, information should still be firmly offered
 - if still refused for 2nd time, that fact should be document and no further information forced on the patient.
- **All options discussed** + respective pros/cons.
- **Format:** in a form that the patient is likely to understand
- **Reflect about detail of risk discussion**, to guide extent of detail:
 - ask – is it possible that the patient if informed of the risk, would change their mind about having the procedure?
 - Generally include: Common, rare but serious, uncertainty, alternatives

Risks:

- based on the proposed treatment,
- seriousness and nature of the patient's condition
- complexity of proposed treatment,
- questions asked by the patient
- patient's level of understanding.

Documentation:

Detailed documentation of the discussion and all risks considered should in the patient's notes. Document also the agreement by the patient to undergo treatment.

Special: Patient unable to consent – Welfare EPOA needed; (not financial EPOA) or treatment w/o consent

- reasonable steps have been taken to ascertain the views of the patient,
- doctor believes that it would have been chosen by the patient if he was competent
- further delay is likely to be detrimental to the patient.

Q9- MRI issues in developmentally delayed pt, 63.1%

A developmentally delayed, unco-operative adult requires a magnetic resonance imaging scan (MRI) for investigation of deteriorating control of seizures. What issues do you foresee in terms of providing general anaesthesia in the MRI suite for this patient?

63.1% of candidates passed this question Key components of a response to this question related to: - MRI suite: remote environment, personnel unfamiliar with anaesthesia requirements, availability of emergency help, monitoring issues, dangers of ferromagnetic anaesthetic equipment - patient factors: ferromagnetic materials within the patient, consent, cooperation with anaesthesia induction, epilepsy control ,

Answer

Patient issues

Consent of patient – Welfare EPOA needed; or treatment w/o consent

- reasonable steps have been taken to ascertain the views of the patient,
- doctor believes that it would have been chosen by the patient if he was competent
- further delay is likely to be detrimental to the patient.

Cooperation with anaesthesia - sedation then general anaesthesia

Reason for MRI – Epilepsy risk? Need rescue technique if seizure occurs.

Other medical problems with the patient which may lead to potential issues – eg allergies to contrast (anaphylaxis).

Issues related to MRI / remote anaesthesia

- MRI – remote location anaesthesia, unfamiliar surroundings to anaesthetist, staff in MRI unfamiliar with anaesthetized patients
- **Monitoring (PS 18)** as for Guidelines on Monitoring During Anaesthesia
- Anaesthetic **equipment (PS 55)** requirement for conduct of anaesthesia:
 - In particular: **Ferromagnetism and compatibility of anaesthesia equipment and medical devices the patient may have**
 - be prepared for Difficult airway scenario

Recovery of patient – having appropriate recovery measures as per ANZCA guidelines

Q10- trauma induced coagulopathy, 63.8%

A trauma patient presents thirty minutes after a significant crush injury, with an estimated 40% blood loss. He was previously well.

1. Explain the coagulation abnormalities you would expect in this patient at this stage. (60%)
2. Discuss the current evidence for treatment of these abnormalities. (40%)

Acute traumatic coagulopathy ATC → hypoperfusion/injury → thrombomodulin, aPC → degrade 5, 8,

- Consumption
- Plt dysfunction / aggregation defects
- hyperfibrinolysis

1

- **Trauma induced coagulopathy** now recognised problem with key features:
- anticoagulation:
 - demonstrated by ↑INR & APTT ie intrinsic & extrinsic pathways
 - **independent of any fluid dilutional component**
 - pathophys=
 - ↑ed circulating thrombomodulin ⇒ ↑activation of plasma protein C levels
 - aPc ⇒ degrades factor V & VIII
 - **triggered by severe anatomical injury & tissue hypoperfusion**
 - **consumption:**
 - shedding of glycocalyx ⇒
 - autoheparinisation
 - massive activation of coagulation cascade ⇒ consumption of coagulation products
 - **platelet dysfunction:**
 - platelet counts can be normal during early TIC (**low platelets strong predictor of mortality**)
 - **platelet aggregation defects** seen
 - pathophys - incompletely understood:
 - inhibition of multiple receptors
 - altered calcium influx via reversal of NCX pump

downstream inhibitors

- hyperfibrinolysis:
- massive activation of thrombin \Rightarrow fibrin formation
- consumption problem by fibrinolysis causes by \uparrow ed levels of tPA \Rightarrow activate plasmin
- pathophys: \uparrow aPC inactivation of plasminogen activator inhibitor \Rightarrow tPA unchecked

Result is:

- \uparrow INR & APTT
- low or normal platelet counts but likely platelet dysfunction
- low fibrinogen

Coagulopathy likely further worsened by hypothermia, acidaemia and haemodilution.

2 - CABCD

- Structured approach to any trauma:
 - C - control catastrophic haemorrhage eg tourniquet
 - A - manage airway
 - B - Oxygenate
 - C - control haemorrhage, optimise oxygen delivery to tissues to maintain critical organ function
 - D - Assessment of neuro, BSL
- circulation:
 - Resuscitation of someone in stage 4 shock:
 - should transfuse RBC - significantly preferable to crystalloid in this acute severe haemorrhage
 - activate MTP
 - unmatched O-ve whole blood - contains all coagulation factors
 - empirical therapy:
 - 1:1 (packed red cells:FFP)
 - alternate 1 pooled platelets & adult dose cryoprecipitate (1unit/30kg = 2-3units)
 - targeted therapy:
 - MAP target >65 mmHg (in absence of TBI)
 - permissive hypotension until bleeding controlled
 - >65 mmHg body of evidence to suggest major organ perfusion
 - EMCrit approach = is to target a MAP >65 mmHg + palpable radial pulse and pulse oximetry waveform.
 - If the BP is too high, give fentanyl 25 micrograms IV
 - Red cells - continue until shock resolved (Hb/HCT are not suitable targets in acute haemorrhage)
 - INR >1.5 give FFP
 - fibrinogen <1.5 give cryo
 - platelets <100 = give platelets
 - TEG to monitor coagulopathy:
 - a angle < 45 deg - give cryo
 - MA <50 mm - give platelets (40-50mm = 1 pool; <40 mm = 2 pools)
 - R time >10 mins - give FFP (11-15 = 1unit; 15-20 = 2units; $>20=4$ units)

Report: 2. Evidence for treatment relates to targets and monitoring aimed at correcting deficits, restoring cardiac output, preventing further loss from haemorrhage and delivery of oxygenated red cells to maintain critical organ function.

Other points I think may be good:

- Damage control surgery/resus - restores physiology rather than complete surgical repair
- Prevent hypothermia / acidosis

- TxA – Crash-2 trial <3 hours.
- Consider 3, if non-surgical bleed and all other correctables trialed – Consult Haematology.

Q11- peripartum cardiomyopathy discussion, 13.4%

You have been asked to provide anaesthesia for a lower uterine segment caesarean section (LUSCS) in a woman at 38 weeks gestation. She has a pacemaker-defibrillator implanted for a known cardiomyopathy. Her current echocardiogram demonstrates an ejection fraction of 35% with mild to moderate left ventricular global hypokinesis. Clinically, the patient feels very well.

1. What additional preparations with respect to her cardiovascular system would you make to ensure the safe management of this patient during her Caesarean Section?
2. Outline the relative benefits and risks of a regional technique compared with general anaesthesia in this patient.

PART 1:

38 weeks gestation and feels very well, can assume her disease is reasonably well controlled.

History

- establish aetiology, course and complications of disease; determine classification of NYHA symptoms (functional status)
PM-deb suggest likely dilated cardiomyopathy (as opposed to restrictive cardiomyopathy or valvular disease)
- determine current treatment and response to treatment (incl anticoagulation)
- determine effect of pacemaker/defib
- investigations to establish baseline function, response to therapy and to track progress through pregnancy
- ask about, and review records of previous anaesthetics
- Review recent cardiology team letters

Examination

- vital signs/baseline observations
- look for any signs of failure

Investigations

bloods (FBC, UEC, coags, ?BNP) –

can this be optimised eg with iron supplements? coags, platelet level?

- CXR (cardiomegaly, signs of failure of indicated by examination)
- 12-lead ECG (evidence of hypertrophy/strain, arrhythmia)
- PPM/ICD check - underlying rhythm, dependent on pacemaker, when last checked
- ECHO - LV function, valve anatomy and function, signs of R-side impairment
- antenatal USS - placental position - ?risk of bleeding

Planning

- Cardiology advice (haemodynamic parameters, mx of PPM/ICD)
- external pacing/defib in theatre
- Haemodynamic targets - combine impact of physiological changes of pregnancy with pathophysiology of cardiomyopathy)
- aim to maintain normal obstetric physiology

- Monitoring - standard +/- arterial line
- Post-op care - ?HDU for monitoring/maintaining haemodynamic targets

Anaesthesia: (these are digress from preop preparation on CVS system).

- -regional vs GA to be compared (see next question)
- -shared care with Cardiac Anaesthetist, who would help with intraop / postop echocardiography for function monitoring. Patient doesn't sound severe enough to require backup CPB/ECMO team.
- -neuraxial technique with epidural top up slowly allows for gradual onset anaesthesia, reduces sudden impact to haemodynamics from anaesthesia; and ensures working epidural in case further top up required, to reduce need for GA. Top up slowly with 0.75% ropivacaine + fentanyl 100mcg. Aim for block height T4 (enough, but not too high to affect cardio-accelerator efferent nerves ie T1-T4).
- -arterial line, close monitoring of haemodynamics intraop/postop; large IV access.
- -blood product to be available, ensure optimal Hb, which is likely going to be >80.
- -safety use of diathermy intraop with regard to PM-defib: convert to asynchronous mode / anti-tachycardic mode, with technician's input or using magnet (not always reliable); external defib pad to be placed, diathermy ideally use short bursts of bipolar; if monopolar desired, ensure diathermy pad placed far away from PM-defib so to direct electric current away from device; and minimise diathermy use to short bursts only.

PART 2:

Report:

- *maternal haemodynamic stability and minimal negative inotropic effect*
- *avoidance of postoperative ventilation*
- *avoidance of maternal and fetal respiratory depression*
- *consideration of maternal wishes and preferences*

Balance between managing changes of pregnancy and effects of cardiomyopathy.

Goals of anaesthesia:

- maternal haemodynamic stability and minimal negative inotropy
- risk of hypotension and reduced C.O. with regional (SAB>epidural)
 - → slowly titrated epidural could avoid sudden changes in BP/CO
- regional minimises fetal exposure to drugs (esp opioids), avoids/minimises systemic opioids in mother
- consideration of maternal wishes/preferences
- previous experiences (regional vs. GA)

GA:

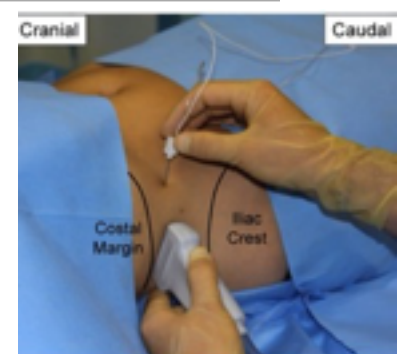
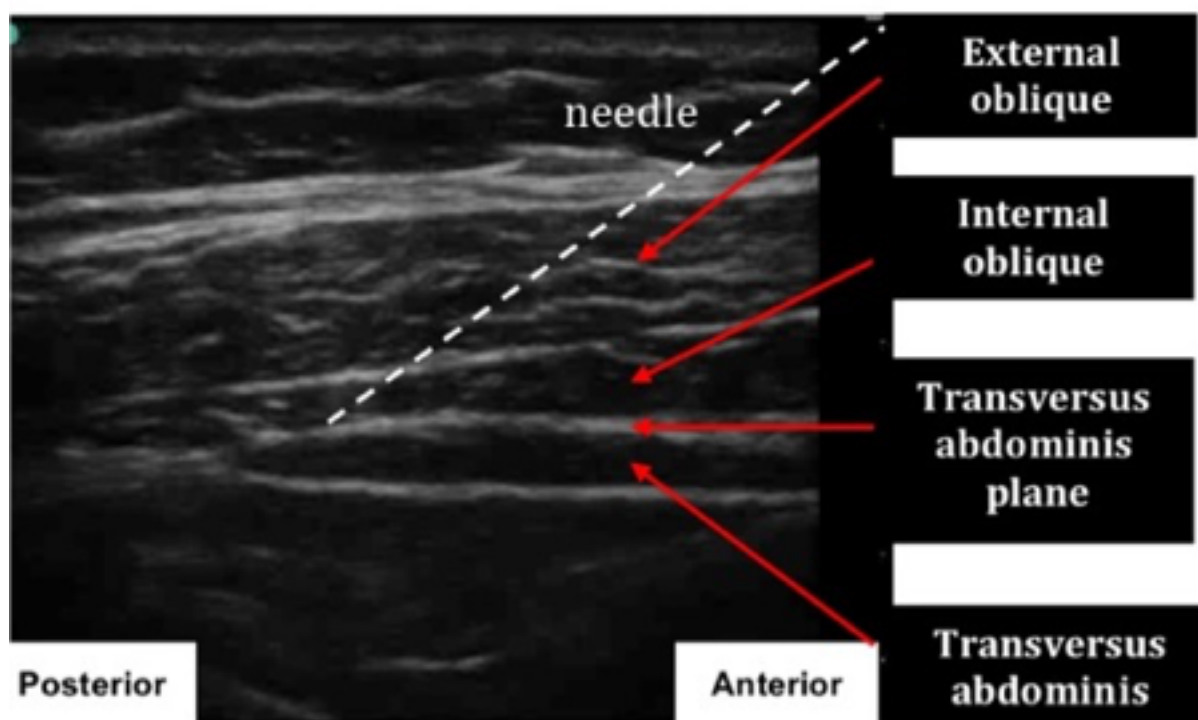
- inhalational gases - negative inotropes
- post-op ventilation
- avoidance of maternal and fetal respiratory depression
- risk of hypotension and/or tachycardia with induction drugs and laryngoscopy or use of propofol TIVA
- effect of PPV on reducing preload
- effect of anaesthesia on uterine tone → risk of reducing tone, more bleed, more haemodynamic impact.

Q12- TAP regional block discussion (repeat), 30.2%

Describe the anatomy of the Transversus Abdominis Plane (TAP) relevant to regional analgesia. (70%) List the complications associated with TAP block. (30%)

A

- Ant abdo innervated by anterior rami of **T7-L1**
 - Nerves run in TAP between IO & TA:
 - Thoracic nerves **T7 - T11**: sensation to abdominal wall
 - **T12**
 - **Ilioinguinal and iliohypogastric**
 - Halfway through their course from post \Rightarrow lat \Rightarrow ant abdomen they give out **lat cutaneous branches**
- these pierce IO & EO \Rightarrow lat abdo wall
 - \therefore must place block more lat/post to this branching
- Technique:
 - Probe halfway between iliac crest & costal margin as picture above
 - IP technique with prob mid axillary line & needle ant to it
 - move into TAP making sure feel movement through EO & IO
 - inject 25mls 0.375% ropiv into each side (volume is more imp't than conc to achieve spread)
 - **Rop with Matt (0.5%)** – for surgical block; (0.2%) for sensory block. **Never additives into block, esp in exam – too many controversies.**



B

5. Local anaesthetic toxicity,
6. Trauma to various structures including blood vessels, bowel, liver, spleen
7. infection
8. failure

Q13- issues of large tonsillar mass, 69.8%

Discuss the key areas of concern in your preoperative assessment of a patient for excision of a large tonsillar mass.

(report)

Targeted history, examination and investigations to determine the threat of the mass to airway patency. Factors to consider include

- functional assessment
- urgency of intervention
- pathological nature/ acute or chronic
- current medications, treatments and comorbidities
- an age-appropriate approach

Answer made up; no resource available

Large tonsillar mass, key periop issues include:

- airway obstruction
- associated OSA
- periop bleed causing airway compromise
- associated morbidities

Periop assessment should include history, exam, investigations to evaluate issues mentioned above.

- History:
 - Demographic information + routine AMPLE history to be taken.
 - current medications, treatments and comorbidities
 - an age-appropriate approach
 - airway obstruction, stridor, SOB, relieved by changing position?
 - OSA symptoms? Treatment with CPAP?
 - Re: potential malignant tumour: weight loss, lethargy, anorexia.
 - Re: infection, tonsillitis / quinsy: sore throat, bleed and systemic symptoms eg. fever, nausea, treatment with antibiotic and response?
 - Functional capacity?
 - Is treatment urgent? Ie for airway obstruction, source control due to sepsis;
- Exam:
 - Airway assessment for upper airway obstruction
 - Nasal patency for potential requirement of nasal intubation
 - Resp exam for lower airway obstruction
 - vital signs – is patient septic? Cyanotic?
 - cachexic? Malnourished? Coagulopathic?
 - ECG if concern of severe OSA / right heart strain
- Investigations:
 - type of mass, biopsy/histology, CT scan staging if indicated
 - labs for albumin, LFT, haem, biochem, coags, gas for concern of malignancy and OSA

- Polysomnography for OSA diagnosis and severity grading +/- echo if signs of decompensated right heart failure.

Q14- statistics definition (repeat), 53%

The Mallampati test is a commonly used bedside screening tool to assess the probability of a difficult intubation. Explain the terms sensitivity, specificity, positive predictive value, and negative predictive value when applied to this test.

Q15- awareness and BIS, 50.3%

1. Classify the possible causes for patient awareness under general anaesthesia. (70%)
2. Evaluate the evidence for the use of Bispectral Index monitoring in reducing the risk of awareness. (30%)

Awareness = explicit recall of operative events during GA (ANZCA Bluebook article 2015); incidence **1:500 in GA CS**, ie 10x more than in general = **1:5000**. (but a question earlier said **1:10,000 – half of epidural abscess**)

Causes for awareness under GA

- Breaks down into:
 - **Accidental**
 - **Unrecognised equipment failure**
 - Reduce practitioner **vigilance** (eg. empty vaporiser)
 - **Abnormal patient physiology (Patient)**
 - **Masked** physiology eg. complete HB, hypothyroidism, BB use, ANS neuropathy
 - Patient's SNS stimulation is 'masked' from alerting Clinician
 - **Drug resistance** eg. genetic variability, excessive ETOH, chronic pain, regular use of illicit substances
 - Higher MAC requirement
 - **Poor CVS reserve** eg. severe AS or heart failure
 - **Poor technique (Anaesthesia)**
 - Underdosing eg in LSCS
 - Unexpected DI + insufficient anaesthesia
 - **TIVA** (failure of drug delivery or poor understanding of pharmacology)
 - **Special circumstances**
 - **Specialist surgery** eg. cardiac, obs, paed, rigid bronch, trauma
 - **Life threatening emergencies** eg. severe bleed, septic shock, cardiac/peri-arrest

Use of BIS evidence

- Studies comparing awareness incidence with or without use of BIS have shown mixed results.
 - B-aware study, BIS use in high risk patients (cardiac, LSCS, trauma, bronchoscopy), reported an incidence ~ 1% and BIS reduced incidence by 80%; NNT 138.
 - However, B-unaware study subsequently, BIS in high risk patient, concluded BIS no better than ET gas analysis. Study showed there was no awareness if BIS <50 and MAC >1.0.
 - Although this study is underpowered

- The most recent, BAG-RECALL trial, attempted to address the issue of underpower from previous study, again showed BIS was not associated with lower awareness.
- Currently, superiority of BIS is not established.
- However, BIS may still be beneficial in providing improved anaesthetics delivery in terms of reducing anaesthetic consumption/requirements and improved recovery profiles.
 - there's observational evidence correlating cumulative deep hypnotic time (BIS <40) with increased mortality and morbidity; BALANCE trial is investigating this.

On balance: until further clarification on evidence, it may be prudent to use BIS as supplementary, but not the sole, assessment for depth of anaesthesia. Vigilance is required.

- Use of BIS is not suitable for ketamine based anaesthesia, paediatric <1year, hypothermia, etc.
- BIS does not change with Opioids nor N2O. Evidence is particularly lacking for use of BIS in TIVA.

NB. (Table below from Alan McLintics)

April-2012, 61.5%

Q1- serotonin syndrome, 59.9%

In regard to serotonin syndrome

- a. What are the risk factors? (20%)
 - b. What are the clinical manifestations? (40%)
 - c. What is the treatment for an acute episode of serotonin syndrome? (40%)
- (report)
- specific treatment with cyproheptadine or chlorpromazine

Q2 – Beachchair position (repeat), 50.5%

65yo man on list for arthroscopic acromioplasty that is to be performed in the beachchair position. A. list the complications assoc w this position (30%), b. describe how risk of these complications can be minimized (70%) – see Chang's environmental hazard p. 4

Q3 – Oliguria, 72%

A 60 yo man is admitted to the HDU following laparotomy for large bowel obstruction. He has a IDUC. 3 hours later he's oliguric. A. define oliguria (10%), b. what are the potential causes of oliguria in this patient? (40%), c. how would you differentiate between these causes? (50%).

- a. Oliguria = UO <0.5ml/kg/hr
- b. causes in this patient
 - Pre-renal
 - Decreased renal perfusion/ischaemia: hypovolaemia, SIRS/sepsis, MI, compartment syndrome.
 - Decreased O2 flux: hypoxaemia, anaemia.
 - Intra-renal

- Stress response, as increased SNS outflow, RAA response → ADH
 - Preexisting renal dx, worsened by sepsis, nephrotoxins – NSAID/ACEi, excess colloid use etc.
 - Post-renal
 - Ureteric obstruction eg. abdo compartment syndrome
 - IDUC obstruction
- c. differentiate:
- History
 - Preexisting renal disease? DM? prostatic
 - Cardiac disease?
 - Medications such as ACEi or NSAID?
 - Significant intraop event such as large volume blood loss, desaturation, hypotension.
 - Exam
 - Oxygenation status? Desaturation?
 - Cardiac exam – patient maintaining MAP? Requiring high dose vasopressor/inotrope?
 - Fluid balance exam? Patient hypovolaemic?
 - Septic? Febrile, tachycardic, shocked, high leukocytosis?
 - Invx
 - FBC – anaemic? Leukocytosis?
 - UECr – renal function
 - Urine sample – Urosepsis?
 - Bladder scan - ?IDUC obstruction
 - Renal USS: hydronephrosis? Peri-renal abscess?
 - Consider assess IAP using intracystic pressure monitor

Q4- Ethics in incompetent patient, 79.1%

An elderly patient has previously declined an above knee amputation for a gangrenous leg. She becomes acutely unwell, confused and no longer competent to make decisions. At the request of the family, the surgeon has approached you to discuss whether to proceed with surgery or not. She is likely to die without the surgery.

Outline the ethical considerations you would discuss with the surgeon.

Autonomy=Patient's right to make her own decision and her earlier expressed wish.

- Although this does not necessarily dictate the decision making.
- Decision should depend on previous circumstance of a competent decision to decline – was this an informed decision with patient knowing consequence of declination? did patient express similar wishes in future event? Was this clearly documented? Is there an advanced directive?

Beneficence = Principle of 'doing good' to patient.

- Potential outcome from procedure should be carefully considered – would this offer post-procedural good quality of life for patient?
- Is the risk of surgery outweighed by the potential benefit?

Non-malevolence=Principle of do no harm –

- the risk of causing suffering to patient should be avoided.

Basis of family's request

- Family's expectation should be thoroughly explored and reason discussed.
 - in context of patient's prior decision to decline surgery.
- Is there welfare power of attorney in family?
- Family's view of not operating?

Paternalism

- = clinician's discretion of patient care regardless of patient's autonomy.
- Should be based on altruism and beneficence – taking into patient's previous decision making and Clinician's best attempt at deciding what's in patient's best interest.

End of life issues / analgesia provision

- Alternative management should be offered and benefit/risk carefully evaluated.
- Palliation should involve MDT with Palliative Team, Psychologist.
- It is patient's right to receive analgesia and minimize suffering.

Q5- spinal block discussion, 63.2%

A healthy 28-year-old primigravida is scheduled for elective lower segment caesarean section for breech presentation at 39 weeks gestation.

You have performed a spinal anaesthetic using 0.5% bupivacaine 2.2 ml and fentanyl 15 µg (total volume 2.5 ml).

- a. Describe the issues in assessing adequacy of the block for the planned surgery (50%)**
- b. Describe the options for managing an inadequate block recognised prior to commencement of surgery (50%)**

Q6- Bronchopleural fistula management, 59.9%

A 25-year-old man with recurrent pneumothorax and persistent air leak is scheduled for video-assisted thoracoscopic pleurodesis. a. Outline the considerations involved in induction of anaesthesia in a patient with a persistent air leak (50%)

b. Outline the management of an intraoperative deterioration of oxygen saturation in this patient (50%)

Issues in anaesthesia induction

- A.
 - Require lung isolation with either BB or DLT;
 - I'd use DLT unless difficulty with intubation; due to
 - Able to alternate isolation quickly, faster placement, can suction/ventilate both sides readily and better deflation of surgical field.
 - If difficult encountered, will use standard ETT with BB.
- B.
 - Potential difficulty with oxygenation: cannot BMV because of large air leak;
 - In dire situation, consider clamp chest drain, but watch for PTX.
 - Evaluate risk by estimating air leak amount
 - Ensure functioning chest drain with UWSD
 - Be vigilant of risk of tension pneumothorax with IPPV
 - Need lung isolation quickly
 - Hypoxaemia in OLV needs to be monitored/managed
- C.
 - CVS collapse due to tension pneumothorax

Management of desaturation intraop

- Most likely desaturation under **OLV**, however **systemic check** of hypoxia needs to be considered:
 - **Systemic check:** ABC approach, scan monitor, patient's colour, surgical field
 - 100% O₂, ventilate manually, assess EtCO₂
 - present then
 - Auscultate chest – spasms, PTX, shunt, dead space,
 - hypermetabolism?
 - Treat accordingly
 - Absent:
 - ETT positions (obtx or wrong place)
 - Consider pass suction catheter
 - Rule out hypotension; optimise CO with vasopressor/inotrope and ensure Hb>70.
 - check circuit
 - check Monitor error
- If due to apparent VQ mismatch under **OLV**,
 - Check with Surgeon and provide O₂/**CPAP to non-ventilated** lung 5-10cmH₂O.
 - May need to **gently ventilate** non-ventilate lung
 - **Recruit ventilated** lung for potential atelectasis and increase PEEP (but consider effect of worsening VQ mismatch)
 - **PA occlusion** of non-vent lung; but balance w risk of RV strain
 - If all fails, consider **CPB**.

Q7 – ICP assessment / monitor, 64.8%

a. List the methods of assessing intracranial pressure (ICP) (30%)

b. Evaluate the role of ICP monitoring in the setting of traumatic brain injury (70%)

Methods

- Clinical – pupils (size, reactivity), GCS, neuro exam, resp pattern, CVS changes (Cushing response indicates raised ICP: HTN, bradycardia)
- Invasive
 - intracranial pressure transducer
 - intraventricular catheter with vertical manometer (gold standard)
 - more reflective of global ICP than subdural/extradural monitors.
- Non-invasive: CT
- Cerebral perfusion assessment
 - Transcranial Doppler
 - NIRS
 - EEG
 - SSEP changes; MEP.

ICP monitor role in TBI

- Aim = maintain CPP to minimize secondary ischaemic insult
- ICP monitor assists in maintaining CPP in TBI; as ICP is dynamic in TBI and likely will increase in >50% cases, due to inflammation, oedema, intracranial haemorrhage
 - CPP = MAP – CVP or ICP whichever is higher.

- If ICP shown to be high, esp if pathological ie >20mmHg
 - Measures to reduce ICP can be performed:
 - Maintain CO₂ = 35mmHg
 - Mannitol/conc salt to target Na 150-155
 - Reduce metabolism to reduce CBF.
 - Drainage of CSF with EVD.
 - MAP can be titrated higher to maintain CPP.
- May also enable detection of worsening ICP requiring surgical intervention, once medical therapy is exhausted.

Cons include:

- Invasive – bleed/infection risk
- Errorneous measurement
- dislogement
- However, no evidence to demonstrate ICP monitor changing outcome.

Q8- thyroid disease, thyroid storm management, 84.1%

A 35-year-old female is booked for thyroidectomy. Her blood results are as follows.

Thyroid stimulating hormone (TSH, thyrotropin) 0.1	(N 0.3 – 3 mIU/l)
Total Thyroxine (Total T4) 20	(N 4 – 11 µg/dl)
Free Thyroxine (Free T4) 4	(N 0.7 – 1.8 ng/dl)
Free Tri-iodothyronine (Free T3) 120	(N 60 – 175 ng/dl)

a. Interpret the thyroid function tests (10%)

b. Justify when you would proceed to thyroidectomy in this patient (50%)

c. What is the management of an intraoperative thyrotoxic crisis? (40%)

a-patient is thyrotoxic with elevated T4, suppressed TSH

b-When to operate depends on

- Urgency of surgery, esp. if malignancy associated.
- If urgent, Within the time available, I'd assess:
 - Airway-any tracheal obstruction from goiter?
 - B: is there retrosternal goiter?
 - C: compressing SVC?
 - Obtain history-SOB, stridor, orthopnoea, syncope?
 - Exam-airway, goiter? Pemberton's sign + cardioresp.
 - Assess with CT neck/chest
 - Endpoint I'd be targeting, control increased SNS tone:
 - Arrhythmia controlled, HR <80 (OHA), BP controlled.
 - Tremor absent
- If elective setting, TFT should be normalized before proceeding. Consider
 - Carbimazole/propylthiouracil
 - Radio-iodine to reduce vascularity of goiter
 - + thorough assessment outlined above.

c- thyroid storm management

- would expect to see malignant HTN + tachycardia, fever.
- Mx = notify Surgeon, declare medical emergency, call help
- Simultaneous treat + consider differentials: sepsis, MH, anaphylaxis (report)
- ABCDE approach mx:

- Intubate
- 100% oxygen and ventilate to maintain CO₂ 35mmHg, compensate for met acidosis
- cardiac support:
 - beta blocker propranolol increments (1mg IV) or esmolol boluses -> infusion (50-100mcg/kg/min). Target HR <90
 - IV fluid + glucose (OHA)
- E: treat hyperthermia; consider physical cooling (icepack, cool blanket)
- Other Specific therapy:
 - hydrocortisone 200mg IV QID
 - action:
 - adrenal insufficiency
 - decreases T4 release and conversion
 - propylthiouracil
 - 1g load PO or via NGT then 250mg QID
 - action:
 - inhibit thyroid hormone release
 - decrease peripheral conversion from T4-T3)
 - then give iodide eg Lugol's iodine 5-10 drops via NGT
- Monitor with art line, temp probe
- Postop- admit to ICU for ongoing monitoring.

NB.

-carbimazole (antithyroid) is not helpful in acute setting, as large store of preformed T3/4 needs to be depleted first.

-don't give NSAID/aspirin as displaces thyroxine from protein binding → worse

Q9 – Paediatric airway obstruction, 72.5%

3yo in ED with recent onset of stridor. A. list the differential diagnosis (30%), b. How do you differentiate between the potential causes of this stridor (70%).

Differential (each category below have both supra/infraglottic causes)

- Foreign body
- Infection – epiglottitis, pharyngeal abscess vs. tracheitis, croup (LTBronchitis)
- Trauma – laryngeal haematoma, airway burn, inhalational injury
- Neuronal – head injury, laryngeal nerve palsy.

Differentiate causes based on Hx, exam, invx

- Hx
 - Gagging, choking? Onset while eating or playing with small object?
 - Barking cough? Fever, fatigue, dyspnea, sore throat, dysphagia, drooling, hoarse voice?
 - Hx of trauma/head injury or recent airway surgeries?
- Exam

- Important to keep patient as calm as possible to avoid worsening of airway obstruction; also assess degree of distress signifying urgency of intervention?
 - (report) eg. Body position: Tripod position in child or arched backward in infant signifying resp distress?
- Phase of stridor? (from CEACCP)
 - Insp: extrathoracic or supraglottic eg. epiglottitis
 - Exp: intrathoracic or subglottic eg. foreign body.
 - Biphasic: at or below cords: eg. croup
- Hypoxic? Septic? Facial burn? Signs of inhalational injury?
- (report) Response to therapy: adrenaline neb/steroid? suggest croup whereas limited response suggest foreign body; rapid worsening suggest epiglottitis
- Invx
 - Imaging; unhelpful unless radio-opaque foreign body seen. May see hyperinflation of lung or lung collapse.
 - Blood: leukocytosis,
 - (report) Consider need for GA for mx/assessment:
 - airway secure, endoscopy assess for level/extent of airway oedema or foreign body, imaging, blood test

Q10- ARDS discussion (repeat), 70.9%

An adult patient from the intensive care unit with severe adult respiratory distress syndrome (ARDS) requires a laparotomy for an acute abdomen.

- a. What are the features of ARDS? (30%)
- b. Explain your perioperative ventilation strategy (70%)

ARDS features

Diagnostic criteria:

- acute onset
- bilat infiltrates on CXR consistent w oedema
- clinical absence of LA HTN ie heart failure / cardiogenic oedema or fluid overload (PAWP <18)
- PF ratio <300 = ALI, <100 = ARDS.

Clinical Features:

- Acute/exudative phase
- Subacute/proliferative
- Chronic/fibrotic

Perioperative ventilation strategy = 'Lung protective ventilation strategy'

- Aim = prevent barotrauma, volutrauma, atelectrauma, biotrauma (infection)
- Mode: pressure control to avoid barotrauma from ventilating with poorly compliant lung;
 - PeakP should be limited to <30cmH₂O.
 - Depending on degree of compliance, some degree of permissive hypercarbia may need to be accepted.
- PEEP: 5-10cmH₂O aim to improve oxygenation by reducing atelectrauma; this needs to be combined with use of recruitment intermittently;

- Recruitment aim to open closed alveoli thereby improve oxygenation (and lung compliance) and PEEP helps to stop alveoli from collapsing.
- TV – 6ml/kg to avoid volutrauma;
 - Due to heterogenous compliances among lung units; high TV leads to overinflation of healthy lungs → damage, worsening of ARDS.

NB.

Other therapies may be considered:

- ECMO: known to confer mortality benefit in severe ARDS when other medical therapies have failed.
- Nitric oxide: to improve oxygenation and reduce PVR.
 - May be used as temporizing measure, however not shown to improve outcome.
- Fluids:
 - Conservative > liberal in terms of reducing ventilation/ICU duration.

Causes of ARDS:

- Direct: pneumonia, aspiration, drowning, PE, contusion..etc.
- Indirect: sepsis, transfusion, pancreatitis, trauma, burns, drugs

Q11- PCA service setting up, 59.9%

You are asked to initiate an opioid patient-controlled analgesia service in your hospital.

a. How would you ensure patient safety? (70%)

b. What are the key components to include in designing an order form? (30%)

Steps to ensuring patient safety

- Protocolised PCA prescription –
 - In-line with established international pain medicine guidelines on PCA prescription
 - guide patient indication and contraindication. Allows for NCA option if appropriate for eg. patient at extremes of age, cognitive dysfunction.
 - Guide monitor level required + vital signs limitations to indicate withhold of PCA
 - Guide 1st instance resuscitation – ie oxygen supplement, naloxone, emergency team help contact.
 - Standardised prescription form for hospital use
- Pain Team service
 - Ensure adequate staff in APMS for ongoing daily follow up of patients on PCA + treatment adjustment.
 - Members in pain team must have adequate clinical knowledge, experience – Pain CNS guided by Pain Specialist is ideal.
- Pre-made, standardized opioid solution with 1 concentration
 - To avoid error in making up PCA solution, which can potentially be dangerous.
- Equipments
 - Protocolised equipment set up – dedicated line or use of anti-reflux device to ensure 1 way flow + unobstructed carrier fluid to keep vein open.

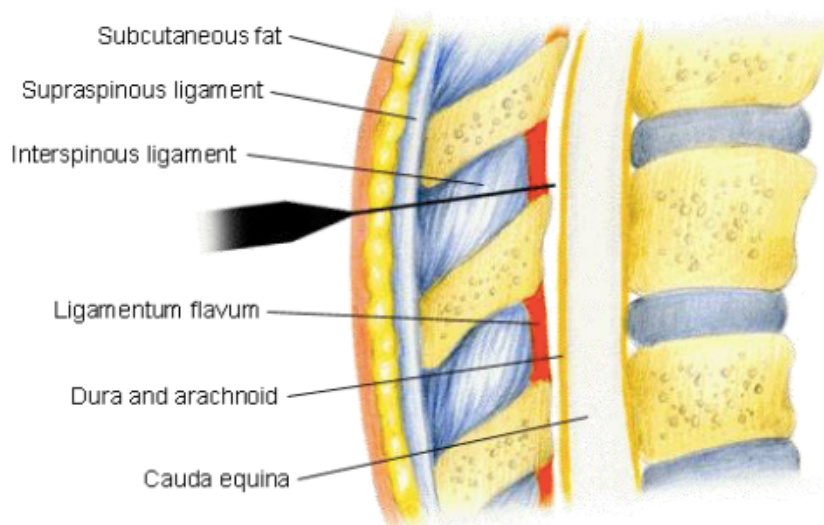
- PCA pump with reliable, robust function – allows program of bolus dose, lock out time, hourly limit, background infusion, lock to prevent tampering, occlusion alarm, dosing history + portability.
 - + regularly serviced.
- Staff education
 - Regular education sessions for prescribers; ideally only dedicated team of prescribers (APMS/Anaesthetists)
 - Regular education for PACU/Ward on set up of PCA, monitor of patient on PCA use.
- Patient education
 - How to use PCA, what it is for ie for pain, not for other reasons, and ensure it is only used by patient, unless it's an NCA.

Key components required in PCA order form

- Prescriber's signature, date.
- Clear patient label. Adverse drug reactions. Relevant clinical history – indication for PCA use, what other concurrent analgesia is prescribed, any special care required? Eg. renal failure, hepatic failure.
- Options to choose standardized, premixed analgesia option – eg. either morphine or fentanyl + standardized prescription of bolus, lock out time, hourly limit.
- Guide monitor level required + frequency, vital signs limitations to indicate withhold of PCA
- Guide 1st instance resuscitation for adverse events eg. opioid overdose – ie oxygen supplement, naloxone, emergency team help contact.
- Contact details for problem solving.

Q12- epidural anatomy, 64.8%

- a. Describe the anatomy of the epidural space (50%)
- b. What are the clinical implications of the anatomical differences between thoracic and lumbar epidural spaces in the placement and management of epidural analgesia? (50%)



Superficial→Deep

Boundaries:

- Posterior: ligamentum flavum, laminae
- Lat: pedicle, intervertebral foramen
- Sup: dura fusion with periosteum of foramen magnum
- Inf: sacral hiatus, closed by sacrococcygeal ligament
 - Nb. Communicates with paravertebral space through intervertebral foramen

Content

- Areolar connective tissue, fat, lymphatics, arteries, extensive venous plexus

Clinical implications of anatomical differences for epidurals

- Level: lumbar L3-5 (spinal cord usu. ended at L1); Thoracic T8-10 (spinal cord anterior to needle)
- Caudally angulated / overlapping spinous processes
 - More caudally angulated in thoracic than lumbar, making midline approach more difficult in thoracic
- Blood vessel puncture (in sitting position)
 - More likely with lumbar than thoracic due to venous pooling due to gravity.
- Differential block:
 - Thoracic more likely to cause sympathectomy of heart (cranial spread to above T4), hence needs to use smaller boluses at time to minimize haemodynamic instability; closer CVS monitoring required, than lumbar which is less likely to spread to high thoracic levels.
 - Infusion rate should be lower with thoracic than lumbar
 - Eg. 2-10 ml/hr vs. 5-15ml/hr.

Q13- stroke minimization, 61.5%

- a. List the risk factors for perioperative stroke (50%)
- b. Describe how you would minimise the risk in a high-risk patient having major orthopaedic surgery (50%)

(Read Chang's)

(report)

Risk factors

- classification (pre, intra and postoperative)
- age, sex, co-morbidities, cerebrovascular disease, timing of antithrombotics
- duration of surgery, emergency surgery, arrhythmias and haemodynamics, fluid balance, inflammation

Minimising risk in the high risk patient

- timing of surgery after an acute neurological event
- anti-thrombotic/ anticoagulant management
- perioperative haemodynamic management/ monitoring, fluid balance management
- dysrhythmia control
- control of CO₂
- patient positioning
- neurological monitoring

Q14- universal precautions (repeat), 76.4%

- What do the terms decontamination, disinfection and sterilisation mean? (30%)
- What measures should be in place to minimise the risk of transmission of infection to the respiratory tract of patients via anaesthetic equipment? (70%)

(PS 28 definitions)

Decontamination

- = removal of microorganisms/unwanted materials from contaminated materials or living tissue.

Disinfection

- = inactivation of non-spore forming microorganisms using either thermal/chemical means

Sterilisation

- complete destruction of all micro-organisms including spores.

Asepsis

- = prevention of microbial contamination of living tissue or sterile material

Measures to minimize risk of infection transmission in resp tract via machine

Refer to PD Doc on: infection control in anaesthesia

- Clinical staff (still in the report, even though Q is asking 'equipment')
 - Hand hygiene, gloves, mask, isolation from patient if unwell
- Anaesthetic equipments
 -
- Airway equipments
 - Machine: Filter should be used between circuit and patient's airway; this way, circuit/components can be reused but still change after high risk contact eg. TB or visibly contaminated
 - Otherwise, circuit, CO2 absorber, ventilators, bellow, 1 way valves should be decontaminated, disinfected regularly or changed.
 - Airway equipments, by degree of grading of cross-infection:
 - Critical equipments ie patient's blood contact
 - Laryngoblate, macgills → sterilize after each use or dispose disposable eg. bougie.
 - Semicritical ie mucosal contact
 - Facemask, blade handle → disinfect or dispose of (eg. mask, guedel, ETT, FOI)
 - Non-critical ie manual ventilation bag → disinfect/clean after each use; unless visible contamination → change

NB.

-OT, negative P, lung isolation technique = NOT RELEVANT as per report.

-if equipment used with cVJD, must be disposed off as sterilization doesn't irradiate the pathogen.

Q15- oxygen delivery device, 32.4%

With regard to oxygen therapy for patients in a general postoperative ward

- Describe the options available (30%)
- What are the justifications for your choice for a particular patient? (70%)

Options + justification

- Nasal prongs
 - Flow rate: 0-4L/min; >4 not recommended as not increasing FiO₂ higher and risk of nasal mucosal breakdown from drying.
 - Delivers FiO₂ up to 35% by increasing O₂ fraction in nasal cavity
 - Less effective if mouth breather, rapid RR, resp distress, due to air entrainment.
 - However generally well tolerated and patient can eat+drink.
 - Suitable for most population without severe resp distress, and not requiring high oxygen, including neonate + most patients on PCA needing O₂ supplement.
 - not suitable for mouth breather, resp distress, high O₂ requirement.
 - May be unsuitable after certain surgeries eg. sinus surgeries, septoplasties
- Hudson mask
 - Flow rate: 4-12L/min.
 - Delivers FiO₂ up to 60%; extra 1L/min O₂ flow increase FiO₂ by ~4%
 - Efficiency also depends on pattern of breathing; high RR/TV entrains air and reduces FiO₂; but is more reliable to maintain FiO₂ than NP.
 - Can deliver nebulized medicine
 - May be less well tolerated cf. NP, esp if in uncooperative patients; prolonged use without humidification could lead to dry mouth, mucosal break down.
 - Suitable for most patients requiring higher FiO₂ than NP, even mouth breathers, or resp distressed.
 - Not suitable for uncontrolled use in CO₂ retainers due to risk of losing hypoxic resp drive.
 - At low flow rate, has risk of CO₂ rebreath.
- Venturi mask
 - Delivers specifically set FiO₂ for a given mask.
 - Suitable for patient who needs specific FiO₂ eg. COPD CO₂ retainers.
 - However, more complex and less familiarity
- Non-rebreathing mask
 - Delivers up to 100% O₂; depending on flow rate and MV
 - Suitable for patients with severe hypoxaemia / high O₂ requirement eg. severe asthma, pulm oedema etc; temporizing before definite intervention.
- BMV (ambubag)
 - Delivers up to 100% O₂
 - Allows assisted ventilation with bag in emergencies
- Non-invasive ventilator support: HFNP or Bilevel via mask
 - Allows FiO₂ to be set and flow rate.
 - High flow rate provides degree of PEEP eg. 50L ~ 5cmH₂O; bilevel mask allows higher PEEP to be given + inspiratory support.
 - Humidification can be combined.

- Suitable for patients who require high O₂ requirement, who require PEEP or insp support: eg. asthmatic exacerbation, pulm oedema, post-abdo surgeries at risk of atelectasis.
- However, availability may be less and limited to HDU rather than in general postop ward;

Oct-2011, 24%

Q1- oxygen delivery device, 5%

Compare and contrast oxygen delivery by nasal prongs, simple facemask and Venturi mask.

Q2- Critical appraisal of RCT (repeat), 65%

A new randomised controlled trial suggests therapy A is better than therapy B in the treatment of condition X.

How would you evaluate this trial before changing your clinical practice?

RCT is

- gold standard clinical trial design to establish cause/effect relationship
- prospective, randomized, cof. 2 groups with intervention vs. control/placebo
- however varying quality of strength and weaknesses hence critical appraisal is mandatory.

Appraisal will include:

- analysis of the conduct of the study:
 - type of trial
 - clinical question investigated relevant in my practice?
 - hypothesis statement,
 - generalizability to my patient group?
 - location
 - inclusion/exclusion criteria,
 - patient demographics?
 - ethics
 - measurement tool
 - randomization? Blinding?
 - Sample group calculation
 - Study execution
 - Group separation?
 - Adequate follow up?
 - Treatment of withdrawals?
 - Quality of result? Power, bias/conflict of interest management,
 - application of appropriate statistics,
 - analysis of results
 - adequate power? Significant result?
 - Comparisons with other studies?
 - Consistency of results?
 - contribution of new knowledge or confirmation of previous work
 - Cross-examination of study

- Discussion with colleagues in journal club

Q3- RBC salvage discussion, 55%

What are the benefits and limitations of red blood cell salvage? (50%) How would you justify its introduction into your institution? (50%)

Pros of RBC salvage

- reduce allogenic transfusion requirement and assc risk
 - TRALI, incompatibility/haemolytic reactions, immune modulation, cancer recurrence, blood-borne infection, biochemical disturbance, antibody formation
- Doesn't require G/H, particularly beneficial for patients with difficult crossmatching due to presence of antibodies
- May be accepted by Jehovah's Witness patients
- Cells infused at room temp avoids need for warming device + lower risk of hypothermia.

Cons

- Expensive equipment cost and maintenance of disposals
- Staff training and complex device
- Delay in blood collection, processing and certain volume may be required before processing possible.
- Air/fat embolism
- Electrolyte imbalance, haemolysis, coagulopathy as only RBC collected.
- Bacterial infection if blood contaminated
- Controversies (CEACCP)
 - Obstetric vs risk of amniotic fluid embolism, rhesus sensitisation (although safety in this context is being increasingly established)
 - Ca surgery: with recurrence or metastatic spread
 - Bowel surgery: infection risk.

Introduction to institution considerations:

- Cost-effective and safety profile to patient:
 - Cost of using cell salvage vs cost of allogenic transfusion
 - Potential complications of each technique.
- In general, more frequent use of cell salvage, the greater the likelihood of it being cost-effective.
- Indication for cell-salvage include :
 - cases with anticipated blood loss > 20ml/kg or >1L;
 - preop anaemia or risk factor of bleed
 - patients with rare blood group/antibodies
 - Jehovah's witness.
- Likely see higher requirement of cell salvage in CTS, vascular, tertiary obs center with complex obs cases; orthopaedic surgeries with multiple spinal surgeries, revision of major joint replacements.
- Therefore justification will depend on the case-mix and volume of suitable operations at the institution.

Q4 – Dural puncture, 60%

While performing an epidural for labour analgesia in an otherwise healthy primigravida during the first stage of labour you inadvertently cause a dural puncture with the Tuohy needle. Discuss your management of this complication

Options

- remove needle and repeat at a higher level (but avoid higher than L2/3). Consider seeking help from a senior Colleague.
- Place intrathecal catheter
- Abandon epidural and use alternative analgesia

Decision depends on:

- Local policy, staff familiarity, anaesthetist availability, midwife experience/competence and patient preference.

My management of dural puncture

- place intrathecal catheter, no more than 3cm in intrathecal space.
- Label clearly that it's intrathecal and only to be used by Anaesthetist.
- Notify midwife, patient, Obstetric Team and document plan for Anaesthetist management only clearly.
 - May not be practical if no Anaesthetist back up support is available, but this isn't a issue in my Department.
- Analgesia: 1ml 0.125% + 2mcg/ml fentanyl increment, titrate to effect cover level of sensory block to around T10/L1

PDPH management

- Multimodal analgesia, hydration, bed rest but balanced with risk of VTE.
- EBP: if required, exclude contraindication and obtain informed consent for patient. Generally performed around 48 hours.
- Ongoing F/U for recovery + phone F/U.

Monitor for complication

- Meningitis, cerebral vascular event, SDH/SAH, SOL.
- Consider obstetric differentials eg. PET.

NB:

- Prophylactic bedrest, epidural/intrathecal IV fluid, epidural blood patch not useful.
- PDPH seen in ~60% of cases; 7-10 days.
- cure from 1st EBP expected in 50% of patients
- 40% may require 2nd EBP
- check CI: fever, sepsis, coagulopathy, patient refusal
- performed around 48hrs
- ↳ 24-48hrs has lower success rate, and <24 even lower success rate

Q5 – CVL insertion avoiding tamponade, 46%

Insertion of CVL may result in cardiac tamponade. A. how would you recognize this complication? (50%) b. how could you minimize the risk of this complication? (50%)

Recognition of problem – Hx, exam, invx

- Hx – SOB, presyncope.
- Exam –
 - tachycardia, hypotension, raised JVP, muffled heart sound.

- resp distress, pulm oedema.
- Decreased GCS
- Invx
 - Echo: to assess pericardial effusion
 - ECG: reduced voltage
 - CXR: pneumomediastinum, widened cardiac border
 - Signs of end-organ failure: renal failure, worsening acidaemia.

Risk minimization

- Insertion:
 - Measure/Estimate depth of insertion
 - USS guided
 - Avoid forceful and deep insertion of guidewire, dilator, line.
 - Secure line with suture firmly, at 2 points
- Post-insertion
 - CXR to check position, tip of CVL should not lie inside the pericardial reflection.
 - Ideally just outside of RHB on CXR, or ~at level of <2cm below carina.
 - Tip should be parallel to vessel wall, not digging into wall to cause erosion.

Q6 – High ICP anaesthesia management, 59%

A 50-year-old patient presents for urgent craniotomy and decompression of a subdural haematoma. Two days ago he was well, but now has a Glasgow Coma Scale score of 11. He is combative and has pulled out his intravenous line. On inspection there are no obvious veins for cannulation.

a. List the options available for induction and intubation. (30%) b. Describe and justify your preferred approach. (70%)

List options

- Gas induction with sevo
- IM ketamine then IV induction
- IM midazolam then IV induction
- IO induction then IV

Aim =

- Quick/smooth/stable induction to facilitate care and patient/staff safety
 - Minimize ICP rise and facilitate neuroprotection
- Maintenance of oxygenation and adequate MAP and CPP
- Establish IV timely to continue with anaesthesia

My approach in OT = Gas induction with O₂, Sevo, then establish IV for ongoing TIVA.

- Rapid onset and allows SV technique + assisted ventilation to minimize rise in CO₂/ICP.
- Sevo <1MAC relatively maintains cerebral autoregulation.
 - May provide neuroprotection through decreased metabolism.
 - Adjustment of sevo is easy.
- Improves IV access success rate with vasodilation
- Once IV established, I'd use remi/propofol/rocuronium to obtund airway reflex while intubate patient. Phenylephrine to balance hypotensive effect from propofol/remi.
- Sevo then stopped and TIVA continued for rest of surgery.

Q7 – visual loss complication, 62%

Four hours after multi-level laminectomy with instrumentation, patient complains of unilateral visual loss. A. what is your differential diagnosis? (40%) b. how can you minimize the risk of visual complications in the prone patient? (60%).

Differentials

- **intraocular** problem – bleed, retinal detachment etc.
- **Vasculature**: Artery - central retinal artery occlusion
 - from eye compression during prone
 - atherosclerosis/thromboembolic disease
 - ischaemia/hypoperfusion/anaemia
- **Nerve** – Ischaemic optic neuropathy
 - Ischaemia/hypoperfusion to nerve
 - Assc with diabetes, lengthy operation
- **CNS event** – CVA/TIA, cerebral tumour
- Postop confusion – POCD, delirium, sepsis

Risk minimization

- Preop
 - **Optimize** premorbid condition: diabetes, HTN, hyperlipidaemia, glaucoma, treatment, anaemia etc.
- Intra
 - **Optimal position of head and protection of eye**; ensure adequate head support
 - **Regular checks** intraop
 - Maintain Ocular **perfusion pressure**, ensure adequate MAP + venous drainage + avoid rise in IOP. Avoid prolonged Trendelenburg.
 - Ensure adequate oxygenation + avoid anaemia.
 - **Avoid hypoxaemia, acidosis and excessive hypercapnoea.**
- Postop:
 - continued maintenance of vital signs + oxygen delivery mechanism.
 - Vigilance + early recognition of problem.

Q8- URTI paediatric, 76%

A child with active upper respiratory tract infection presents for general anaesthesia.

a. Outline the factors that increase the rate of adverse respiratory events during anaesthesia. (50%)

b. How can you reduce the risk of an adverse event occurring? (50%)

Risk factors for resp AE

- Patient:
 - URTI syndrome: fever, purulent nasal congestion/coryza, productive sputum, sys. Unwell, wheeze, LRTI
 - Age <5yo; esp <1yo; hx of prematurity, reactive airway dx, snoring, passive smoking.
- Anaesthetic

- Airway: ETT>LMA>FM
- Drug: (decreasing risk) thio>halo>iso/des>sevo>propofol;
 - Residual NMB
- Surgical
 - Involve airway: ENT, bronchoscopy, laryngoscopy
 - Or cause blood in airway: nasal surgery, tonsil, adenoids.
 - Other high risk: cardiac, upper abdo, eye surgeries.

Risk minimisation

- Preo:
 - Thorough risk assessment and if multiple risk factors present, consider delay surgery by 2-4 weeks. (unless Surgery indicated to source control infection, eg. recurrent tonsillitis, sinusitis)
 - Consider salbutamol neb premed esp w reactive airway dx
- Intraop
 - Avoid airway instrumentation if possible
 - Consider TIVA with propofol
 - Consider lignocaine spray to cords of IV bolus during intubation/extubation, which MAY reduce airway AE.
 - Dry airway with suction of blood before extubation
 - Close monitor for laryngospasm/bronchospasm.
- Postop
 - Close monitor for laryngospasm/bronchospasm.

NB.

- Consensus: no longer mandatory to postpone 6 weeks; at least 2 weeks probably good enough
- in conclusion: Blanket cancellation is historical, current literature supports individualised selective decisions.

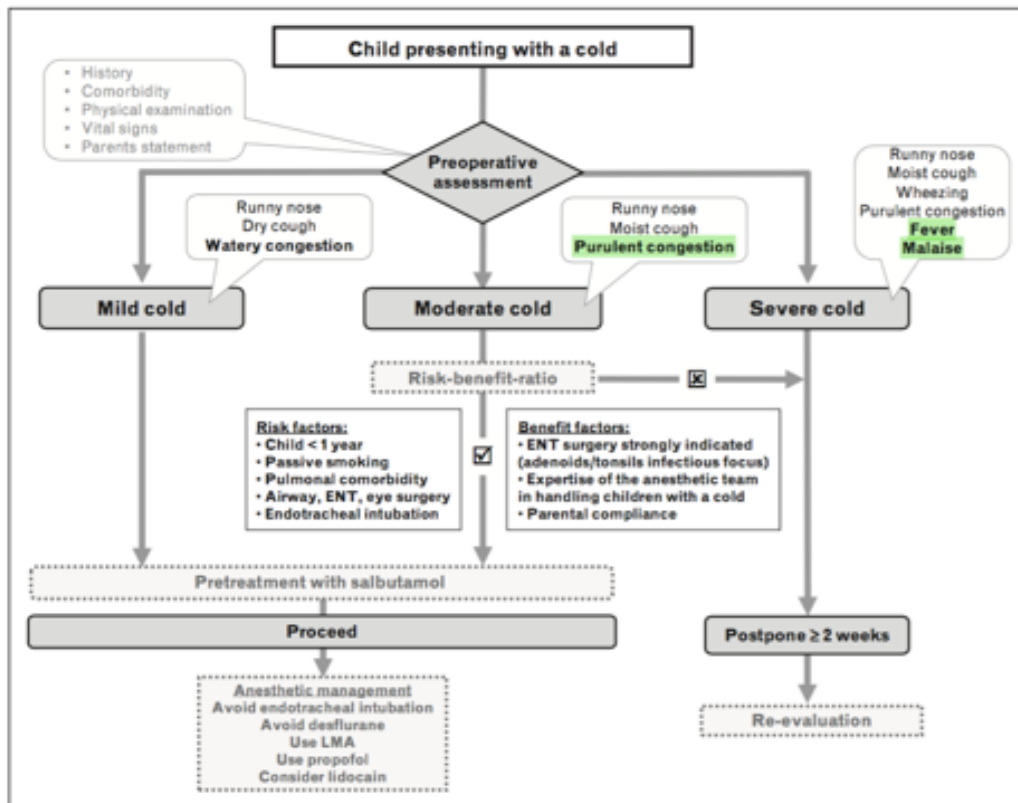


FIGURE 1. Proposal for a decision algorithm for a 'child presenting with a cold'. Modified from [43]. LMA, laryngeal mask airway.

Q9 – ALI, 26%

You are called to anaesthetize a 70 yo man with perforated bowel for laparotomy, 3 days post colonoscopy. Outline measure you'll take to reduce the likelihood of patient developing acute lung injury

Aim:

- **Source control** of insult – sepsis, SIRS from bowel perforation
- Prevention of **secondary insult** – aspiration, pulmonary oedema, barotrauma, volemia, atelectotrauma. (pressure, volume, fluid, collapse, chemical)

Pre

- Establish current status, comorbidities
 - Specifically looking for preexisting lung disease, smoking hx, use of inhalers/steroids, pulmonary oedema, pneumonia, lung collapse, or respiratory failure on blood gas.
- and optimize where possible in the limited time available
 - salbutamol nebulizer
 - antibiotic use, to cover intraabdo sepsis and potential pneumonia

Intra

- RSI to avoid aspiration
- Lung protective ventilation strategies: PEEP 5-10, TV 6ml/kg, avoid high Peak P, recruitment as required.
- Meticulous fluid management – use arterial line to monitor haemodynamics and consider use of SVV to guide volume status.

- Defend MAP (~65-70mmHg) using small bolus of fluid + vasopressor/inotrope as required.
- Consider blood product as required for correction of excessive bleed causing anaemia. Avoid over-transfusion to reduce risk of TRALI.

Postop

- Extubation consideration factoring in oxygen/ventilatory support requirement, haemodynamic status and ?open abdomen requiring surgery in near future.
- need ICU/HDU level care after major emergency surgery for potentially frail, high risk patient
- meticulous fluid management, maintaining euvolaemia as close as possible.
- Analgesia to enable chest physio, mobility, incentive spirometry

Q10- buprenorphine patch, 33%

A 70-year-old patient wearing a transdermal buprenorphine slow release patch (Norspan®) (5µg/h) presents for knee arthroscopy.

- Describe the mechanism of action and pharmacokinetic profile of this patch. (50%)
- What are the implications for perioperative pain management? (50%)

MoA:

buprenorphine = opioid agonist – appears to have full agonism for analgesia but less with resp dep, constipation.

- ~60x more potent than morphine.
- High affinity to opioid receptor, and dissociate slowly accounting long duration of analgesia.
- Due to less kappa-receptor binding, there's less psychomimetic /dysphoric effect

PharmK of buprenorphine patch mcg/h

- Absorbed via skin, bypass 1st pass met. High bioavailability.
- 72 hours to reach peak concentration; patch lasts for 1 week.
- Lipid soluble.
- Hepatic metabolism CYP450 3A4.
- T_{1/2} beta ~12 hours
- No active metabolite. Good for patients with renal failure.

Implication for periop pain mx

- **Issues:** likely have chronic pain with difficult periop pain management
 - Will require higher opioid amount due to tolerance
 - Buprenorphine however will compete with other opioid agonists, and has slow offset due to long t_{1/2} beta.
 - Need to avoid withdrawal.
- **Management** will encompass:
 - Indication – pain history
 - Effect
 - Other treatment?
 - Goal setting
- Patient assessment re: indication of buprenorphine patch, its dose history and effect from it.
 - Any other analgesia?

- Level of pain? Poor pain control leads to poor postop pain.
- Psychosocial issues?
- Explore expectation and establish common goal for analgesia – to baseline pain level or minimal increase managed by multimodal analgesia.

▪ **Analgesia strategies:**

- **Continue long term** regular opioid ie buprenorphine patch – (care not to apply direct heat over patch as could effect absorption leading to toxicity)
- **Multimodal** analgesia + **RA**.
 - Expect minimal effect with additional opioid (until day 3 after buprenorphine cleared) – and large dose is likely required.
 - Hence, Consider ketamine infusion, clonidine, gabapentin to opioid spare.
- **Close monitor for pain** assessment and **titrate** analgesia.
- **APMS** involvement + Pain Specialist input.

Q11- quality assurance, 57%

- Define quality assurance. (30%)
- How would you design and implement a Quality Improvement programme to assess patient satisfaction with the preoperative visit? (70%)

ANZAC PD on Quality Assurance

QA =

- An organized process that **assesses** and **evaluates** health services to **improve** practice or quality of care
- Objective is to ensure that high standards of clinical practice are maintained through regular assessments. The results of such assessments should be evaluated and actioned as necessary.

QA programme implementation

Planning

- careful **design** and **preparation**
- defining **topic** to be evaluated
 - patient satisfaction, which would cover:
 - Communication, efficiency, anxiety alleviation, informed consent, conduct/risk explanation etc.
- **data** to be collected
 - Target population, questionnaire, anonymous/confidentiality, independent surveyor + analyser.
- **methods** to collect and analyse data

Implementation

Involves:

- Collection and **analysis of the data**
- **Review** of results
- **Determining action** to be taken

in order to:

- Monitor and evaluate quality and appropriateness of patient care
- Identification of areas of deficiency or risk
- Implement and monitor of changes where necessary

Review ie reaudit

- Monitoring of the outcome of changes introduced from implementation with further survey in future "closing the loop";

Setting standards

- Writing the improvements achieved into new official regulations, guidelines or standards

Resources

- QA coordinator for each anaesthetic department
- Sufficient resources of people, time and support should be available for all anaesthetists and trainees to participate fully in QA programs

Q12- regional for tibial plateau fracture, 73%

- Which peripheral nerve/s need to be blocked for complete analgesia following repair of a tibial plateau fracture? (30%)
- Describe your technique for blockade of these nerve/s (EXCLUDING central neuraxial blockade). (70%)

Need to block: femoral/saphenous/commo peroneal/tibial

CALM, SOBER, PLANS, ACTIONS

- Sedation, o2, block trolley, know where equipment is for resus.
- PLANS - probe, local, additives, needle, stimulator
- Probe (5-12 MHz HFL probe); vs (2-5MHz curvilinear), Local, Additives, Needle, Stimulator (optional)
- Actions-arrange, clean, time out, image, optimise, note vulnerable, surround

Femoral USS:

locate image, nerve underneath fascia lata & iliacus. aspirate, inject ensure low resistance. infiltrate 0.75% ropivacaine, 10-15mls for surgical anaesthesia

Popliteal fossa USS:

- lateral, linear high frequency probe, 0.75% rop, 10-15mls. (watch for maximal safe dose ~30ml of 0.75% rop in 70kg pt)
- pop fossa up, identify tibial artery, often superficial and lateral to artery.

Consider Catheters.

USS: increase landmark identification and reduce risk of IV injection

Q13- hypernatraemia management, 40%

A 50-year-old man presents with confusion and the following electrolyte profile: Na⁺ 155 mmol/l,
K⁺ 4 mmol/l

HCO₃⁻ 15 mmol/l

Creatinine 120 µmol/l Hb 200 g/l

- a. What are the possible causes of this abnormality? (30%)
- b. How can they be distinguished? (70%)

Causes =

water depletion or excess of solute

- not enough water in:
 - no water,
 - disrupted osmo receptor,
 - motor dysfunction
- hypotonic fluid loss:
 - DI (renal/central);
 - diuresis (postobstruction, drug, diuretic phase of ATN);
 - Nonrenal fluid loss: GI, skin, lungs, dialysis

too much solute: too much Na, sea drowning, Conn syndrome/Cushings.

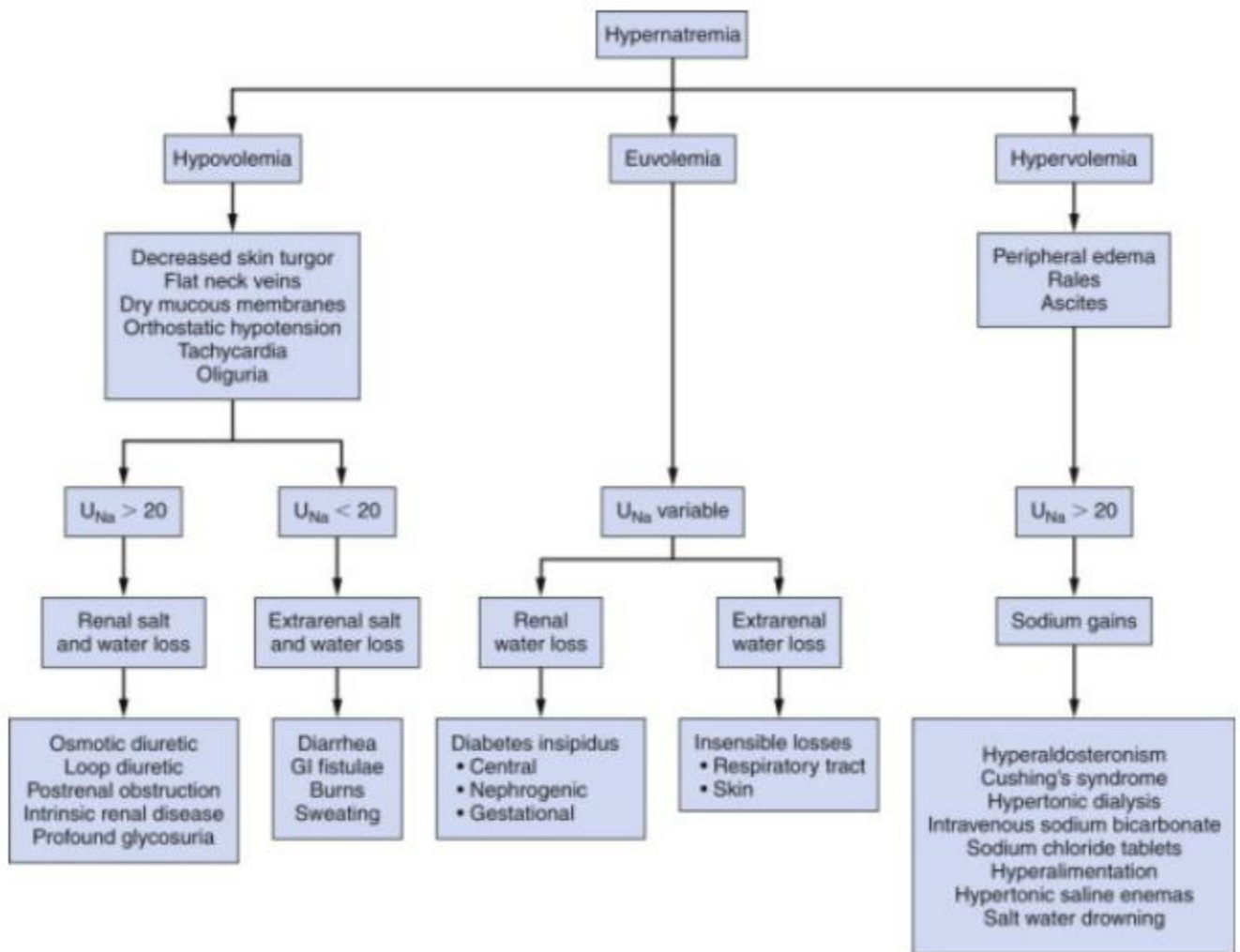
Distinguishing causes (report)

B.

How these may be distinguished on the basis of

- history (drinking/thirst response/fluid loss/trauma/infection/intracerebral pathology pathology)
- examination (volume status, vital signs)
- investigations/imaging and monitoring
- response to ADH/DDAVP

NB.



Tx cause; correct slowly 48hrs, free water PO, or D5W; tx DI w desmopressin 1-4mcg SCIMIV daily.

Q14- MI management, 39%

A 70-year-old man has undergone radical prostatectomy under general anaesthesia. On emergence he has crushing central chest pain, is restless, and has cold, clammy skin. His blood pressure is 90/50 mm Hg, pulse rate 110/minute and SpO₂ is 95% on oxygen via a Hudson mask.

A twelve-lead ECG shows widespread ST segment elevation across the anterior chest leads.

a. Describe your immediate management. (50%)

b. What are the treatment priorities for this patient? (50%)

Immediate mx.

Recognising acute periop STEMI probably

Help immediately + simultaneously manage patient

Monitor – ANZCA + continuous ECG + 12 lead ECG repeats; send bloods.

ABCDE approach

- optimize oxygenation – FiO₂ 100%, Hb>80g/L, euvolemic, haemostasis.

- Minimize cardiac workload – cautious use of vasopressor to maintain MAP. Consider esmolol to control tachycardia if it worsens ie to persistently >120bpm.
 - Analgesia.
 - GTN.
- D: aspirin loading.

Immediate Cardiology consult + consider urgent PCI.

Notify Surgical Team.

CCU/ICU

Priorities:

- Immediate as above
- Revascularisation
 - Thrombolysis contraindicated; however urgent PCI + MDT discussion on management option / DAPT.
- Subsequent care: optimize medical therapy: ACEi, BB, aspirin; risk of bleed with DAPT needs to be carefully considered by MDT.
 - Use of unfractionated heparin with close monitor + option for reversal may be a reasonable approach.

Q15 – VTE prophylaxis (repeat), 30%

Explain your approach to thromboprophylaxis in the patient undergoing total knee replacement. See 2015A Q12.

April-2011, 32%

Q1- dexamethasone discussion, 90%

(a) What is the role of dexamethasone in the management of postoperative nausea and vomiting? (70%)

(b) What are the potential problems associated with its use? (30%)

Dex = steroid with only glucocorticoid activity.

Role in PONV – proven efficacy PONV prophylaxis, and has long duration of action.

- MoA = unknown, but multiple theories:
 - Central inhibition of prostaglandin synthesis
- Dose 0.15mg/kg – IV/PO; or 4mg in adult. No advantage with higher dose for PONV.
- Given at induction.
- NNT = 3.7 = similar to ondansetron / droperidol; additive effect if used together as multi-modal antiemetics.
- Also anti-inflam effect, improves fatigue.
- PharmK: IV, penetrates into tissue/CSF, primary metabolism by liver, inactive metabolite excreted in urine.

Problems?

- Peri-anal burning sensation on administration
- Hyperglycaemia esp in DM - ?impaired wound healing, infective complication?
 - controversial
- Adrenal suppression with long term use
- Single use generally considered safe with regard to:

- Osteoporosis, Cushing's syndrome – muscular weakness, PUD, skin fragility,

Q2- pulmonary fibrosis discussion, 46%

A patient with known idiopathic pulmonary fibrosis (fibrosing alveolitis) presents for an open right hemicolectomy.

(a) What are the respiratory issues facing this patient with regard to their general anaesthetic? (70%)

(b) Explain your intraoperative ventilation strategy. (30%)
(report)

A

- establishment of disease severity/use of oxygen
- sequelae of the disease (pulmonary hypertension/infection)
- effect and side-effects of treatments (steroids/azathioprine)
- factors relating to abdominal surgery and their impact on this respiratory disease (GA and muscle relaxation/fluid shifts)
- impact of disease on respiratory system physiology (lung volumes/V-Q mismatch/ventilation pressures/risk of barotrauma)
- postoperative implications of disease (patient disposal/respiratory failure potential/impact of analgesic regimens)

B

- tidal volumes (target ranges)
- anticipated ventilatory pressures
- I/E ratios
- use of PEEP
- FiO2 adjustment

Q3- professional attributes of an anaesthetist, 26%

Explain the professional attributes of an anaesthetist in specialist practice.

Health advocate

- Maintains personal health, well-being.
- Identify and responds to health needs of patients, families, carers and communities

Professional

- Demonstrates commitment to patients, community and profession through ethical and legal practice of anaesthesia
 - Adheres to ethical principles – autonomy, beneficence, non-malevolence, justice.
- Understands and align practice with ANZCA professionalism guidelines.
- Practise with integrity, honesty and compassion.

Communicator

- Helps patients, families, other clinical staff to achieve good understanding of conduct, benefit, risks, alternatives, of any proposed medical treatment; in order to facilitate provision of high quality healthcare.
- Develop rapport and trust with patient.

Medical expert

- Achieves excellence in clinical care

- Recognize that patient safety is paramount
- recognizes personal limitation and seek help where appropriate

Scholar and teacher

- Demonstrates lifelong commitment to reflective learning, and creation, dissemination, application of medical knowledge.
- Critically evaluate research results to ensure accurate translation and application to appropriate clinical environment

Collaborator

- Recognis and practise as a member within a MDT
- Mutual respect for colleagues and members from MDT; including with trainees.
- Able to facilitate task delegation or take on task from a Team Leader.

Manager

- Manages personal, departmental issues and clinical practice effectively
- Allocates and use health-care resources fairly, matching resource to areas of demand.

NB.

Acronym = Health Professionalism Can Maintain Stellar Clinical Manner (7)

Code of conduct = **values/behaviours developed and accepted by medical profession**; in general include honesty, patience, integrity, diligence, respectfulness, professionalism (including confidentiality), compassion, cooperation, tolerance and humility, commitment to 4 principles of biomedical ethics (autonomy, justice, beneficence, non-malificence) and other desirable virtues

[Q4- albumin discussion, 11%](#)

Evaluate the use of human albumin in perioperative volume replacement.

Albumin

- 4% (isoosmolar), 20% (hyperosmolar), 65kDa not permeable through endothelium
- contains NaCl ~140mmol + small amount K
- prepped from human plasma pasteurized at 60deg for 10 hours to deactivate microorganisms.

Action:

- given IV, stays much longer than crystalloids in IV space due to colloiod; t_{1/2} ~16 hours; gets distributed with ECF.
- Increase serum albumin level.
- 20% albumin also draws ISF/ICF into IVF to incrase IV volume.

Pros

- effective volume expander with longer lasting effect than crystalloid
- less peripheral oedema, pulm oedema, overall fluid requirement
- very low infection risk
- increase serum albumin

Cons

- expensive, limited resource, risk of allergy/anaphylaxis.
- If patient has leaky capillary eg sepsis, albumin leaks into ISF and draws fluid out from IVF → worsens oedema.

- SAFE showed no difference in outcome in ICU patients (saline vs. albumin) + worsens outcome in TBI.

Q5- post-LSCS numbness, 77%

a. how would you clinically assess a patient c/o leg numbness day after spinal for EMCS (70%) b. how would you manage the situation? (30%)

Differentials for leg numbness

- Cerebral vascular event – CVA/TIA, meningitis
- Spinal cord injury – needle, abscess, haematoma
- Lumbosacral nerve damage
- Peripheral nerve - femoral/common peroneal nerve damage from lithotomy
- Meralgia paraesthetica
- Ongoing drug effect? – unlikely the day after.

Clinically assess

- Hx
 - Onset of symptom, progression? Association?
 - Red flags?? Rapidly worsened symptom = worrying; esp. if c/o also weakness, cauda equine syndrome with perianal paresthesia, urinary/bowel incontinence.
 - Back pain? Fever? Headache? Other neurological deficit?
 - Reivew anaesthetic record, traumatic neuraxial? Difficult, pain/paresthesia during insertion, breach of epidural vein?
 - Labour history – prolonged obstructed labour? Prolonged EMCS?
 - Risk factors: DM, preexisting peripheral vascular dx, meralgia paresthetica, previous TIA/CVA, localized infection, systemic sepsis, coagulopathy?
- Exam
 - Neruo exam – Cr N + peripheral N.
 - Distribution of numbness follow peripheral N vs. lumbosacral plexus vs. radiculopathy?
 - Signs of sepsis? Tachycardia, fever, hypotension
 - Spinal insertion site? Swelling, bruise?
- Invx: leukocytosis, inflame markers + imaging if red flag present ie CVA or epidural abscess/haematoma.

Management depends on diagnosis.

- If red flags absent and purely sensory complaint following peripheral or lumbosacral plexus distribution → reassure probable transient nature + ongoing review for symptom recovery.
 - If symptom persists/worsens after eg. 2 weeks, consult Neurology and nerve conduction study with ongoing follow up. PT/OT review.
- If red flag present: need urgent CT/MRI, Neurosurgical consult for urgent surgical evacuation (should take place <8 hours of symptom onset) + antibiotic. Patient needs careful consultation for perceived prognosis and close MDT input (PT/OT).
- Documentation of assessment and management thoroughly. Consult of medicolegal team for advice should patient complaint happens.

Q6- VF management (repeat), 55%

A 60-year-old man is booked for plating of a fractured ankle. He arrests on induction. His ECG shows ventricular fibrillation.

Outline the immediate management of his cardiac arrest with particular reference to current resuscitation guidelines.

VF cardiac arrest is a medical emergency!

Immediate mx should be:

- Notify OT
- Call for help and get defib, resus trolley
- Follow ACLS principle – DRSABC → commence CPR immediately while awaiting for defib to be given
- A: keep airway patent with jaw thrust, chin lift; turn anaesthetic off. Primary aim in initial resus = defib + CPR; and intubation shouldn't delay these. Once resources frees up, should consider intubation esp if prolonged resus anticipated + protect airway from aspiration.
- B: FiO₂ 100%;
- C: CPR 30:2 ratio, 100 compress/min, at least 5cm deep; (ratio continues until ETT in place, after which = continuous compression + ventilation).
 - Defib should be given without delay: biphasic, 200J, unsynchronized shock, followed by CPR for 2 mins.
 - 2mins later reassess for rhythm and ROSC, if still VF → defib with 200J then continue CPR + give adrenaline (after 2nd shock) 1mg IV
- Drugs: adrenaline after 2nd shock + every 2nd cycle of 2 mins CPR/assessment.
 - Amiodarone 5mg/kg or 300mg given after 3rd shock.
 - Can consider lignocaine 1-1.5mg/kg then infusion 1mg/kg/hr
 - HCO₃ if hyperK.
- Apply monitors: when possible – ECG, pulse ox, NIBP.
- Other advanced adjunct once resource frees up = arterial line, CVL.
- Consider differentials and treat source: 4H + 4T.
- Post-resus care = ICU for further monitor/management + consideration of TTM

NB.

Consider targeted temperature management

- Post cardiac arrest (any cause)
- ROSC < 30 mins from team arrival
- Time < 6 hours from ROSC
- Patient is comatose
- MAP ≥ 65mmHg

TTM - Contraindications

- Advanced directive stipulating DNR (absolute)
- Traumatic arrest
- Active bleeding (including intracranial)
- Pregnancy, recent major surgery, severe sepsis

Q7 – VAE management, 53%

A patient is scheduled for posterior fossa surgery in the sitting position. (a) Outline the precautions you would take to minimise the risk of venous air embolism. (70%) (b) How would you recognise an air embolism intraoperatively? (30%)

VAE

Risk minimization

- **Avoid sitting position** if other position is possible for Surgeon
 - Avoid excessive head elevation
- Maintain **positive pressure at surgical site** + Maintain cerebral venous pressure
 - Maintain **euvolaemia**
 - Use **PEEP** (however balanced w risk of paradoxical air embolism if PFO is suspected)
 - Vigilance of **blood loss and volume replace** as indicated.
 - Monitor **CVP**
 - SCDs/TEDS to facilitate lower limb venous return
 - Consider **JV compression** to temporarily increase venous P.
- **Minimise air entry site**
 - **Bone waxing** by surgeon
 - **Venous bleed cauterised**
 - Pour **saline** into field if large open venous system seen
- **Monitor** to allow early detection
 - **Art line, CVP, EtCO2**
 - Consider advanced technique such as **TOE, transcranial doppler**
- Also avoid N2O

VAE detection

- Clinical: sudden drop in EtCO2, rise in CVP, drop in MAP, arrhythmia, tachycardia
- Precordial stethoscope / Doppler – millwheel murmur, poor sensitivity; but widely available.
- TOE/Doppler – most sensitive, allows quantitative measure, and assess PFO.
- Transcranial Doppler – noninvasive but not very sensitive.

NB.

Mx = saline flood, compression, position, suck from CVL, fluids, avoid increase PVR, 100% O2, right side up.

Q8- cricothyroidotomy discussion, 55%

(a) Describe the anatomy, including surface landmarks, relevant to performing cricothyroidotomy. (50%)

(b) What are the complications of this procedure? (50%)

Cricothyroidotomy = gaining access to airway via opening of cricothyroid membrane.

Anatomy

- Trapezoid shape
- Bordered by
 - thyroid cartilage superiorly
 - cricoid cartilage inferiorly (C6 level)

- cricothyroid muscles laterally
- superficially: skin, subcutaneous tissue, fascia
- Other structures:
 - Cricothyroid artery (branch of external carotid A) approaching cricothyroid membrane from either side and run in upper third of membrane.
 - Vocal cords lie within thyroid cartilage above cricothyroid membrane
 - Oesophagus deep to the membrane/trachea
- Performing cricothyroidotomy
 - Locate thyroid cartilage (laryngeal prominence), identify inferior border and cricoid, identify space in between = cricothyroid membrane.
 - Midline access to avoid breaching artery laterally (with 14G needle/cannula or no 20 scalpel-horizontal incision through skin till cricothyroid membrane incised, then blunt dissect).

Complication of cricothyroidotomy

- Bleed esp if cricothyroid A breached.
- Infection
- Desaturation during insertion
- Subglottic stenosis
- Creation of false lumen and sequelae → airway obstruction, SC emphysema, pneumothorax, pneumomediastinum (report)
- Injury to surrounding structures:
 - Thyroid, vocal cord, oesophagus

Q9- paediatric murmur discussion (repeat), 67%

You hear a cardiac murmur in a two-year-old child presenting for elective minor surgery.

(a) What are the features of the murmur that would differentiate an innocent from a pathological murmur? (50%)

(b) How would you evaluate this child's fitness for anaesthesia from the cardiac perspective? (50%)

Risk features of murmur

- Innocent
 - Soft, <2/6, early SM, variation w posture,
 - Eg. venous hum – soft continuous murmur, louder standing quieter lying – diminishes with pressure of jugular vein; (= large CBF (20%) → large jugular venous BF → vessel wall vibration)
 - vibratory murmur – small chest wall,
 - pulm flow murmur – turbulent flow across relatively underdeveloped branch of PAs w vigorous heart beat – gen resolve by 6/12 (Auckland)
 - carotid bruit = common in kids due to large CBF.
- Pathological
 - High grade 3-6/6, thrill, harsh sound, no variation w posture, diastolic murmur
 - Eg. VSD – PSM; PDA – machinery continuous murmur

Evaluation preop

- Hx
 - Failure to thrive?

- Activity level and any limitation? Cyanotic episode with feeding, exercise, cry? Dyspnea/Orthopnoea/PND/syncope?
- Known with CHD? Congenital syndrome eg. Down?
- Previous anaesthetic problem?
- Exm
 - Syndromic?
 - Pulse: bounding (PDA), rad-fem delay? (coarctation)
 - Cyanosis/Clubbing? W cyanotic lesion
 - Peripheral/central perfusion, CRT?
 - Increased WOB? Recurrent bronchiolitis/wheeze? (Auckland)
 - Praecordium:
 - Apex displaced?
 - Murmur feature? – grade, thrill, diastolic? Gallop?
 - Pulm oedema / peripheral oedema?
- Invx
 - Echo? ECG?
 - FBC – polycythaemia?
 - UECr – renal functions?

Summary: if child is asymptomatic, is normally active, is growing well with no red flag exam findings, then may continue w surgery. Vigilance with preventing VAE as could still have small ASD/VSD. Otherwise, MDT approach with Paeds Cardiologist / Surgeon.

NB.

context: innocent murmurs occur in up to 70% of younger children
CXR as 1st line invx is useful (Auckland course); ECG not so much.

Q10- AKI discussion, 52%

- (a) What factors contribute to acute kidney injury in the perioperative period? (70%)
(b) Outline the efficacy of perioperative strategies to reduce acute kidney injury. (30%)

Read Chang's

(report)

Part (a)

- RIFLE criteria
- nephrotoxins (with examples)
- surgical risk: types and relevant detail
- patient risk: age/pre-existing renal dysfunction and co-morbidities
- anaesthesia factors e.g. hypotension
- postoperative: e.g. hypotension/ sepsis

Part (b)

- identification of patient at/situation of risk
- maintenance of perioperative renal perfusion and oxygen
- delivery/monitoring
- avoidance of nephrotoxins

- evaluation of role of dopaminergic agents/mannitol/diuretics

Q11- Codeine discussion, 50%

- (a) Describe the clinical pharmacology of codeine including an outline of its therapeutic use. (70%)
- (b) Describe the influence of pharmacogenetics on the variability of patient response to codeine. (30%)

Codeine = prodrug, metabolized to be active; 30-60mg tds/qid.

- PO form. No IV.
- Absorbed in GIT. Large Vd. 4L/kg. Met. By CYP 2D6 into various metabolites. T_{1/2} ~6hours.
- C-6-glucuronide (inactive)
 - Morphine (10%) = analgesia → M3G (neuroexcitatory effect – seizure, hallucination, agitation + M6G (analgesic, but accumulate in renal failure)
 - Potential for accumulation in renal failure
- PharmD – opioid receptor. Analgesia, antitussive, treatment of diarrhea/high ileostomy output.; SE – NV, ileus/constipation, sedation, itch, retention, allergy.
- B.
 - CYP2D6 exhibits genetic variability (10% Caucasian, 2% Asian lacks CYP2D6) and codeine is not effective.
 - Some are ultra-rapid metabolisers (Middle Eastern, North African) → high serum morphine conc + increased efficacy but also risk of toxicity.

Q12 – residual NMB complication / assessment, 55%

- a. what are the complications assoc with residual neuromuscular blockade? (30%); b. evaluate the methods available to assess residual neuromuscular blockade? (70%).**

Complications

- Airway: unable to protect
 - Obstruction + aspiration
- Ventilation: inadequate
 - Hypoxaemia, metabolic acidosis
 - Hypercapnoea, resp acidosis, CO₂ narcosis, SNS stimulation and increased cardiac stress
 - Atelectasis and risk of pneumonia
- Awareness of weakness
 - Anxiety, distress, PTSD, patient dissatisfaction.
- Environmental
 - Longer stay in PACU

Assessment methods.

- Clinical (crude method, not objective/accurate enough)
 - Head lift for 5 sec
 - Hand grip
 - Deep breath

- Neuromuscular stimulator
 - TOF (= 4 twitches, 2Hz over 2 sec, supramaximal current)
 - Twitch height T4/T1 ratio analysed by accelerometer and ratio >0.9 indicate adequate reversal.
 - If <0.9, needs appropriate reversal agent
 - Visual, tactile assessment inaccurate.
 - DBS (= 2 bursts of tetanic stimulation of 3 twitches each, 750ms apart)
 - T2/T1 ratio measured using accelerometer equally reliable as TOFR
 - Tactile assessment better than TOF using tactile.
 - More painful on awake patient
 - Tetanic (= sustained stimulation 50Hz for 5 sec)
 - Look for fade = residual block.
 - Very painful and not appropriate in awake patient.

Q13- Systemic prevention of power failure, 35%

You are involved in the planning of a new Day Surgery Unit.

(a) What systems would you put in place to reduce the likelihood of a power failure?

(50%)

(b) Outline a protocol for dealing with power failures. (50%)

Reduce risk of power failure

- Design include 2 types of power outlet:
 - Ordinary +
 - Uninterrupted power supply (with blue face plates) = ordinary outlet + connection to emergency power supply which activates if ordinary power supply fails
 - NOTE: red = Main power but with diesel generator back up.
 - Used for critical equipments, eg anaesthetic machines, ventilator, infusion pumps, OT lights
 - Need to know duration UPS can sustain power supply
- Separate power generator when ordinary power fails
- Internal back up batteries – for essential equipments: machines, ventilator, pumps.
 - + knowledge of its duration/reliability
- Immediate access to Electrical company, electricians for high priority problem solving/restoration of power supply.

Protocol of management

- General infrastructure
 - Protocol kept at front desk, manager's office, inside emergency management protocol in all OTs, with flashlights
 - Emergency management coordinator designation
 - designated lines of communication with all areas (OT, coordinator, power company, electrician) regarding the evolution/resolution of the power failure
- OT environment
 - Protocol for continuation or cancellation of surgery – if safety can be ensured.

- If continuation required, convert to UPS for vital equipment + battery powered surgical equipments: diathermy, laser, drills.
- Anaesthesia: anaesthetic management should aim to convert to spontaneous ventilation; consider battery powered TIVA; knowledge of independent power supply/alternatives to run essential equipment
 - Back up manual monitors available: BP, BMV, intermittent boluses of drugs.
- Personnel
 - education for staff regarding back-up capabilities and essential emergency contacts
 - intelligence regarding internal battery supply/UPS usage and available supply
 - education on OT management protocol

Q14- QT prolong, 31%

(a) Describe the abnormality on this electrocardiogram. (30%)

(b) What are the implications of this abnormality for anaesthesia? (70%)

Long QT

Implications

- Issues: long QT can lead to life threatening ventricular arrhythmia (torsades, VF) if further worsens
- Worsening of long QT can be caused by (OHA)
 - Drugs
 - TCA, phenothiazine, antihistamine.
 - Droperidol, ondansetron, volatile anaesthetics
 - Hypothermia
 - Increased stress response, SNS tone.
 - Increased ITP (Valsalva, excessive PEEP)
- Management should be:
 - Preop: (OHA)
 - Cardiology Team consult
 - Commence betablockade
 - Ensure normo electrolyte levels, esp Mg.
 - Discontinue drugs that prolong QTc if appropriate –
 - Premed for anxiolysis
 - Intraop:
 - Monitor ANZCA + art line.
 - Resus equipment/drug (esp Mg) available; if high risk use have defib pad on before induction.
 - Avoid sympathomimetic or drugs that prolong QTc as appropriate.
 - Blunting of SNS stimulation (pain, laryngoscopy, normocapnia).
 - Avoid excessive PEEP/Valsalva.
 - Maintenance of normal temperature.

- Postop: ongoing monitor of ECG; consider HDU, telemetry for ongoing monitor esp at high risk (eg. sudden collapse hx, FHx of sudden death)

Q15- ANS neuropathy in diabetes (repeat), 47%

(a) How would you identify a patient with autonomic neuropathy associated with diabetes? (50%)

(b) What are the anaesthetic implications from a cardiovascular perspective? (50%)

Diagnosis

- ANS affects multiple systems:
- Hx
 - Duration of disease.
 - Postural hypotension? Presyncope, syncope, palpitation?
 - GI gastroparesis, constipation, diarrhoea; erectile dysfunction, urinary retention; excessive sweating?
 - Known complications of neuropathy? Previous anaesthetic record of unstable haemodynamics?
- Exam
 - Lying/standing BP. HR/tachy/brady at rest? Valsalva?
 - Peripheral neuropathy?
 - Excessive diaphoresis.

Implications from CVS perspective.

- Unstable haemodynamics, esp on induction, with bleed, or likely exaggerated response to stimulation from unopposed SNS.
 - Monitor with Art-line if patient's at high risk;
 - Maintain adequate MAC-Br to blunt unopposed SNS response.
- Risk of silent MI; hence need vigilance on monitor of cardiac ischaemia with continuous ECG; use 5-lead ECG with patient's at high risk eg. known IHD, previous MIs, PVD.
- Hypothermia risk from impaired vasomotor activity/thermoregulation; risk of subsequent complications – bleed, shock.
- Pharmacology: slower circulation time for medicine.

Oct-2010, 51.8%

Q1- hypothermia consequence and management, 74.1%

(a) What are the clinical consequences of hypothermia to 34°C in adults? (50%) (b) How can you manage body temperature in a multi-trauma patient? (50%)

Hypothermia = core temp <35 deg; has multisystemic effect

Hypothermia clinical consequence

- CVS
 - Increased SNS tone: tachy, HTN, inc O₂ demand, CBF; risk of arrhythmia, heart block, VT. J wave on ECG.

- Changes in regional circulation: vasoconstrict peripherally, splanchnic BF.
- **Resp**
 - Inc O₂ consumption, ventilator drive to meet demand; increased WOB.
 - Risk of bronchorrhea, bronchospasm.
- **CNS:**
 - Behavior - adding clothing, moving to a warmer environment etc
 - Possible cerebral protection in certain circumstances
- **Haem:**
 - Impaired immune + platelet function + clotting factors.
- **MSK:**
 - Shiver + increased O₂ demand; difficulties with monitor; patient discomfort.
- **Immune:** impaired wound healing, sepsis
- **Pharm:** altered drug metabolism (muscle relaxants)

Body temp management in multi-trauma pt

- Minimise heat loss
 - Increase ambient temp
 - Reduce unnecessary exposure; cover with warm blanket / bairhugger
 - Ensure patient is dry
- Active warming
 - Heater, forced air warmer, warm blanket
 - Bladder/body cavity lavage with warm saline
- IVF + blood through warmer
- Warmed/humidified gas in ventilation; use of HME.

Q2- Spinal cord blood supply; ischaemia risk minimization, 67.6%

a) Describe the arterial blood supply of the spinal cord. (50%)

(b) Why is spinal cord function at risk during open repair of a thoracic aortic aneurysm and what measures are available to reduce this risk? (50%)

Blood supply

- **Anterior spinal A**
 - 2 vertebral A → merge at foramen magnum → ant spinal A
 - supplies ant 2/3 of spinal cord
- **Posterior spinal A**
 - Vertebral A → Post inf cerebellar A → post spinal A
 - 1 on each side of post cord; supplying post 1/3 of cord
- **Radicular As (of cervical, thoracic, iliac As + Adamkiewicz)**
 - Branches from aorta to augment multiple levels of spinal arteries
 - (report) pass via the intervertebral foramina along nerve roots which they supply. Most of these paired segmental arteries are small.
 - Has large branch = A of Adamkiewicz from **low thoracic level T9-T12** in 75% population (although variable, can have higher/lower take off variation)

During repair of thoracic aortic aneurysm, because of aortic clamp, radicular arteries below clamp no longer augments spinal cord perfusion → risk of ischaemia, esp if A of Adamkiewicz involved.

- Surgical manipulation also may → vasoconstriction, reduced SC blood flow.
- Significant blood loss, anaemia, CVS instability further compromises SC perfusion

Ischaemia risk minimization (below all from report)

- **Minimize cord ischaemia**
 - o Minimize clamp time
 - o Optimize perfusion pressure, SCPP = MAP – CSF P or SC VP whichever is higher.
 - maintain MAP + consider place lumbar drain to lower CSF pressure (aim <10cmH2O)
 - o maintain sats >90% and Hb >70g/L.
 - o Lower body CPB or reimplantation of segmental A, (ie shunt)
- **Neuroprotection**
 - o Mild systemic hypothermia or DHCA
 - o Epidural cooling
 - o Pharm method to decrease metabolic requirement ie volatile or IV anaesthesia
- **SC monitor**
 - o Evoked potentials – SSEP or MEP

Q3- chronic liver disease / alcoholism discussion, 71.2%

A 45-year-old man with a longstanding history of alcoholism is booked for upper gastrointestinal endoscopy and banding of oesophageal varices following an episode of haematemesis.

(a) How is the severity of this patient's liver disease assessed? (50%)

(b) How do these findings influence your evaluation of this patient's perioperative risk? (50%)

(report)

A

In particular, a focused history that includes past complications and treatments as well as an examination eliciting signs and symptoms of chronic liver disease, such portal hypertension, were essential in assessing the severity of this patient's liver disease. Extra marks were awarded to candidates who indicated looking for extra-hepatic sequelae of advanced liver disease, such as hepatorenal and hepatopulmonary syndromes. Of particular relevance in this patient would be evaluating the effects that long term alcohol abuse and liver disease have had on the patient's cardiovascular system.

B

- CP or MELD: However, these scores are only tools to serve a guide to the severity of the liver disease and in of themselves do not dictate the patient's perioperative risk.
- Marks were not awarded for descriptions of anaesthetic management plans

Q4- supraglottic airway obstruction management, 64.7%

A 68-year-old man in hospital awaiting definitive surgery for a supraglottic squamous cell carcinoma of the larynx has worsening stridor at rest.

- (a) How might his symptoms be improved in the preoperative period? (30%)**
(b) Describe your evaluation of his airway and how this will influence your intraoperative airway management plan. (70%)

Symptom improvement

- Dexamethasone
- Adrenaline nebulizer
- Posturing: tripod position
- CPAP, heliox or tracheostomy
- Treatment of infection if present
- Consider radiotherapy

Airway assessment / management

- History – red flags include: stridor, dyspnea, orthopnoea, dysphagia, hoarse voice, previous documented difficulty with airway
- Exam – routine/important: mouth open, interincisor distance, MP, TMD, neck movement, prognathism, ?loose teeth, tracheal deviation?
- Investigation
 - Nasoendoscopy by ENT – assess for size, extension, bleed of supraglottic SC ca.
 - CXR/CT neck/chest – airway compression? Deviation? Stage of cancer? In lower resp tract?
- Management needs MDT input, and options include:
 - Awake tracheostomy – if severe supraglottic obstruction is seen making intubation risk unacceptably high
 - AFOI/awake VL:
 - If airway obstruction isn't severe and ETT can be passed through cords; however blind passage is dangerous therefore AFOI/AIC combined with VL visualization should be done.
 - ENT back up for emergency tracheostomy
 - Asleep SV technique is assoc with higher risk and only consider if awake technique is impossible ie uncooperative/agitated patient

Q5- Paediatric dehydration, fluid management, 65.5%

A 6-month-old boy presents with an acute abdomen. He is diagnosed with intussusception and booked for laparotomy after a failed attempt at reduction. His heart rate is 160bpm and BP is 75/45 mmHg.

His electrolyte profile is as shown:

Na+ 132 K+ 2.7 Cl- 106 Urea 3.3 Creatinine 86 Lactate 4.5 mmol/l

- (a) How would you determine his degree of dehydration and how severe is it likely to be? (40%)**
(b) Describe your perioperative fluid management. (40%)
(c) When would you proceed to surgery and why? (20%)

Dehydration assessment

- Hx: intake vs output – feeding as normal or reduced feed? Diarrhea? Vomit?
 - Number of wet nappy changes?

- Exam
 - Lethargic? Non-interactive? Drowsy?
 - CVS: HR, BP, skin turgor, ant fontanelle?
 - Also RR, urine output, weight loss?
- Invx
 - UECr
- Assessment: For this age group, HR 160 is slightly increased, BP normal; hence dehydration is estimated to be approx mild. Tachycardia can be reflection of pain.
 - However, significant hyponatremia/hypokalaemia; which may suggest loss of fluid (loss of K), with compensatory mechanism by RAA axis eg ADH holding onto pure water causing hyponatremia. Rise in lactate likely reflection of ischaemic gut!!

Periop fluid mx

- Aim = replace deficit + maintain ongoing need
- Regimen then depends on estimated loss, but use
- Preop:
 - 10-20ml/kg of bolus then observe response; if HR improves, consider repeat 10ml/kg bolus; I'd use balanced IVF eg. P148.
 - Ongoing loss eg. NG, stoma output should be replaced ml:ml.
- Intra
 - Replace loss intraop from bleed + evaporation from laparotomy; monitor response regularly
 - Maintain = 4:2:1 rule, for this patient estimate weight = 6kg. Hence hourly maintenance = 24ml/hr.
 - Consider 1/3 reduction to account for acute stress response, so use 18-24ml/hr.
 - I'd use dextrose saline: 0.9% NaCl + 5% dextrose.
- Post
 - Maintain with 18-24ml/hr dextrose saline
 - Ongoing monitor of haemodynamics + electrolytes + response to any correction/replacement fluid.

When to proceed and why

- Depends on urgency of surgery; however if ischaemic gut, need to optimize/fluid resus/replace electrolyte within limited time and proceed for urgent surgery.
- I'd transfer pt to OT to facilitate ongoing close monitor/resus + prepare for GA.

NB.

Paediatric Vital Signs

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SIMPLIFIED SUMMARY

Age	HR	RR	SBP
0-6M	80-180	< 40	60-90
6M-1	70-150	< 35	90-100
1-4	70-120	20-30	100

>4 -> like adults

In Summary:

SBP:

- neonate should be ie 70-85 SBP, over 45 DBP; MAP 50-60.
 - <1 year = 90 +/- 10
 - 1-5 = 100 +/- 10
 - >5 = like adults
- MAP: for term newborn - ~6/12 old;
MAP = Gestational age at birth + age in weeks
- 0-6 mont = 70SBP (neonate); RR40; HR 160
 - 6-1year = 90SBP (infant); RR35; HR 140
 - >1 = 100SBP (small children); RR20-30; HR 120
 - >5 = like adult (children)
 - systolic pressure 50-90mmHg = 80 + (age x 2) for over 1 yo;
 - MAP up to 6/12 = post-conceptual age
 - RR = 24-age/2 for over 2yo

No place for isotonic saline anymore. Don't use 0.45% saline, use 0.9% saline.

Q6- critical appraisal of research, 23%

How would you critically appraise a paper published in a journal?

Critical appraisal is a systematic process used to identify the strengths and weaknesses of a research article in order to assess the usefulness and validity of the research findings; which would include:

- Quality of study result
- Relevance of study question

Type of article should be considered; and in order of highest to lowest significance:

- Systemic review, metaanalysis

- RCT
- Non-RCT trials eg. case-control, cohort, observational
- Case report, series
- Expert opinions

Appraisal will include:

- analysis of the conduct of the study:
 - type of trial
 - clinical question investigated relevant in my practice?
 - hypothesis statement,
 - generalizability to my patient group?
 - location
 - inclusion/exclusion criteria,
 - patient demographics?
 - Ethics – potential conflict of interest?
 - measurement tool
 - randomization? Blinding?
 - Sample group calculation
 - Study execution
 - Group separation?
 - Adequate follow up?
 - Treatment of withdrawals?
 - Quality of result? Power, bias/conflict of interest management,
 - application of appropriate statistics,
 - analysis of results
 - adequate power? Significant result?
 - Comparisons with other studies?
 - Consistency of results?
 - contribution of new knowledge or confirmation of previous work
 - Cross-examination of study
 - Discussion with colleagues in journal club

Q7- pacemaker discussion, 90.6%

(a) Describe the common classification code for permanent pacemakers. (30%)

(b) Outline the principles involved in the perioperative management of patients with a permanent pacemaker. (70%)

Classification

5 letter system:

- Chamber paced – AVDO
- Chamber sensed – AVDO
- Response to sensing – T I D O
- Rate modulation/programmability – simple, multi, rate responsive, none
- Antitachycardia function – paced, shocked, dual, none

Mx:

- Preop -

- **Evaluate:** indication, current usage, underlying rhythm, dependence? Magnet response?
 - If dependent, need asynchronous pacing intraop when PM inhibited by diathermy.
 - Should disable rate responsiveness + antitachycardia function.
- **MDT** input with Technician + Cardiologist if patient's high risk eg. requiring cardiac resynchronization therapy.
- Routine AMPLE hx, exam of airway/CVS/resp systems, invx ensure electrolytes normal
- **Intraop:**
 - **Resus equipment**, isoprenaline, atropine, external pacing, defib ready; pads on if high risk (far away from PM; usu on opposite thigh)
 - **Monitor**-ECG on **pacemaker detection** setting; need haemodynamic monitor in case of ECG noise – eg. pulse ox or art-line.
 - **Technician** input
 - Precaution to **minimize PM interference**
 - Diathermy-bipolar, pad position, >15cm distance to PPM of diathermy use, <5sec bursts Q10sec; lowest feasible energy.
 - Lithotripsy: shock wave timed at R-wave.
 - In CRT: loss of AV synchrony can precipitate heart failure; so have telemetric programmer / technician close at hand.
- **Postop:**
 - **Reinterrogation** of PM, turn setting back to normal; mandatory esp. if setting has changed or detected PM trigger intraop or used diathermy <15cm to PM.

NB.

HRS/HRSUK codes for ICD type

- Shock chamber – AVDO
- Chamber which pacing delivered – AVDO
- Tachycardia detection – E (intracardiac Electrogram) vs. H (Haemodynamic means)
- Pacemaker capability of the device (3-5 letter codes as usual)

Q8- ACLS in pregnancy, 55.4%

How and why is cardiopulmonary resuscitation modified for the pregnant patient at term compared with the non-pregnant patient?

Q9 – persistent postop pain (repeat), 54.7%

a. list the predisposing factors for pain persisting for more than 3 months postop (50%) b. outline the interventions that have been demonstrated to be efficacious in the prevention of persistent postop pain (50%) see 2014A Q15.

PPP =

Chronic pain = persistent: pain persist despite having recovered from initial tissue injury. ie persistent pain >12 weeks. (report re: PPP says - Pain of at least 2 months duration)

- **postop:** Must develop after surgical procedure
- **not due to other nociception:** Other causes have been excluded
 - The possibility that the pain is from a preexisting condition has been excluded

Predisposing factors

- Patient
 - Preexisting pain, chronic pain, poor coping strategy, psychiatric disorder – anxiety, catastrophizing thinking, history of peripheral neuropathy – DM, PVD
- Anaesthesia
 - Poor pain control periop, acute postop pain, nerve damage from regional nerve blockade.
- Surgery
 - Nerve injuries, direct/ischaemic, limb amputation, thoracotomy, ICDs, mastectomy, LSCS, hysterectomy.


Management to prevent PPP

- Preop
 - Discussion of plan, reassurance, address psychiatric issue.
 - Premed anxiolytic; preemptive analgesia (ie given before noxious stimulation) – para, NSAID, gabapentin
- Intraop
 - Multimodal analgesic strategy + RA.
 - Esp for mastectomy, thoracotomy, LSCS.
 - Preventive analgesia: ketamine, clonidine, opioid.
 - Prevent no damage:
 - Good surgical technique
 - Minimizing tourniquet time.
 - Careful patient positioning
 - Maintain physiology: oxygenation, MAP, Hb.
- Postop
 - Good control of any acute postop pain.
 - Ongoing close f/u, with APMS input.
 - Ongoing multimodal analgesia.

Q10- dental damage complication, 79.9%

An adult patient who was intubated for tonsillectomy is noted to have an upper central incisor tooth missing in the Recovery Room after extubation.

(a) List the predisposing factors for perioperative dental damage. (50%) (b) What is your management of this situation? (50%)

(a) Predisposing factors include: 

Patient factors:

- Vulnerable teeth (loose, isolated, capped teeth, veneers, crowns)
- Gum pathology; hyposalivation (eg from previous radiotherapy)
- Anatomy causing difficulty in intubation (eg poor mouth opening or neck extension)

Anaesthetic/surgical factors

- Use of general anaesthesia and an endotracheal tube
- Poor technique at laryngoscopy
- Surgical gags/retractors
- Inadequate anaesthesia or relaxation allowing biting

- Poor care with suctioning or oral airway (eg Guedel) use
- Postoperative shivering

(b) Management includes

- Review the records to assess the patient's prior dental condition
- Review the case, if necessary with other team members, to determine the most likely timing and cause of the dental damage
- Find the tooth, with imaging (eg CXR) if necessary
- Consult a dentist for assessment and further management
- Document the events and findings
- Notify medical defence organisation and local QA mechanism (departmental morbidity meeting)

Q11- mitral regurge, pulm HTN discussion, 57.6%

A 78-year-old female presents for fixation of a displaced femoral fracture. She has longstanding mitral regurgitation and is known to have a mean pulmonary artery pressure of 60mmHg. She reports orthopnoea but is not short of breath at rest.

(a) What are the issues of concern in your preoperative assessment? (50%) (b) How would you manage pulmonary vascular resistance perioperatively? (50%)

Issues in preassessment – femoral # fixation

- Urgent surgery - at least moderate risk surgery
- High risk patient – elderly, MR, severe pulm HTN; likely CCF + arrhythmia + current physical insult
- Periop and consent should account for such high risk and with careful decision making involve MDT with patient/family, ICU, Geriatric Physician, Cardiology, Orthopaedics
 - Ideally least invasive management option to provide patient with meaningful quality of life.
- APAC should include:
 - Functional capacity, MR severity, previous treatment?
 - LV/RV failure? Arrhythmia?
 - Other contributory cause of pulm HTN? Eg. COPD?
 - Echocardiogram
 - Current status? Bleed, pain, haemodynamic instability from femoral #? Also compartment syndrome, fat embolism, neurovascular compromise? Other associated injury from trauma?

Management of PVR periop

- Preop
 - Avoid further rise in PVR – hypoxaemia, hypercapnia, acidosis
 - Ensure good oxygenation, maintaining of MAP, Hb
 - Ensure optimization of any acute physical insult eg. pulm oedema, atelectasis, pain, bleed, anaemia, shock. VTE prophylaxis.
 - Avoid nitrous oxide, avoid ketamine.
 - Continuation of anti-pulm HTN agents or consider starting **sildenafil, prostacyclin**.

- Consider admission to ICU for monitor and **milrinone infusion**.
 - Intraop
 - Monitor
 - Anaesthesia: RA vs. GA. I'd use RA if on contraindication;
 - Good for MR with SVR reduction, less affect on ventilation, good analgesia postop, good SNS blunting periop; reduces risk of VTE.
 - Maintain stable haemodynamics with balanced use of fluid/vasopressor.
 - Avoid excessive high dose of vasopressor (effect on PVR)
 - Consider use of vasopressin for pure systemic circulation effect.
 - If GA required; use lung protective vent strategy. Enough PEEP but avoid excessively high PEEP or high PIP (higher volume, likely overdistend pulm vessels and worsen PVR)
 - Postop
 - Ongoing monitor and management in ICU with all of above.

Q12- GALA for carotid endarterectomy, 75.5%

What are the advantages and disadvantages of general versus local anaesthesia for carotid endarterectomy?

RA can be done under superficial cervical plexus blockade +/- surgical LA top up; deep CPB hasn't shown to provide additional benefit.

- Pros
 - Allows assessing patient clinically in real time
 - Cerebral BF autoregulation is relatively preserved
 - Less use of shunting (demonstrated in GALA trial)
 - Avoid GA and assc. Risk (sore throat, PONV, potential cardioresp instability)
 - Therefore likely better haemodynamic control with RA.
- Cons
 - LAST
 - Failed block, need for GA (1.5% requirement in GALA trial)
 - High level of cooperation from patient and Surgeon required; may compromise safety if patient become confused/agitated intraop
 - Access to airway limited if need to intervene

GA

- Pros
 - Control of airway, ventilation, allowing more control over pCO₂ cf sedation
 - Potential neuroprotective effect from GA
 - Avoids risks of RA: high level of patient cooperation, LAST
- Cons
 - Relative uncoupling of autoregulation (although effect limited with TIVA/volatile MAC<1)
 - Likely more haemodynamic instability, complicated by potential pre-existing CVS disease

- although can be managed with vasopressor/vasodilator
- Need extra monitoring, which isn't as reliable as clinical
 - SSEP,
 - EEG
 - NIRS
 - Stump pressure
 - TCA
- Sedation postop, making assessment of neuro function difficult.

Overall: GALA trial showed no difference in outcome (morbidity and mortality)

Q13- Diabetic ketoacidosis management, 75.5%

Outline the principles of an initial management plan for diabetic ketoacidosis, having regard to the physiological derangements involved.

Q14- anaesthetic assistant responsibilities, 40.3%

You are on the interview panel appointing new Assistants for the Anaesthetist. What are the educational requirements and the practical responsibilities expected of the applicants?

Consult ANZCA PS on Anaesthetic Assistant responsibilities

Educational requirements

- 3 year full time Course at an appropriate institution
 - 2 year for enrolled nurses in full time employment
 - 1 year for registered nurses in full time employment
- Mix of lectures + supervised practical experience
- Assessment of skills/knowledge through exams and assignments and practical assessments
- Content of course should include: basic sciences pertinent to practise of anaesthesia, clinical anaesthesia-including GA and RA, environmental safety in OT, safe delivery of anaesthesia, care/use/servicing of anaesthesia delivery systems/monitor/equipment; infection control/universal precautions, crisis management.
 - OT management aspects – health and safety of staff, patients.
- Evidence of CPD – ACLS, equipment updates, conferences

Practical responsibilities

- Member of MDT
- Assist in conduct of anaesthesia
 - Immediately available for induction, emergence and when assistance is required.
 - Primary responsibility remain with allocated OT list / Anaesthetist
- Prepare and application of anaesthetic monitor
- Prepare and check of anaesthesia equipment, delivery system
 - Level 2 check before list
 - Level 3 before each case

- Decontamination, cleaning, sterilization of equipment as per ANZCA guideline
- Restocking of equipment, drugs
- Ensure quality assurance

Q15- pulmonary function test, flow volume loop, EtCO₂ discussion, 51.8%

Each of sections (a), (b) and (c) is worth equal marks; within each section, each question is worth equal marks. (a)

mixture of lectures, supervised

		% predicted	Lower limit of normal
Forced vital capacity – FVC	1.74 litres	60%	2.41 litres
Forced expiratory volume in 1 sec – FEV ₁	1.47 litres	70%	1.82 litres
FEV ₁ /FVC ratio	84.5%		68.2%
Forced expiratory time - FET	9.1 secs		
Residual volume - RV	0.85 litres	39%	1.5 litres
Total lung capacity - TLC	2.81 litres	54%	4.22 litres
Diffusing capacity - DLCO	8.75 ml/min/mmHg	39%	14.9 ml/min/mmHg

(i) Identifying the key features, what pattern of disorder is demonstrated by these tests?

(ii) What are the possible causes? (b) What are the implications of general anaesthesia for an adult patient with Curve B presenting for a knee arthroscopy? (=restrictive pattern on flow/volume loop)

C -

(i) Describe the abnormalities on this capnograph. (ii) What is your differential diagnosis? (iii) How would you identify the likely cause in the intraoperative setting? = obstructive pattern on EtCO₂ trace.

April-2010, 50%

Q1- tourniquet use discussion, 66.3%

a. List the complications associated with the use of limb tourniquets during surgery. (60%)

b. How can these complications be minimised? (40%)

A complications

- During tourniquet application
 - Limb ischaemia esp in PVD
 - Skin, nerve, muscle damage esp fragile skin, peripheral neuropathy, DM
 - Tourniquet pain – SNS response with tachycardia, HTN and increased cardiac workload
 - Expose patient to risk of increasing opioid use, postop sedation.
 - Poor venous drainage prior to tourniquet on:
 - Increased venous bleed, bruise, venous stasis/DVT

- Un-noticed arterial damage → bleed when tourniquet released
- When tourniquet released
 - Release of metabolic waste product → cold blood, CO₂/H/K → hypotension, arrhythmia, hypothermia
 - Venodilation/decreased venous return → hypotension
 - Reactive hyperaemia → reperfusion injury with O₂ radical release, bleed.
 - Potential PE from dislodged DVT.

Risk minimization

- Application:
 - Padding, appropriate tourniquet sizing, ensure venous drainage prior.
 - Limit tourniquet P to 100mmHg above SBP (arm), 100-150 for thigh; or 250 for arm, 300 for thigh.
- Maintenance
 - Limit tourniquet time to 90mins; max 120mins; monitor P.
 - Ensure tourniquet break for 15 mins if longer tourniquet time is required → removal of waste product, delivery of O₂, restoration of tissue ATP.
- Release
 - Ensure normovolaemia and consider fluid loading with release
 - Hyperventilate to counter CO₂ rise, metabolic acidosis
 - Consider CaCl for arrhythmia (probably related to hyperK)
 - Resus equipment available for potential need of ACLS

Q2 – Prone position (repeat), 22.9%

a. list hazards to patient assoc with prone position under GA (60%) b. how can these hazards be minimized? (40%) see 2013A Q12

Q3 – Morbid obesity laparoscopy, 63.3%

20yo female with BMI 48 for elective diagnostic lap, endometriosis. No other PMH.

Describe potential problems assoc with anaesthetizing this patient.

Note: Exam report comment: Esoteric and excessive management suggestions for what is a common anaesthetic scenario subtracted from the value of some answers

Issues

- Patient
 - Morbid obesity is associated with following issues:
 - Difficult airway: intubation and BMV, needing careful airway assessment and possible awake intubation technique.
 - Look for other risk factors eg. hx of OSA, high grade mallampati or short thyromental distance. Preoxygenation may be difficult due to reduced FRC..
 - Difficult ventilation: as reduced respiratory compliance; compounded by pneumoperitoneum + Trendelenburg.
 - CVS: compression of IVC → hypotension. Hypercapnoea may induce arrhythmia with SNS stimulation.

- GI: have higher residual gastric fluid volume, risk of aspiration need to be considered – I'd use modified RSI
- Anaesthesia
 - Pharmacology consideration – dosing based on LBM for most medications however exceptions include suxamethonium, infusions of propofol etc. which is based on TBW.
 - May have difficulty with:
 - BP monitor, requiring arterial line
 - IV access, needing USS or even CVL.
 - Positioning difficulty, needing more assistants, air mattress. Safety for patient/staff is paramount.
 - Theatre table may need extensions
- Surgery
 - (Pneumoperitoneum + Trendelenburg)
 - Surgical difficulty → longer duration, likely risk of organic injury, bleed.
- Postop:
 -
 - Prolonged recovery likely if long surgery + use of sevoflurane with higher fat solubility.
 - Sedation risk esp if underlying OSA, higher risk of resp complication, which may necessitate HDU level monitor.
 - High risk of DVT needing multi-modal prophylaxis.

Q4- anaemia, transfusion trigger discussion, 42.2%

a. Describe the pathophysiological changes associated with a haemoglobin of 75 g/L. (50%)

b. Outline the patient factors that would indicate the need for a perioperative red blood cell transfusion in a patient with a haemoglobin of 75 g/L. (50%)

A

Immediate – SNS, CO

Intermediate – RAA, ADH, volume, thirst, 2,3-DPG, O₂ extraction by tissue

Delayed – Haemopoiesis, Hb production

B

1 transfusion triggers are not definite end points but guides

2 Instead, transfusion should be aimed at prevention of end-organ hypoxia, symptomatic relief of symptoms, and encourage wound healing, especially when there's increased demand and sign of decreased supply

Q5- Myotonic dystrophy discussion, 52.4%

A 26 year old woman with subclinical myotonic dystrophy presents to the high risk obstetric clinic. She is 25 weeks pregnant in her first pregnancy and otherwise well. She hopes for a normal vaginal delivery.

Describe and justify your recommendations for the management of her analgesia for labour and the perioperative management of any potential operative delivery.

Myotonic dystrophy

- = autosomal dominant disorder
- multisystemic, characterized by myotonia of skeletal muscle, weakness.
- Systemic manifestations include cardiomyopathy, respiratory failure, risk of aspiration.
- Specific to obstetrics, there's risk of uterine atony, PPH.

Analgesia recommendations for labour

- Consider early epidural analgesia
 - avoid opioid and N2O -> increased sensitivity to resp depression, sedation.
- Use multimodal analgesia to opioid spare.

Periop management of potential operative delivery (= use system of focused issue mx)

- Preop: thorough assessment of patient's disease severity (although known to be subclinical), establish functional capacity, obtain AMPLE history, exam airway, cardio/resp systems. Invx with ECHO, and check TFT. Ensure euthyroidism. Consider steroid supplementation if adrenal insufficient.
 - MDT input with Obstetrician, Cardiologist, General Physician.
- Regional anaesthesia is preferred for usual benefit in obstetric anaesthesia – airway complication, aspiration, fetal sedation, bradycardia, uterine atony, delayed bonding.
 - Especially if there's CVS/Resp impairment from myotonic dystrophy.
 - Need large bore IV x2, GH and have 2 units cross-matched closeby.
- Prevent myotonia; as well as distress, may reduce surgical access
 - Continue drugs eg. phenytoin, procainamide if already on.
 - Avoid hypothermia, shiver, mechanical, electrical stimulation
 - Avoid sux (generalised contracture); may use NDMR, however neostigmine may induce contracture; ideally use roc/sugammadex if necessary.
 - Use GTN if difficult surgical access eg. IV 25-50mcg bolus.
- Prevent resp function deterioration
 - Beaware of increased sensitivity to resp depression. Opioid spare with RA, multimodal analgesia. Use smaller doses of opioid PRN. titrate to effect carefully with close monitoring. Eg. sevredol 5mg PO.
- Prevent CVS function deterioration
 - monitor as per ANZCA guideline. I'd have low threshold for art line, depending on patient's cardiac function on preassessment.
- Prevent aspiration
 - Ranitidine PO regular during labour.
- Postop -> Ongoing monitor of CVS/Resp/MSK functions and multimodal analgesia. Consider TAP/ilioinguinal/iliohypogastric catheter to opioid spare.

NB.

Severity-Systemic

1 airway: aspiration?

2 CVS: dysrhythmia, MV prolapse, cardiomyopathy

3 Resp: resp failure?

4 CNS: central apnoea at night?

5 GI: delayed emptying, ileus/pseudoobstruction

6 Renal/GU: uterine atony, PPH

7 Endo: DM, hypothyroid, adrenal insufficiency

Females may be amenorrhoeic or have problems with infertility. Men have testicular atrophy.

Other random: Baldness, mental retardation, Cataracts

Myotonias can be either dystrophic (myotonia + muscle wasting/weakness) or non-dystrophic (only myotonia)

[Q6- HOCM discussion, 67.5%](#)

A 40 year old man with hypertrophic obstructive cardiomyopathy (HOCM) presents for elective laparoscopic cholecystectomy.

a. Describe the principles of intraoperative haemodynamic management for this patient. (40%)

b. How would you manage hypotension post induction of general anaesthesia in this patient? (60%)

HOCM

- Causes dynamic LVOT obstruction + SAM due to high velocity blood flow / Venturi effect + functional MR.
- Also, LVH, diastolic dysfunction, risk of arrhythmia

Principles of intraop haemodynamic mx for HOCM

- Monitor + art-line + consider TOE
- Preload – full
 - Avoid high intraperitoneal pressure that impairs preload; aim <10mmHg; avoid excessive reverse trendelenburg
- HR – avoid tachycardia; aim low normal to maximize diastolic filling + coronary perfusion.
 - avoid excessive SNS drive; may have AF; or at high risk of arrhythmia if develop tachycardia.
- Afterload – maintain normal afterload with vasopressor.
- Contractility – aim for low normal contractility to reduce dynamic LVOT obstruction.
 - May need negative inotropy eg. beta blocker

Hypotension post induction mx

- If severe, is EMERGENCY! Declare this and get help with resus trolley immediately.
- ABCD resuscitation; discontinue anaesthetic, FiO₂ 100%.
- Consider differentials although frequency gamble mostly likely cause is HOCM – evaluate with TOE.
 - Ensure good preload, afterload, consider bb to reduce dynamic LVOT obstruction esp hyperdynamic contraction seen on TOE if tachycardia is present.
- Other differentials:
 - Transient anaesthetic effect on reduced SVR, cardiodepression – supportive care.
 - Anaphylaxis – fluid + adrenaline (but watch for dynamic LVOT obstruction)
 - Bleed

- Pneumoperitoneum etc – consider open procedure if patient does not tolerate pneumoperitoneum

Q7 – SAH management coiling, 62.7%

A 43 year old female with a Grade 1 subarachnoid haemorrhage is scheduled for coiling of her middle cerebral artery in the radiology suite. Discuss the important issues to consider when providing anaesthesia for this patient.

Issues (arranged by overlapping issues, although may consider pre,intra,post (report)).

- SAH - likely increased ICP
 - Need to prevent rise in ICP
 - TIVA/remi to maintain optimal autoregulation
 - Ventilation to maintain normocarbida
 - Prevent rise in cerebral metabolism:
 - Avoid fever, treat seizure if occurred,
 - Ensure good venous drainage: avoid compression with tube tie; maintain neutral head position.
 - Consider ICP monitor
 - maintain CPP + manage CVS instability
 - may see ECG or changes (TWI/QT prolong)
 - use art line +/- CVP + temp/NMT monitor etc. (report)
 - maintain good MAP; aim euvolaemia and use vasopressor/inotrope as required
 - avoid excessively high BP which could worsen bleed.
 - Keep SBP<140mmHg;
 - monitor closely with art-line.
 - Use remi to obtund stimulation from intubation.
 - Neuroprotection and minimize secondary insult with TIVA.
 - Maintain normothermia + normoglycaemia.
 - SIADH-hyponatremia – monitor and correct as required slowly <10mmol/L per day with sodium chloride (0.9% or 3%)
 - Risk of rebleed; delayed neurological deficit / vasospasm –
 - nimodipine prophylaxis
 - ongoing close monitor/neuroassessment in ICU.
 - Rtreat with HHH if vasospasm occurred.
 - Remote area Radiology suite
 - Familiarize environment + equipment
 - Maintain contact with assistants for anticipated complication and obtain help timely.

NB.

OHA:

-watch for complications: rebleed (esp first 24 hrs, 4% risk), delayed neurological deficit, hydrocephalus, oedema, seizures.

-ICU book: HHH: up MAP then watch for neurology, then maintain (likely MAP 90-110) until stable. If no improvement after 2-4 hours, consider interventional radiology; hypervolaemia to increase MAP (unless LVF), which will also achieve haemodilution.

- OHA: suggested values are MAP + 15%, CVP >12mmHg, HCT 30-35%.
- if any neuro deterioration - perform CT scan.
- FASTHUG care in ICU.

Q8- subtenon block discussion, 83.7%

- Describe the anatomy of the eye relevant to a sub-Tenon's eye block. (40%)**
- Discuss the potential advantages and disadvantages of this technique for providing regional anaesthesia for eye surgery. (60%)**

STB = instil LA into ST space, which is potential space **between tenon's capsule (avascular) + sclera (vascular/red)**

Anatomy for STB

Globe (superficial → deep) (6)

- Conjunctiva → tenon's capsule → subtenon space (potential space) → sclera → choroid/ciliary body/iris → retina

Extraocular muscles, encasing the cone-shaped orbit:

- 4 recti
- SO+IO

Neuroanatomy

- Sensation to the Eye
 - Cornea and Supero-nasal conjunctiva → **nasociliary N (V1)**
 - The Rest → **Lacrimal, Frontal, Infra-orbital**
- Motor supply
 - SC, levator palpebral – III (upper)
 - MR, IR, IO – III (lower)
 - LR – VI (abducens)
 - SO – IV (trochlear)

Optimal block = sensory block and akinesis of the globe (motor block) is required.

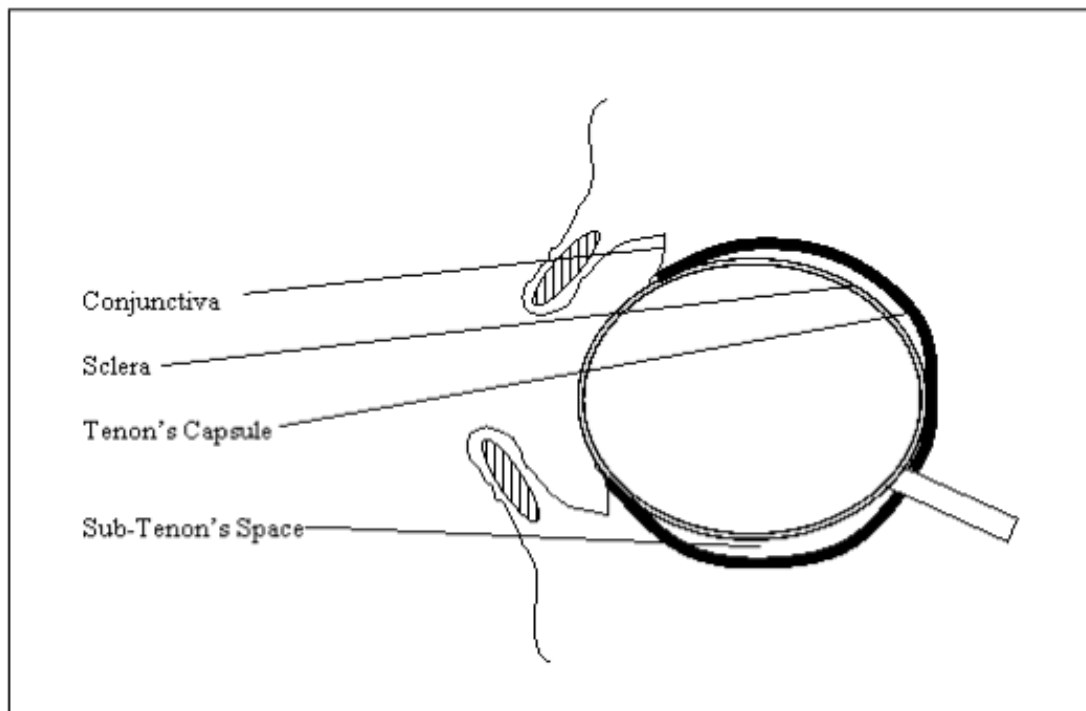
- NB. ie inside **muscle cone = 2, 3, 5, 6.**
- **Outside = 4**

Globe tends to sit anterior, high and lateral in orbit; hence accessing subtenon block is commonly via infero-nasal approach.

Pros/cons

- **Pros:** **quality** as good as RBB, avoids **complication** (retrobulbar bleed, optic N damage, scleral perforation), minimal pain, safer in **anticoagulation**
 - Others: can be done w **axial length >26mm**
 - Block can be easily **topped up**.
- **Cons:** **subconjunctival haemorrhage, chemosis** (which are relatively minor), care w **scleral buckles** (may need multiple injections)
 - Others: **allergy to hyalase**
 - Patient **cooperation:** lie still and relatively flat for surgery
 - Rare but important: **brain stem anaesthesia**
 - **CI in prev vitrectomy** (report)
 - **Arrhythmias** with LA pressure → vagal

NB.



Q9- emergence agitation discussion, 61.4%

- Describe the factors that influence emergence delirium in children. (50%)
- How would you manage emergence delirium in a 3 year old child having had myringotomy tubes inserted under general anaesthesia? (50%)

ED = behavioural disturbance post emergence:

- **Psych:** Inconsolable, irritable, uncooperative
- **Phys:** Thrashing, crying, moaning → can result in physical harm to child, bruise, distress, wound dehiscence etc.
 - ?lasting memory impairment / maladaptive behavior (Auckland 2016)
 - variable incidence report 18-80%.

ED factors

- **Pt**
 - **Age:** Preschool age, esp 2-5yo
 - **Psych:** Anxiety, poor adaptability/temperament
- **Anaes**
 - **Gas:** Volatile agent, higher risk w sevo, iso, des cf. halo
 - **Speed:** Rapid washout time of volatile
 - **Pain**
 - **Other Drugs:**
 - **Benzodiazepine** use (report)
 - ??**Anticholinergics**-atropine; **antidopaminergic**-metoclopramide,
 - **Protective factors:**

- Avoid rapid washout of sevo, eg. use of propofol bolus at end of surgery.
- Intraop use of ketamine, fent, clonidine, dexmedetomidine may also be helpful.
- Use TIVA.
- **Surg**
 - **Eye, ENT** procedures

Management of ED in 3yo post myringotomy

- **Declare**: Call for help, gently hold child, use soft protective pads eg. on bed rails
- **Ensure safety**, simultaneously **manage** + consider/treat **causes**:
- **Other Causes**:
 - **ABCDE**: hypoxia, hypotension, raised ICP, thirst/hunger, anxiety, hypoglycaemia, hypo/hyperthermia
 - **MI**: bladder distension, pain
- **Actions**:
 - Reduce stimuli: Noise, light, handling
- **Pharm** tx: eg.
 - **Fentanyl** 1mcg/kg IV; 2mcg/kg IN; at end of surgery;
 - **Morphine** 0.05mg/kg
 - **Propo**: treat w 0.5-1mg/kg
 - bolus 2-3mg/kg IV over 3 mins at end of surgery
 - **Clonidine** 1-2mcg/kg IV
 - **Dexmedetomidine** - 0.15-1mcg/kg IV over 5 mins.
- Reassure parents of self-limiting nature + good prognosis of condition.

NB.

- Emergence agitation not same as emergence delirium (ED). ED is a subset of EA. No universally agreed definition of EA.
- Prevention: propofol bolus / infusion – **Kataria if <35kg; Schneider if >35kg.**

Q10- inhalational injury discussion (repeat), 34.3%

- Describe the pathophysiological effects of an inhalational injury following a house fire. (60%)**
- What implications would this have for anaesthesia one week after the injury? (40%)**

Smoke inhalation = inhales heat and chemical smoke, can cause

- Thermal injury – airway swelling, tissue sloughing, scarring, stricture
- Chemical injury – inflammation, oedema, hypoxaemia due to CO toxicity or cyanide poisoning (methaemoglobinaemia)
 - leading to airway obstruction
- Lung: pulm oedema, VQ mismatch, chemical pneumonitis, bronchospasm, ARDS
- SIRS: (report=key word) inflammatory cascade

Implication for anaesthesia 1 week later:

Airway

- Likely still ventilated; if not, still have airway sensitivity.

- Swelling → difficult intubation. (report: use of LMA is not appropriate)
 - Be very careful with transfer across beds, not to dislodge tube.

Breathing:

- ARDS likely; pulm oedema, secretion.
- Chest wall burn -> dec compliance; difficult ventilation.
- May have VAP.
 - Use LPV strategy; may need to accept permissive hypercarbia

Circulation:

- Large area burn -> large volume fluid shift; losses.
- Large area debridement -> bleed + anaemia.
- Narrow window of fluid therapy to avoid excessive administration which worsens oedema / ARDS.

Drug:

- Avoid sux; use NDMR if paralysis required.

E:

- Meticulous temp care; be aware of risk of hypothermia due to large area surgical exposure.

Nutrition: large metabolic requirement; ideally continue NG/NJ feed throughout periop period (Auckland)

NB.

Feed early <48 hours; post-pyloric feeding recommended + minimize interruption; continue NJ feed throughout surgery.

Q11- opioid dependence, chronic pain management, 76.5%

A 34 year old, opioid-dependant woman is complaining of severe pain on the day after a first metatarsal osteotomy. The nurses are concerned she is drug-seeking.

a. How would you assess this patient? (60%)

b. Outline your pain management plan. (40%)

Assessment; Objective pain assessment – consider:

- Baseline pain level? Chronic pain? Patient received her normal pain regimens periop?
- Current analgesia regimens – is this appropriate? Esp. in context of chronic pain management?
- Has patient got persistent postop pain? Assess for risk factors:
 - Patient: chronic pain, anxiety, poor pain coping strategy?
 - Anaesthesia: severe acute postop pain? Inadequate periop pain regimens?
 - Surgery: intraop record – any documentation of nerve injury? Prolonged use of tourniquet?
- Patient's current pain feature? Neuropathic pain? Features of allodynia, hyperalgesia, nerve damage? Feature of withdrawal?
 - Although unlikely, but rule out compartment syndrome.
- Obtain nursing staff perspective – patient's behavior on ward? Can patient be distracted? Is patient self-medicating?

Mx plan:

If acute on chronic pain:

- explain/reassure patient

- ensure optimal multi-modal analgesia + opioid sparing strategies – ketamine, clonidine
- ensure continuation of patient's normal opioid regimens.
- rationalise opioid use with patient and nursing staff
- consider psych liaison if significant anxiety
- rule out surgical problems - need surgical review if concern with tight cast, ischaemia, compartment syndrome...etc.
- ongoing follow up by pain team.
- Contact the nominated opioid prescriber to plan discharge management

NB. (comment) reluctance to give opioids = a bad mistake.

Q12- quality assurance program (repeat), 51.2%

a. Describe the aims of a quality assurance program. (40%)

b. Outline the steps you would take to set up a quality assurance program for your anaesthesia department. (60%)

(report)

- The reference for this question is ANZCA Professional Document TE9: Guidelines on Quality Assurance in Anaesthesia

Q13- Universal precautions discussion (repeat), 65.7%

a. What do you understand by the term "Universal Precautions"? (40%)

b. Describe how you apply these precautions in your daily anaesthesia practice. (60%)

Q14- WPW/VF discussion, 84.9%

A 58 year old man presents for tonsillectomy for a tonsillar tumour. He has a 2 year history of intermittent palpitations. His electrocardiogram at diagnosis shows the following

a. What is the diagnosis? Describe the electrocardiographic changes that support your diagnosis. (30%)

Following the administration of neostigmine and atropine for reversal of neuromuscular blockade, you see the following rhythm on your monitor.

b. What is this rhythm? How would you manage this situation? (70%)

WPW

- SR@70, but short PR interval (travelling down accessory pathway); delta wave (slower initial QRS depolarization via accessory pathway), wide QRS,
- Secondary ST/T wave changes.
- Also supported by history (intermittent palpitation) - report

VF:

- ACLS (repeat)

Q15 – preoxygenation (repeat), 56.6%

a. what is the physiological basis of preoxygenation? (50%) b. describe your method of preoxygenation including how you assess its adequacy (50%). See 2015A Q15.

Oct-2009, 30.2%

Q1- clopidogrel and stent discussion, 32.9%

There is a 70-year-old female on your emergency list for an urgent laparotomy. She was involved in a motor vehicle accident this morning and sustained multiple trauma. Her medications include clopidogrel to cover the insertion of bare metal stents into her coronary arteries 2 months ago.

1. Describe the mechanism and duration of action of clopidogrel. (30%)

2. What are the major considerations for the perioperative period in view of the patient's stent? (70%)

MoA + duration of clopidogrel

- ADP receptor antagonist; irreversibly antagonize ADP receptor on platelet
 - No plt activation, expression of GPIIb/IIIa-R, no aggregation.
- Prodrug; active metabolite half-life 8 hours; but irreversible binding so duration is of lifespan of platelet (5-7 days)

Major considerations in periop care of this patient?

- Risk of bleed with multiple trauma + clopidogrel which isn't easily reversed.
 - Trauma induced coagulopathy, hypothermia, acidaemia, consumptive coagulopathy.
- Risk of stent thrombosis, and high mortality rate, without clopidogrel. (although BMS is now >30 days and should be relatively endothelialized and is safe w/o clopidogrel). Consult Cardiologist. Patient probably need platelet for resus from severe trauma. Be vigilant of risk of MI/CVA/death.
- Risk of severe trauma.
 - In acute setting, risk of bleed probably > thrombosis risk.
 - Careful monitor of periop major adverse CVS event should be monitored.

Mx;

- Hx; good primary survey; invx CT/USS and resus within limited time before emergency surgery.

Anaesthetic considerations:

- A-EMST principle; stabilize C-spine; RSI
- B-likely multiple rib #s, haemopneumothorax; need ICD before IPPV can begin to minimize risk of tension
- C-hypovolaemic shock, coagulopathy; allow permissive hypotension, low volume resuscitation before definite haemostasis with surgery.
 - May require damage-control surgery in view of severe multiple trauma
- D: TBI, ICP care. May have low GCS that require airway protection.
- E: keep warm, but avoid fever in context of TBI.
- M: May require MTP.
- Monitor/equipment: level 1, Art-line; back up anaesthetist, 2 technicians for off-load high level tasks.
- Postop:
 - ICU. Cardiologist. Recommence clopidogrel when considered appropriate by MDT.

Q2- glycaemic control discussion, 69.6%

List the advantages and disadvantages of tight glycaemic control perioperatively in a diabetic patient on insulin. (30%)

How would you manage the glycaemic control for such a patient having a minor procedure under general anaesthesia? (70%)

Tight

Pros – minimize hyperglycaemia

Cons – hypo, need closer monitor to reduce risk and is labour intensive; assoc. with worse outcome in mortality (NICE-SUGAR) in general ICU pts.

Periop mx:

Assessment

Prep

Early on list

Continuation of treatment appropriately

Monitor regimen

Plan for abnormal result – eg. 250ml 10% for hypo then dextrose infusion; vs. sub correction insulin based on local protocol

Recommendation regimen

(report)

- The important advantages of tight glycaemic control relate to minimising the complications of hyperglycaemia i.e. ketosis, glycosuria and diuresis and risk of infection
- The important disadvantage is the increased risk of potentially dangerous hypoglycaemia
- A definition of tight control (eg 4.5 -6.0 mmol/litre), and, for the second part of the question, acceptable control for THIS patient (eg <10mmol/litre)
- Peri-operative management should include consideration of
 - the assessment of the patient's regular preoperative insulin therapy and control of the timing of the surgery (i.e. early on the list)
 - an explicit peri-operative insulin regimen that covers the patient's basal insulin
 - requirements while avoiding hypoglycaemia in the fasting period
 - a monitoring regimen with a plan for abnormal results
 - a post-operative plan for recommencing regular therapy, or a discharge plan

(comment)

- Some incorrectly extrapolated the studies from the intensive care to the operating theatre environment
- Good answers tailored the complexity and "tightness" of the peri-operative regimen to that of the patient's regular therapy

Q3 – SOB in PACU differential; residual NMB, 24.8%

a. 49 yo woman has just arrived in the PACU following a TAH under GA. She is agitated and c/o difficulty breathing. 1. List differential diagnoses (40%). 2. How would you

determine if this was caused by residual NMB? (40%). 3. What is the role of sugammadex in the treatment of residual NMB? (20%)

1. differential

- Patient:
 - Airway obstruction → hypoxaemia
 - Ventilatory issue – atelectasis, VQ mismatch, pulm oedema, preexisting lung dx (asthma/COPD exacerbation)
 - CVS: PE, MI, HF, severe anaemia
 - CNS: TIA/CVA, delirium, anxiety
 - Renal: urinary retention
- Anaesthesia: residual NMB, opioid narcosis or inadequate analgesia.

2. determine if due to residual NMB

- Hx
 - Review anaesthesia chart, timing of last NMB, documentation of TOF assessment? Given reversal agent?
 - Factors for prolonged block? Mg, gentamicin etc.
- Exam
 - Clinical: head lift, hand grip, TV depth (crude assessment)
 - NMT assessment using TOF ratio (or DBS ratio); TOF better tolerated. Assess T4/T1 ratio using accelerometer and if <0.9 = residual NMB.

3. role of sugammadex in treating residual NMB

- = cyclodextrin that reverse aminosteroid NMB – most effective with rocuronium, less so with vecuronium, not for pancuronium.
 - Reliable reversal of rocuronium and quicker than neostigmine; also duration for effect is longer. Capable of reversing deep NMB with higher dose eg. up to 16mg/kg.
 - Particularly useful when neostigmine reached its 'ceiling effect' as likely in this case.
- Unable to reverse benzoisoquinolinium NMB eg. atracurium.
- Expensive. Risk of anaphylaxis exists.

Q4- CPR metabolic consequence discussion, 59%

A 70 year old female had a cardiac arrest after arriving in the Recovery Room following open fixation of a femoral fracture. This arterial blood gas was taken after intubation and several minutes of CPR.

(report)

- Recognition of a severe mixed respiratory and metabolic acidosis
- The most likely cause of this abnormality is lactic acidosis from **hypoperfusion** to the peripheral tissues, in conjunction with absent or **hypo-ventilation** from inadequate perfusion to the respiratory centre of the brain stem. Artificial ventilation is inadequate or has had inadequate time to remove the accumulated carbon dioxide, and external cardiac compression has been too late or inadequate to prevent anaerobic metabolism in the peripheral tissues
- Many possible causes of both respiratory and metabolic acidosis were acceptable including dual pathology, but any aetiology had to explain BOTH components

Q5- Analgesia pregnancy safety, 65.8%

A woman who is 10 weeks pregnant presents to the Emergency Department with a closed tibial shaft fracture.

- 1. Classify the drugs used in pain management according to their safety to use at this stage of pregnancy. (40%)**
- 2. What are the options available for perioperative pain management for this patient? (30%)**
- 3. What would you recommend? Justify your choice. (30%)**

Drug safety classification – as per Australian Drug Evaluation or Medsafe NZ

- A = safe, used by large number of pregnant women without harm
- B1: used by small number of pregnant women without harm. No harm in animal studies
- B2: similar to B1. However animal studies is inadequate or lacking.
- B3: similar to B1. However animal studies shown increased fetal damage. Although significance to human is unknown.
- C: may cause harmful effects to fetus but without malformations.
- D: unsafe, can cause harmful fetal malformation.
- X: high risk of permanent damage, use is contraindicated in pregnancy

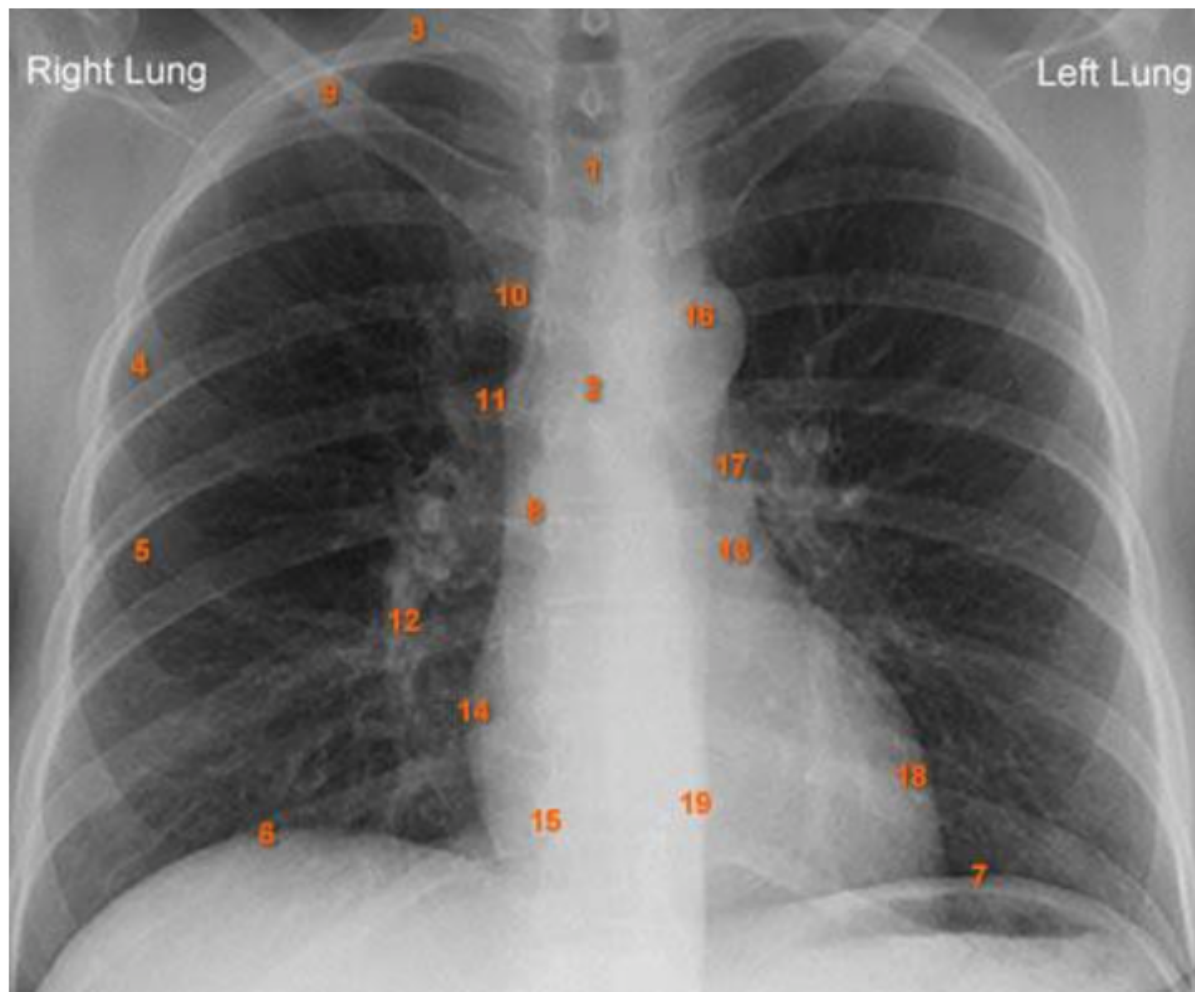
Periop pain management option

- Group A: paracetamol, codeine, LA: bupivacaine/lignocaine
- Group B: gabapentin
- Group C: opioids, NSAIDs, tramadol; antidepressants-TCA, SSRI.
- Group D: carbamazepine, phenytoin, valproate.
- Others:
 - Early reduction of fracture + traction/immobilization/surgery
 - Regional – eg. epidural or popliteal nerve block + catheter.
 - Monitor for potential compartment syndrome + timely fasciotomy (report)

My recommendations – after informing patient to formulate analgesia plan:

- Para-safe.
- Opioids – short course of opioid is probably required to provide effective analgesia. Risk of fetal resp depression is not an issue at this gestation and use of short course isn't associated with high risk of tolerance.
 - Also allows PCA to set up = better analgesia
- Regional with popliteal block/catheter would give best analgesia + opioid spare. Use of low conc LA infusion eg. 0.2% ropivacaine 0-10ml/hr, will not mask compartment syndrome.
- Ongoing F/U by APMS and wean off opioid as early as appropriate.
- Avoid NSAID due to potential risk of miscarriage; wouldn't use epidural due to potential compartment syndrome.

Q6 CXR structure, 36%



a. Identify the structures labeled A to H on this normal chest X-ray. (40%)

1. Tracheal Air Column
2. Carina
3. 1st Rib
4. Scapula
5. Minor or Horizontal Fissure
6. Right Hemidiaphragm
7. Left Hemidiaphragm
8. Ascending Aorta
9. Clavicle
10. Superior Vena Cava Shadow [A]
11. Region of Azygos Vein
12. Right Pulmonary Artery [B]
13. Left Atrial Appendage [G]
14. Border of Right Atrium [C]
15. Inferior Vena Cava
16. Aortic Arch [E]
17. Left Pulmonary Artery [F]
18. Border of Left Ventricle [H]
19. Descending Aorta

b. Describe the arterial blood supply and venous drainage of the myocardium. (60%)

Artery:

- Aorta-->aortic sinuses (just above AV) → LCA + RCA
 - LCA → LMS → LAD + LCx
 - LCx (lateral around L AV groove) → marginal
 - LAD (anteriorly between IV groove) → diagonals
 - RCA (posteriorly between ant AV groove) → anastomose w LCx + branch PDA + intervent branch

Supplies:

- LCA: LA, ant/lat LV, ant IVS, SA (40%) + AV (20%) nodes; part of RV
- RCA: RA, RV, post LV, post IVS + SA (60%), AV (80%) nodes

Coronary supply		
	Area Supplied (4 things: nodes, R chambers free wall, some IVS, His)	ECG
RCA	Sinus node (55%), AVN (90%), His (90%), RA RV (free wall), part of IVS	II, III, avF Inferior leads
PDA (2)	posterior wall of LV, part of IVS	
LAD	anterior wall, anterior part of IVS, part of RV	V3- V5
Cx	Sinus node (45%), LA, lateral wall of LV	I, avL

Venous drain:

- 2/3: veins accompany arteries → directly into RA.
 - ant cardiac vein
 - (4) great cardiac, middle cardiac, small cardiac, oblique cardiac veins → coronary sinus
- 1/3: small veins (venae cordis minimae) → directly into cardiac cavity

Q7- Remifentanyl infusion discussion, 37.3%

A 27 year old male presents with a glioblastoma for a craniotomy. As part of your anaesthetic technique, you decide to use a remifentanyl infusion.

- 1. Discuss the characteristics of remifentanyl with respect to its use as an infusion. (50%)**
- 2. What are the advantages and disadvantages of using effect site calculations to guide remifentanyl infusions? (50%)**

Remi = phenylpiperidine; pure μ -agonist. Equipotent to fentanyl. 70%PPB, small Vd, rapidly metabolized by tissue esterase with large clearance 30-40ml/kg/min hence short t_{1/2}. Organ-independent metabolism, well-preserved in disease states, hence reduces inter-individual variability.

Remi characteristics for use in infusion

- dose (0.05-0.5mcg/kg/min)
- rapid onset (high lipid solubility cf. morphine and low pKa), allows for easy titration.
- Small Vd/high Cl, t_{1/2} is short ~3 mins.
- Context-insensitive therefore regardless of infusion duration, t_{1/2} remains same ~3mins → good in infusion as offset is predictable and quick after long duration of use.
- Delayed postop resp depression risk is low (unless other opioid used).

- Allows for relative stable control of haemodynamics due to effect on MAC-Bar sparing esp when stable effect site concentration is reached with infusion.
 - Ideal for control BP, permissive hypotension to achieve good surgical field eg. in ENT.

Pros/cons of using effect site to guide remi infusions?

- Effect site calculation considers age, LBM (height/weight calculation), gender + equilibration time between central and effect sites (report).
 - Ultimately this results in less variation in drug effect, and a more predictable effect from a given dose.

Cons

- Inter-individual variability still exists, hence calculation isn't absolute and titration to effect should always be done.
- Predetermined algorithm based on sample of fit/healthy individuals, whom may not reflect patient's clinical states – eg. opioid abusers, extreme ages.
- Can cause adverse effects: apnoea, resp depression, chest wall rigidity, bradycardia/hypotension more likely with remi.

Q8- oxygen flux factors discussion, 62.7%

1. Outline the factors that determine oxygen delivery to the tissues. (30%)

2. How might you increase the oxygen delivery to the tissues in an anaesthetised patient. (40%)

3. How does a hyperbaric chamber influence oxygen delivery to the tissues? (30%)

A

Oxygen delivery (g/dl) = blood flow to tissue x oxygen content

Oxygen content = (Hb (g/dl) x oxygen saturation x 1.34) + (0.003 x PaO₂ (mmHg))

B

- Blood flow/CO/vasculature tone etc
- Hb
- Oxygenation

C

Inc O₂ content dissolved in blood

Eg. 100%, 1 atm content = 2g/dL; at 3atm = 6g/dL; esp useful in eg. CO or methaemoglobin when Hb lost ability to carry oxygen; otherwise, Hb does majority of work and dissolved content even w HC therapy doesn't help.

(report)

- Part 1: an equation relating cardiac output, arterial oxygen saturation and haemoglobin concentration to oxygen delivery with accurate amounts and units
- Part 2: a structured method of providing examples of how to increase the various components of the above equation eg cardiac output with inotropic agents, haemoglobin with red blood cell transfusion
- Part 3: hyperbaric oxygen improves delivery predominantly by increasing dissolved oxygen

Q9- Endocarditis prophylaxis (repeat), 60.9%

1. What are the indications for prophylaxis against perioperative bacterial endocarditis?

2. Justify your choice of antibiotics. (50%)

(report)

Indications for prophylaxis include

patient factors:

- previous endocarditis from any cause
- prosthetic valve or other intracardiac material
- unrepaired or palliated cyanotic congenital heart disease
- acyanotic congenital dx with prosthetic material within 6 months of repair or with residual defect at site of repair
- cardiac transplant recipients with valvuloplasty
- RHD in indigenous population.

Procedural factors

- dentistry involving work on the gums or a breach in the oral cavity, or work close to the periapical area
- As+Ts
- If procedure is at site of established infection.

Choice of AB:

- Depends on sensitivity + surgical site
- Dental/Resp tract/ENT
 - Amoxicillin 2g PO 1 hour before or IV 2g just before surgery
 - If allergy then clindamycin 600mg PO 1 hour before or IV just before over 20mins.
 - Or clarithromycin 500mg PO 1 hour prior.
 - If MRSA, give vancomycin 25mg/kg up to 1.5g IV slow infusion before procedure.

○

A justification of antibiotic choice based on the sensitivities of the most likely organisms (eg streptococcus viridans) including the timing of dosing and alterations for those with penicillin allergy

Q10- defibrillation physiology, 47.8%

1. Describe the differences between biphasic and monophasic manual external cardiac defibrillators. (50%)

2. What is the “synchronize” button for? When would you use it? (20%)

3. List the potential hazards of defibrillation. (30%)

Monophasic vs Biphasic

- Mono = passage of dampened wave form across heart in one direction only
 - Requires higher energy 360J to achieve defib current cf. bi
- Biphasic = sinusoidal waveform across the heart in one direction followed by reversed polarity wave in opposite direction.
 - Less energy than mono ie 200J;
 - Approx. 120J achieves same defib current to mono 360J.

- Higher efficacy of mono; and due to lower energy, expose patient to reduce risk of electrical injury, myocardial damage (see below under 'hazards')
- Other: bi has automatic adjustment of energy in response to patient impedance to current flow; hence don't require escalating energy levels.

Synchronise

- = shock delivery timed with R wave of ECG complex; in arrhythmia with a cardiac output. Eg. AF, VT, SVT.
 - Therefore pulseless VT/VF should be managed w unsynchronized shock
- To avoid shock delivered during repolarization (T wave) which could cause R on T → malignant ventricular arrhythmias

List potential hazards of defib:

- Burn -> use corrective sized conductive pads correctly applied
- MSK/nerve damage
- Lethal arrhythmias -> synchronise shock if appropriate.
- Failure to shock -> equipment maintenance
- Hazards to health care worker -> clear declaration of shock and ensure no patient contact during shock delivery

Q11- Ethics, research review, 46.6%

What are the key objectives of ethical review of a research project?
(report)

Ethical Principles in Medical Research should follow International Guidelines such as the Helsinki Declaration.

Ethical Review objectives should include assessing aspects of research such as:

- Aim should be clearly defined, that is to address a clinical question that remains unanswered in order to improve knowledge.
- Assess participant consent process – should include have information sheet provided outlining aim of study, why it is done, what it involves for participant and how the result will contribute towards improving knowledge.
 - Participants should have enough time to consider before providing their voluntary consent; have all questions answered and able to withdraw from study at any time.
- Design of study:
 - any potential harm has been minimized – participants should not be denied any known effective treatment; true equipoise status must be ensured; confidentiality must be strictly maintained.
 - methodological validity, bias minimisation – randomization, blinding, if appropriate.
 - adequate power to detect significant finding ie minimizing false negative (type 2) + false positive (type 1 error).
 - If interim analysis showed potential harm or benefit, there must be protocol to terminate study early to minimise harm or unnecessary wasting of time/resource.

Q12- Important Paeds airway considerations, 54.7%

You're giving a practical tutorial on paediatric airway management to ED registrars at a large hospital. What are the important aspects of paed airway management that you'd present to them?

Paeds airway mx important aspects: (as per report)

- **anatomy / physiological features + mx**
 - distinctive features of neonatal/infant airway cf adult, covering
 - large head/occipitus→
 - use shoulder roll, ensure neck neutral, use shorter handle if blade insertion is difficult due to large head
 - small nasal passage, nasal breather, large tongue & tendency to obstruct airway
 - use guedel to overcome airway obtxn.
 - Short neck, difficult surgical airway landmark
 - Floppy, long epiglottis make view difficult
 - Consider straight blade to lift epiglottis
 - Higher level of larynx (C3-4), more acute angle b/w tongue & glottis opening
 - Use laryngeal manipulation +/- straight blade
 - Trachea = shorter; tendency to have EB intubation.
 - Vigilance of depth + auscultate to ensure bilat AE.
 - Knowledge of calculation of ETT depth eg. size x 3 or age/2 + 12.
 - Paeds resp physiology;
 - smaller reserve and more rapid desaturation
 - increased risk of apneas
 - increased airway resistance
 - increased risk of atelectasis + effect of gastric distension + chest wall compliance.
 - reduced efficiency of resp muscles
 - lack of response to bronchodilators due to absence of bronchiole smooth muscle
- **(emphasise high risk potentially with Paeds airway mx, and calling for Anaesthetic help early is essential!!).**
- **airway assessment**
 - congenital syndrome
 - dysmorphic features: macroglossia, micrognathia, wide webbed or short neck, limited mouth opening
 - difficulty with using universal assessment tool: mallampati, mouth open, neck movement.
- **Basic airway manoeuvres + equipment**
 - Position, oxygen, sign of airway obtxn: stridor, accessory muscle use, see-saw chest/abdo wall movement
 - And simple mx strategies: jaw thrust, ensure head neutral, use guedel, use CPAP.

- Utility, sizing, pros/cons of guedel (can be effective to relieve obtxn but need sedation to tolerate), NPA (better tolerated in light sedation but may not be as effective), LMA (need to obtund airway reflex; not a protected airway).
- **Intubation equipments and technique in Paeds resuscitation**
 - Laryngoscope types (Mac vs Millers)
 - ETT – cuffed, uncuffed + difference, sizing by age/4+4;
 - Varieties of ETT: RAE, reinforced, microlaryngeal tube, trachy tube
 - Fibreoptic scope
 - Laryngoscopy technique + verification method – clinical + EtCO₂ (gold standard)
- **Surgical airway its indications**
 - Crico, mini-trach.
- **Common paediatric airway scenarios**
 - Stridor, Croup, epiglottitis, foreign body, tonsillectomy/bleeds, trisomy 21, cystic fibrosis

Q13- morbid obesity obstetric discussion, 49.1%

You see a 28-year-old woman at the pre-admission clinic who is 32 weeks pregnant. She weighs 150kg and has gestational diabetes. She is hoping to have a normal vaginal delivery at term.

1. What are the issues you would discuss with her during the appointment? (50%)
2. What would you recommend for her management when she goes in to labour? (50%)

Q14- smoking cessation, 49.1%

A patient has smoked 20 cigarettes a day for over 25 years.

1. What are the expected physiological changes that would occur in the first 3 months following cessation of smoking? Include a time frame for the changes you describe. (60%)
2. What are the clinical benefits, with regard to anaesthesia, of smoking cessation in this patient? (40%)

From ANZCA PD: (roughly as 1 day, 1 month, 2 months, 6 months)

- 1 day: COHb, nicotine, O₂
- 1 month: Wound heal, sputum inc
- 2 months: Sputum volume normalise, lung function improve, normalisation of opioid requirement
- 6 months: Immune function

Benefits:

Airway - reactivity

B – oxygenation, mucus, chest infection, O₂ delivery

C – MI, CVA, arrhythmias

D – CVA, DVT/PE

Infection – improved wound healing

Q15 – Neuroprotection in head injury, 64.6%

Describe the principles of cerebral protection in a patient with an isolated closed head injury.

Identify severity + potential systemic complication

- Pt assessment – any evidence of raised ICP? Airway compromise with low GCS? Neurogenic pulm oedema or cardiac instability, electrolyte disturbance.
 - Manage with ABC approach, intubate if GCS <8 and maintain oxygenation, normocarbida, adequate CPP, normoglycaemia.
- Monitor: art line, routine ANZCA recommendation + ETCO₂ if intubated.
- Ongoing care in ICU/HDU.

Maintain CPP

- maintain MAP – with fluid, vasopressor, inotrope as required. Euvolaemia.
- Ensure venous drainage, head up 30deg, neutral position, no compression over vein ie. No neck collar, tube tie.
- Consider ICP monitor to guide CPP management.

Prevent rise in ICP

- Prevent excessive rise in BP. Blunt response to stimulation with analgesia. Eg. remifentanyl use to blunt airway reflex on intubation.
- Normocarbida.
- Con salt / mannitol aim for Na 150-155; osmo 290-300.
- Consider EVD if worsening ICP / hydrocephalus.
- If bleed evident on investigation, for surgical control / evacuation.

Optimize oxygen delivery

- Maintain oxygenation >90%
- Maintain Hb > 70g/L.

Minimise cerebral metaboli requirement

- Avoid pyrexia
- Avoid seizure; if occurred, treat with phenytoin, BDZ etc.

April-2009, 30.2%

Q1- Universal precaution and application (repeat) 36.1%

What do the terms decontamination, disinfection and sterilization mean?

What measures should be in place to minimize the risk of transmission of infection to the resp tract of patients via anaesthetic equipment?

Q2- requirement for safe gas delivery, 48%

What are essential safety requirements for delivery of gases via anaesthetic machines and their associated breathing circuits in use in ANZ? (don't include ventilators or scavenging in answer)

Dangerous gas mixture =

- Hypoxic
- High CO₂
- Either high inhalational anaesthetic conc (with cardioresp depression) or insufficient conc putting patient at risk of awareness

Safety features for gas delivery by machine + circuit (exclude ventilator/scavenging)

- **Wall gas outlet** to machine
 - **Colour**-coded outlet port:
 - O₂-white; N₂O-blue; air-black/white
 - **NIST** for specific gas to avoid mistake.
 - Colour-coded **hose**
 - **Pressured at 4 bar; gas pipeline checked with Pharmacist**
- Gas from **cylinder**
 - **Pin-indexed**
 - Visible pressure **monitor** on cylinder
- Anaesthetic **machine**
 - Pressure **monitor**/regulation
 - Visible aneroid manometer from wall outlet/cylinder for each gas;
 - **flowmeters**
 - O₂ = last gas added to the common gas outlet at top of flowmeter tubes
 - **anti-hypoxic device**
 - minimum O₂:N₂O ratio regulator
 - Cut off of other gases on loss of high pressure O₂
 - audiovisual alarm – disconnection, low O₂, high/low CO₂ or volatile.
- **Circuit** (this is a bit unclear)
 - Features include: **unidirectional valve**, CO₂ **cannister**, sample **tube**, **HME filter**
 - Pressure regulation:
 - Pressure monitor of circuit
 - Ability to adjust APL valve
 - Pressure alarms (high/low P) + disconnection alarm (audio-visual)
- **Other gases:**
 - Low/high **CO₂** monitor/alarm
 - Low/high **anaesthetic** gas concentration monitor/alarm + **interlock** system (allowing only 1 vaporiser to be switched on)
- **Infrastructure:**
 - Level 2 machine check beginning of anaesthetic list
 - Level 3 machine checks beginning of every case

Q3 – Malignant Hyperthermia, 81.2%

A previously well 80kg 19-year-old male is anaesthetised for ORIF of # tib and fib. He has a RSI including Suxamethonium and is intubated and ventilated via a circle system at 12 breaths per minute and a TV of 700mL with a FiO₂ of 0.5. He has had 500mcg of fentanyl and anaesthesia is maintained with 1.5 MAC Sevoflurane. He develops an increasing sinus tachycardia to 160/min with frequent ventricular ectopic beats and his ET CO₂ rises to 60mmHg despite increasing his ventilation. There is no rebreathing evident of capnography. ABGs now pO₂ 105mmHg pCO₂ 65mmHg pH 7.12 HCO₃ 20.7mmol/L BE -10. Outline the steps you would follow to manage this situation.

Issue: significant mixed metabolic acidosis, resp acidosis despite adequate IPPV. Needs to consider/mx as MH unless proven otherwise. Look for other signs eg. muscle rigidity, hyperthermia.

Management steps outline

- Declare emergency, get help, stop surgery, get MH box + dantrolene/ice, stop volatile immediately and run TIVA.
- Job delegation as per ANZCA endorsed guideline – ensure small team to mix multiple dantrolene ampoules
 - 2.5mg/kg dose IV, repeat Q15 mins to response. May need to mobilise dantrolene supply from Pharmacy, hospitals closeby.
 - Arterial line, CVL, IDUC.
- Ventilate FiO2 100%; hyperventilate to low/normal CO2; reassess w ABG
- CVS: maintain MAP >65mmHg. Stabilise arrhythmia/hyperK with CaCl 10% 10ml.
- CNS: paralyse with NDMR.
- Temp control to <38deg: cold IV fluid, physical cooling measures (icepack to peripheries), cold saline irrigation of bladder, web swabs in surgical field and expose patient.
- Renal protect esp risk of myoglobinuria/rhabdomyolysis. Optimise volume status and monitor UO. Aim UO>1.5-2ml/hr. Avoid nephrotoxics.
- Electrolyte: hyperK tx: insulin/glucose, dialysis in severe hyperK esp with renal failure.

Postop: ICU and continue maintenance of vital signs as above + documentation of events thoroughly.

Subsequently: muscle biopsy/genetic testing/cafeine+halothane testing for patient + family. Clinical alert for patient.

NB:

- Verapamil cause severe hyperK with dantrolene
- Dantrolene dose >10mg/kg is unlikely to be effective (or 35 vials). 24ampoules at least (20mg per ampoule) 36 ampoules if large hospital or isolated hospital.

Q4- Axillary block discussion, 40.1%

Draw X-section view of arm at axilla to show anatomy relevant to brachial plexus block for surgery of forearm. List pros/cons of block at this level compared w supraclavicular block

Pros

Ptx, horner's, superficial, can compress A/V if punctured, good for hand/forearm surgery, excellent surgical condition.

Cons

Large volume, risk of LAST, vesicle injury, less hygienic area, arm abduction required, may not covering medial cut n of forearm and arm; tourniquet pain not covered (report)

Q5- Parkinsons management (repeat), 63.9%

70yo man with 10yr hx of Parkinson's presents for TKJR. He's on levodopa/carbidopa 5 times a day. Outline the main issues to consider re: PD and periop management of this patient

Issues

- Assessment severity of PD; difficulty w communication or CVS assessment due to reduced mobility
 - Abrupt stop of PD drugs may cause NMS
- Frailty, nutrition
- ANS instability, gastric stasis, haemodynamics
- Drugs: avoid interaction – avoid anti-dopaminergic
- MSK: tremor, unable to lie still, sit still means regional may not be practical
- Monitor inaccuracy
- Postop analgesia assessment may be difficult; need to continue PD regimen as soon as practical; risk of fall, risk of DVT.
- Need organized help with rehab.

Q6 – Pneumoperitoneum physiology, 62.4%

Describe physiological effects of pneumoperitoneum with CO2 for laparoscopy

Effects = from increased intraabdo pressure (IAP) + CO2 absorption.

CVS, depends on IAP:

- <10mmHg: increased VR, SVR → increased CO, MAP.
- 10-20mmHg: reduced VR balanced by increased SNS tone → increased SVR/HR/contractility → reduced CO but MAP maintained.
- >20mmHg: reduced VR outweighs increased SVR/HR/contractility → low CO/MAP
- overall, increasing IAP → increasing myocardial O2 demand, which is initially balanced by increased coronary BF, until hypotension develops.
- Sometimes see increased vagal tone → bradycardia, hypotension.

Resp

- Fall in FRC, RV, ERV, pulm compliance → increased Peak P.
- Increased atelectasis → VQ mismatch

GI

- Increased GI pressure, risk of regurgitation
- Decreased splanchnic blood flow from increased IAP.

Renal

- Decrease renal blood flow/GFR
- Increased RAA axis, ADH secretion → Na and water conservation.

CO2 absorption/hypercapnoea

- Increased PVR
- Resp acidosis
- SNS stimulation
- Increased cerebral blood flow, ICP
- CO2 narcosis at high level ~80mmHg.

Q7- coagulopathy in liver rupture, trauma, MTP & management, 35.1%

Outline coag changes you'd expect in a patient with ruptured liver from a blunt abdo trauma requiring massive transfusion and describe how you'd minimize them

MTP = >1 blood volume or >10 units RBC in 24 hours.

Coagulation changes; from original injury or from MTP

- **Trauma induced** coagulopathy –
 - Tissue damage, shock, glycocalyx degrade, heparinoids release, anticoagulant expression + profibrotic proteins, Prot C activation -> increased tPA -> end points that worsen bleed:
 - hyperfibrinolysis; dysfibrinogenaemia, systemic anticoagulation, impaired platelets
- Consumptive
 - Tissue damage, SNS, SIRS, shock, activation of coag cascade (tissue factor of rF7a complex activate coagulation → thrombin/fibrin form); eventually result in DIC
- Acidaemia; dysfunctional factors/platelets
- Hypothermia; dysfunctional factors/plates
- Dilutional

Risk minimisation

- Prevent, treat coagulopathy
 - Control bleeding source – medical mx (if haemodynamic stable; bleeding likely self-containing) vs. surgical mx.
 - Avoid hypothermia...
 - Avoid consumptive coagulopathy; MTP, proactive replacement of plasma products with guidance from TEG or coagulation profiles.
 - However RBC/FFP/Plt ratio empirically should be close to 1:1:1
 - Aim INR <1.5; APTT <40, (or give 4 FFP); Ca++>1mmol/L, Fib >1g/L; plt >50 (or >75 for safety margin).
 - TXA given early <3 hours
 - Permissive hypotension, low volume resuscitation until definite control of haemostasis; avoid overzealous IVF administration.
 - Cell-saver
 - F7a if all fails, 90mg/kg.
 - Avoid acidaemia...
 - Optimize oxygenation, low normal MAP 60-65mmHg, (balancing risk of bleed); optimize intravascular volume + Hb.
 - Ventilate to low normal CO2 to compensate for metabolic acidosis.
 - Consider HCO3 if severe acidaemia 1mmol/kg = 1ml/kg of 8.4%

NB.

- **TIC:** = early endogenous coagulopathy independent of acidaemia / hypothermia; Worst 5-10% is seen on TEG → poorest prognosis; Mortality 4x.
 - 2 mediators: **hypoperfusion + tissue injury (severity of TIC correlated w shock/injury);**

- Catecholamine surge, endothelial activate, **glycocalyx** degrade → Heparinoids release;
- **anticoag express, profibrotic proteins**, prot C activation (F5, F8 inhibited, inhibitor of tPA inhibited → **free tPA** increased to cause fibrinolysis) →
 - **dysfibrinogenaemia**, systemic **anticoag**, impaired **plt activity**, **hyperfibrinolysis** (tPA activation)

Q8- amniotic fluid embolism management, 86.6%

Outline features and clinical management of amniotic fluid embolism

Q9 – periop betablocker initiation, 43.1%

A 65yo male presents in PAC. He is scheduled for fem-pop bypass surgery for PVD in 4 days time. He has ischaemic rest pain in his leg. Evaluate the usefulness of initiating therapy with beta-blockers to reduce the incidence of perioperative myocardial infarction in this man.

Periop MI prevention encompasses:

- risk factor optimization
 - arrhythmia, CHF, ACS, severe valvular disease
 - DM, CRF, HTN, hyperlipidaemia, smoking cessation.

Betablocker initiation is controversial

- In general: continue betablockers if on already (AHA/ACC Guideline 2014)

Pro

- If v high risk patient with inducible ischaemia on stress testing,
- Or intermediate risk with >3 risk factors +
- Moderate-high risk surgeries,
- No CI, such as asthma, COPD, bradycardia, heart block, adverse reaction, then
 - may be benefit to initiate >1wk prior to surgery, titrate to target HR <65, avoid hypotension.
 - use longer acting agents (ie atenolol or bisoprolol > metoprolol), possibly reduce risk of periop MI by reducing cardiac oxygen demand.
 - (NB claudication is relative CI)

Cons

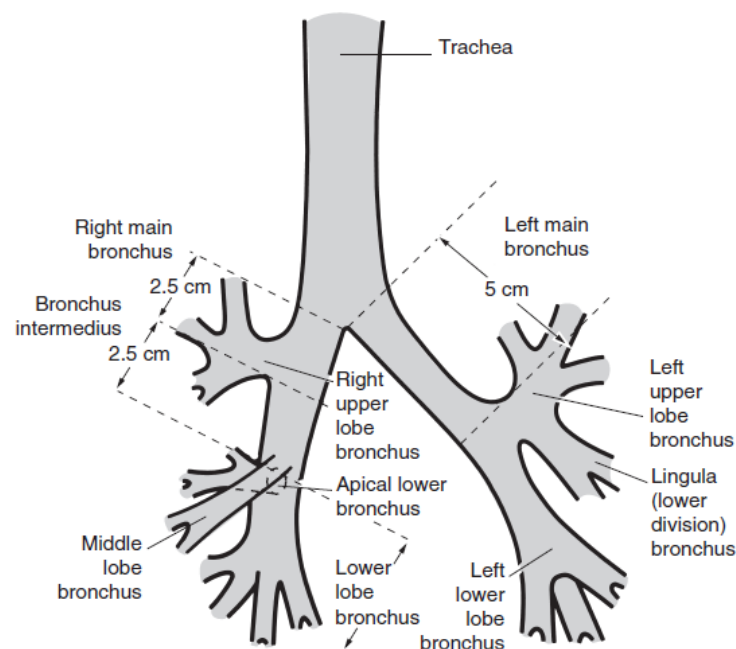
- However, evidence is inconsistent.
- Large trial (POISE) showed cardiac benefit, but showed increased overall mortality, from increased risk of stroke + hypotension (although dosage of betablocker 100mg considered high in this trial + introduced on day of surgery)

On balance: this is a case of high-risk procedure of moderate urgency. Cardiac risk is >5%.

Would potentially beneficial if there's more time. Given only 4 days away, will NOT initiate bb. Aim for non-malevolence.

Q10- Bronchial anatomy for DLT placement, 70.8%

Draw a diagram illustrating the bronchial anatomy to the level of the lobar bronchi and describe how you'd use fibreoptic scope to correctly position a R/ DLT



Positioning R/ DLT with FO:

- Place DLT with R/ rotational movement as tube is advanced (with patient's head slightly turned left)
- Check position – 170cm ~29cm; 10cm taller or short should adjust deeper or shallower by 1cm.
- Use 4.2mm bronchoscope, suitable for size 35Fr DLT.

Check

- Enter tracheal lumen, continue ventilate right side, see primary carina + bronchial lumen going into R/main bronchus (ensure cuff is just visible and no bronchial cuff herniation).

Check R/ DLT

- Then ensure RUL ventilating port is in correct position with RUL bronchus
 - Entre RUL bronchus confirm trifurcation
- Come back and move distally see RML + RLL + secondary carina.

NB.

- Neonate bronchoscope = 2.2mm; paed = 3.2mm.
- < 6 yrs - elective bronchial intubation or bronchial blocker
- 6-8 yrs - bronchial blocker, bronchial intubation, univent
- 8 yrs - bronchial blocker, bronchial intubation, univent, DLT

Q11- SAH clipping management, 56.4%

A 40 yo otherwise health male presents following a sub-arachnoid haemorrhage. He is scheduled for clipping of a middle cerebral artery aneurysm. Outline the major issues in providing anaesthesia for this patient and describe how you would address them.

Issues for anaesthesia and management

- Patient
 - Grade of SAH based on WFNS?
 - Predicts severity of raised ICP? Conscious level?
 - CVS instability assoc with SAH?
 - Neurogenic pulm oedema?
 - Electrolyte disturbance? From CSWS/SIADH/DI.
 - Obtain routine/important AMPLE history and airway exam.
- Anaesthesia
 - Airway: access limited
 - Ensure good secure
 - Airway reflex needs to be obtund on intubation to avoid secondary bleed: remi/TIVA/muscle relaxation. Phenyl to counteract hypotensive effect from induction.
 - Ventilation → likely have pulm oedema; use lung protected strategy with PEEP to maintain oxygenation.
 - Maintain normocarbida
 - Circulation: maintain MAP, ensure euvolaemia. May need to have transient drop in BP to help with surgical bleed control + clipping.
 - Minimize BP changes at crucial parts: intubation, pins, incision, extubation (= key point from report)
 - D:
 - Optimise CPP; maintain oxygenation/MAP as above. Optimize venous drainage: head neutral, no compression over neck venous drainage.
 - Be vigilant of potential rupture, seizure; treat with phenytoin, BDZ if seizure occurs.
 - Drug: TIVA optimally maintains cerebral autoregulation and potentially confers best neuroprotection; avoid nitrous. Consider mannitol, conc salt as required.
 - Consider ICP monitor, lumbar drain
 - E: maintain normothermia, normoglycaemia.
 - M: routine monitor as per ANZCA guideline + A-line preinduction.
- Surgery
 - Bleeding risk → ensure valid G/H + large IV access.
 - May perform temp clipping before definite clipping, ensure optimal collateral BF by maintaining high normal MAP.

Postop:

- HDU/ICU for ongoing care and neuro-assessment.
- Vigilant of rebleed esp in first 24 hours.
- Vigilant of vasospasm esp first 2 weeks: prophylaxis w nimodipine; HHH therapy if vasospasm occurs.

Q12- respiratory distress post thyroid surgery, 63.4%

Describe management of patient post-total thyroidectomy who has resp distress in PACU

Simultaneously maintain oxygenation with supplementary O2 while consider differentials.

Differentials include:

- Tracheomalacia
- Hypocalcaemia
- Recurrent LN injuries
- Oedema of airway
- Iatrogenic PTX.
- D-bleeding / haematoma
- Others anaesthetic differentials include:
 - A. laryngospasm, aspiration, anaphylaxis
 - B. bronchospasm
 - C. MI
 - D. Oversedation, Residual NMB, Drug error

Mx:

- Call for help + inform Surgeon to review ?haematoma
- ABCDE approach:
 - A. support/maintain airway: chin lift, jaw thrust;
 - suction if aspiration, ?haematoma needing release of suture line
 - temporize measure with adrenaline neb + IV dex if not given already; consider heliox
 - meanwhile assess need for re-intubation and set up equipments for inhalational induction, SV technique; or RSI if bleeding concern, full stomach.
 - ENT presence for tracheostomy back up + control of bleed.
 - B. FiO₂ 100%; nasoendoscopy to assess RLN integrity and cord positions
 - CPAP
 - Assess pneumothorax: neck distension, hyperinflated lung, decreased sound; bronchospasm – wheeze?
 - C. maintain MAP >65; any presence of shock or ECG changes?
 - D. assess anaesthetic chart and consider reversibility of any sedatives/NMB? –
 - Naloxone, neostigmine/sugammadex, flumazenil, doxapram.
 - E. assess electrolyte, replace Ca as required, keep level >2 or ionized Ca >1.
 - Postop: need ICU/HDU for ongoing management and airway obstruction settles before extubation.

Q13- establishing paediatric surgery service in local hospital, 13.9%

Outline steps to take to ensure safe introduction of elective paediatric surgery at your local private hospital

Consult ANZCA PD on paediatric surgery in general hospital without dedicated paediatric facilities + monitoring, and airway equipment.

- **Introduction of paediatric surgery require MDT approach involving Surgery, Anaesthesia, Nursing, Administrative support.**
- **Consult regulatory authorities: local, state and national and set up local group to consider scope of practice which will include:**
 - Formulation of local protocols
 - Policies for patient selection (age >1yo, ASA <3, minor-intermediate surgery)
 - Policies for transfer: neonates, prem baby, ex-prem baby <52 post conceptual age, hx of apnoea, or complex medical/surgical problems.
 - Importantly, Consult other local hospitals / Paediatric specialty centre for advice/review.
- **MDT approach on implementation strategies, which will require preparation of:**
 - Staff training for Anaesthesia, Surgery, Nursing (Ward/PACU) on management of Paediatric Surgical patients + training with paediatric equipment.
 - Equipment purchase
 - Airway
 - Circuitry, ventilators
 - Cannulas, BP monitor, defib
 - Fluid, infusion pumps
 - Drugs, prescribing guidelines
 - Tempcontrol in theatre, air conditioner, to ensure adequate thermomaintenance for paediatric patients
 - dedicated/separate ward facilities for patient and family care, interview.
 - + Gradual implementation of plans and ongoing formal review/QA of the whole undertaking.

Q14- chronic pain, methadone conversion, 35.6%

Healthy 28yo male has persistent pain 12 weeks after compound # to lower leg and now on slow release oxycodone 80mg BD and oxynorm 20mg Q4h. Discuss pros/cons

of switching opioid to methadone in this situation and how this may be achieved safely.

Pros

- formulation of methadone has various forms: PO, IV, rectal
- no active metabolite
- long duration
- additional efficacy with NMDA antagonism +/- reduced reuptake of SSRI/NAdR -> enhanced descending inhibitory pathway.
- Less constipation

Cons

- Less familiarity among Anaesthetists
- Conversion can be difficult and ratio is a rough guide. Interindividual variability + between dose (ie higher vs lower dose) variability exists.
- Pain control may be inadequate initially and close monitoring titrating to effect is essential.
- Titration is slow, should allow 72 hours for peak effect to be seen before further titration.
 - o Meanwhile, continue with short acting oxycodone for breakthrough pain.
- Common metabolic pathway via CYP 3A4, 2D6; competition with other drugs
- Long, widely variable elimination half life!
- Can prolong QT, needs ECG monitor.

Switching to methadone

- Pain assessment + discussion with patient regarding switch.
- Safe switch should encompass
 - Calculation of equianalgesic dose based on FPM published opioid conversion table.
 - I'd start at a lower dose, considering incomplete cross-reactivity between opioids; ie reduce equianalgesic dose by 30%.
 - I'd divide the dose into BD regimen, then titrate up to target dose Q3 days.
 - In the meantime, use oxycodone as rescue analgesia.
 - Ongoing regular review by APMS for efficacy/compliance.

Q15- statistics, sample size discussion, 65.8%

How is an appropriate sample size for a clinical trial determined?

What are the ethical implications of using an inappropriate sample size in a clinical trial?

Sample size determination

- Consider factors such as
 - o effect size – what's clinically significant difference; the smaller the effect size, the larger the required sample.
 - o Power – usu. >80% - which describes certainty of picking up the true effect; higher power require larger sample
 - Ie type 2 error (beta) set to be <0.2 to accept null hypothesis
 - o Significance level – which describes the limit above which false positive due to chance is considered to be unlikely, usu. 0.05; the higher the significance level, the larger the sample size.
 - Ie type 1 error (alpha) set to be 0.05 to reject null hypothesis
 - o Variance of sample – describes the variability of study outcome within sample (difference in means); which can be estimated from pilot studies or literature search. The larger the variance, the larger the sample required; rare events require a larger sample size.
 - o Drop out / withdrawals – need to be accounted for; therefore increase the calculated sample size by 10%; also allows for margin of error in estimate of variance.

Calculation

- Computerised Statistical softwares, which formulated to calculated sample size based on factors described above.
- Published tables

Ethics of an inappropriate sample size

Ethical consideration

- Sample size too small
 - Lacks precision to provide reliable answers (type 2 error); result may be misleading and put subjects at risk
 - Wastes time and resources
- Sample size too big
 - Waste resources, money/time.
 - Potentially delaying initiation of a therapeutic benefit hence prolonging suffering in those denied treatment.
- Trials must have sample size calculation protocol (power analysis)
- If adequately powered study has an unexpected large effect, it can and should be stopped early by data/safety committee who should be overseeing the study.

Oct-2008, 50%

Q1- safety feature of vaporizer, 43%

Outline the operating principles and safety features of a modern variable bypass out of circuit vaporiser.

Safety features

- Temp compensation
- Flow compensation

Principle:

Plenum: out of circuit, vaporiser where a liquid/vapour phase of VA is kept in equilibrium, at saturation, at the temp set, and vapour uptake driven by positive upstream FGF. Manual dial allows splitting ratio of bypass/vaporiser chamber stream to be set → allows adjustment of VA conc.

Safety features related to prevent wrong VA used, minimise VA % inaccuracy,

Temp compen → heat sink high heat capacity so latent heat vap rapidly equilibrated with container/container with environment. **So change temp minimized in VA.**

Flow adjustment with temp changes ie. Up flow with down temp, so overall VA conc is maintained; this is achieved by bimetallic strip/metal rod.

Or direct addition of known quantity of VA to FGF. eg desflurane dual circuit gas blender.

Flow compen → ensure sat, by **metal or fabric** wick/strip max surface area → **flow independence.**

Pumping effect (remix of vap with FGF/back pressure from ventilator) minimised by pressure valve or ensure channel length long enough from vaporiser outlet.

- **Vap positioned upstream from O2 flush, so reduce risk of sudden inc flow.**

Agent specific vaporiser (required due to differing phys/chem Properties, hence **calibration.**), colour coded/filling port key indexed/spindle O-ring tight fit **from back bar/anti-spill device/Interlocking system/closing mechanism/visible agent level/warning system re: low fill.**

Q2- lower ant wall regional block (repeat), 57%

Describe the innervation of the lower anterior abdominal wall from the umbilicus to the pubic symphysis. Describe a technique of peripheral nerve block (not wound infiltration) to provide post- operative analgesia for a low transverse abdominal incision.

Innervation

branches of 10th, 11th, 12th (subcostal) intercostal nerves
ilioinguinal n
iliohypogastric n
genitofemoral n

Anatomy:

The anterior divisions of T7-T11 (ant rami)—> intercostal space

- enter abdominal wall between **IO + TA until reach RA** —> perforate and ending as anterior cutaneous branches supplying the skin of the front of the abdomen.

-Midway in course, around mid-axill line —> **pierce EO —> lateral cutaneous branch** —> anterior and posterior branches that supply the EO and latissimus dorsi respectively.

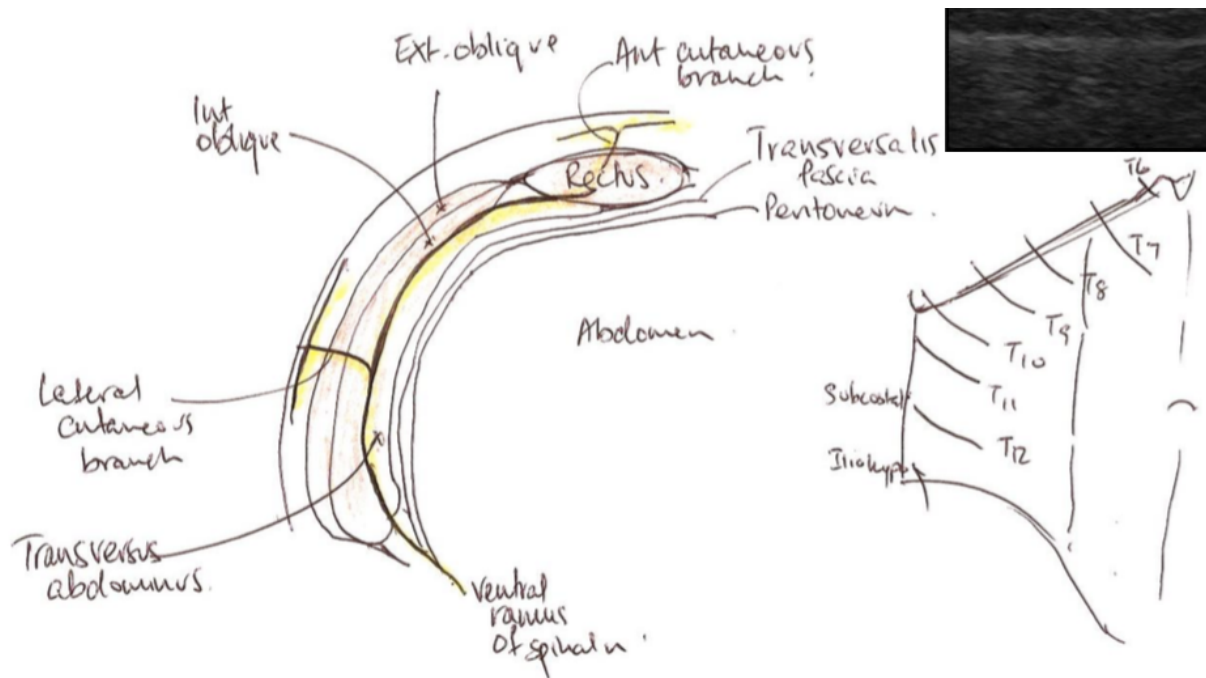
~~The anterior branch of T12 communicates with the iliohypogastric~~

~~——— Its lateral cutaneous branch perforates the IO + EO muscles and and supplies sensation to the front part of the gluteal region.~~

The iliohypogastric nerve (L1) divides between IO + TA near the iliac crest —> lateral and anterior cutaneous branches, the former supplying part of the skin of **the gluteal region while the latter supplies the hypogastric region.**

The ilioinguinal nerve (L1) communicates with the iliohypogastric nerve between the internal oblique and transversus abdominis near the anterior part of the iliac crest.

—> It **supplies the upper and medial part of the thigh and part of the skin covering the genitalia.(3)**



Technique: CALM, SOBER, PLANS,

A-lateral/supine

C-clean technique

T-time out

I-image probe transversely placed at MAL, between IC + costal margin with HFL probe.

O-ensure 3 muscle layers clearly identified

N-note underneath peritoneum

S-instill LA in between IO + TA - 20mls of 0.2% ropivacaine for postop analgesia on both left and right

in plane: needle introduced medially, in-line with the US, until reaches the layer between internal

NB.

- I (twice) get laid on Friday – iliohyp, ilioingui, genitofem, lat cut ner, ob, femoral
 - ie lumbar plexus = L1-4 primarily, but with contribution from T12 to the two 'I' nerves.
 - 2 from L1 – (iliohyp/ilioing)
 - 2 from L2 (but also 2 from 2 spinal nerves) – genit, lat, fem
 - 2 from L3 (but also 2 from 3 spinal nerves) – obt, fem
 - all except 'I' receives L2.
- sacral plexus = L4-S4;
 - Sacral plexus; 5 nerves: SIPP + sciatic = L4-S3 – sup gluteal, inf gluteal, post cutaneous, pudendal, sciatic

Q3 – venous air embolism (repeat), 91%

What would make you suspect venous gas embolism during a surgical procedure? Briefly outline the principles of management of venous gas embolism causing haemodynamic compromise – see 2011A Q7

High risk procedures:

- Post cra fossa
- Intraperitoneal insufflation
- Beach chair

Mx principle

- Emergency, notify Surgeon, stop surgery, call for help.
- Airway: intubate
- Ventilation: FiO₂ 100%. Stop N₂O if in use.
- CVS: as per ACLS, CPR (even if not in arrest) may help to break up air bubble to smaller size, less obstruction.
 - Trendelenburg/right side up to reduce outflow obstruction.
 - Support RV function – volume, inotrope/milrinone, vasopressor; minimize PVR.
- Immediately prevent further air entrainment:
 - Lower operative field to below level of heart. Flood surgical field with saline.
 - Bone waxing, occlusion of open vein.
 - Jugular venous compression if intracranial surgery
 - Use of PEEP controversial: balance risk of paradoxical emboli through PFO with potential benefit of increase venous pressure.
 - CVL placement with tip close to RA to aspirate air.
- Postop: ICU. Consider hyperbaric O₂ therapy/referral.

Q4- safe handover to colleague , 63%

In what circumstances is it permissible to permanently hand over responsibility for an anaesthetic to a colleague and how would you ensure that this handover occurs safely?

Handover circumstances:

Personnel

- fatigue, illness,
- other legitimate commitment
- has suitable, competent and willing colleague to hand over to

Circumstances

- ideally, patient is clinically stable, without foreseeable adverse events or require any anaesthetic intervention imminently eg. induction or emergence.

Points to ensure safe handover should include:

- all facts relevant to safe management of patient
- Patient: Hx, exam, invx
- Surgery: nature, stage of surgery

- Anaesthesia: airway, vent technique, IV access, fluid therapy, incidents, allergies, drugs given
- The to wrap up:
 - Postop plan, destination
 - Ensure documentation up to date
 - Ensure Colleague has all questions answered
 - Levae contact detail
 - Notify Theatre Team.

Q5 – Periop VTE prophylaxis (repeat), 45%

An otherwise well 60 yo man having radical prostatectomy. List+briefly evaluate strategies to prevent periop thromboembolism

Q6- meningococcal sepsis management, 71%

You are covering ICU in your local district hospital when a 14-year-old boy presents to your emergency department obtunded and hypotensive with a rash suggestive of meningococcal sepsis.

Describe your resuscitation.

This is a medical emergency!

Declare emergency to ED staff and obtain help with resus;

Simultaneously assess patient + resus with ABCDE + early antibiotics!

- AMPLE history + airway, cardio/resp exam.
- A – maintain open airway with jaw thrust, chin lift; will need to consider intubation to protect airway if patient's LOC deteriorates eg. GCS <8; however, in the first instance, systemically cover resus until help available to provide resource for intubation
- B – FiO2 100% + monitor sats to ensure adequate saturation > 92%;
 - ABG to check for adequacy of ventilation; avoid resp acidosis which complicates metabolic acidosis leading to severe acidaemia
 - Will need IPPV after intubation is established; maintain low normal CO2 35mmHg
- C – patient is hypotensive and will require fluid resus to assess response.
 - IV access (+ blood culture, FBC/UECr/Coags/LFT)
 - Give 500ml boluses increments to assess effect, continue until no longer responsive; in which case vasopressor should be used.
 - In context of severe sepsis, noradr via CVL is appropriate.
 - Titrate to maintain CPP >60mmHg (if obtunded, likely has increased ICP; hence aim for MAP >80mmHg).
- D – antibiotics: 3rd gen cephalosporin – ceftriaxone 2g IV BD.
 - Dexamethasone 8mg IV given before antibiotic providing it's not delaying AB treatment.
- Monitor: NIBP, ECG, Sats, temp, IDC; when resource is available, art line + CVL should be established. Admit to ICU for ongoing care.
- Should investigate with CXR, Urine sample + consider CT scan to assess for other causes of obtunded GCS + signs of increased ICP. LP should be performed after contraindications have been ruled out: ie high ICP, coagulopathy, local infection.
- Family meeting with diagnosis, treatment progress + consider AB prophylaxis.

Q7- cerebral palsy management (repeat), 31.5%

A 6-year-old girl with severe spastic cerebral palsy presents for major orthopaedic surgery to correct lower limb deformities.

Outline the implications of cerebral palsy for anaesthesia management for this operation.

CP

- = diverse group of neuro disorders characterized by varying deg of motor, sensory,

intellectual impairment

Anaesthesia mx for major ortho surgery

- Pre
 - Thorough preassessment as ortho surgery is major, can be long, painful, involve significant bleed.
 - Specifically in CP, look for:
 - A- TMJ dislocation due to spasticity, potential difficult airway. Fixed flexion deformity?
 - B- Scoliosis – restrictive LD; hx of CLD from prematurity?
 - C-Cardiac complication of RLD → pulm HTN, RHF
 - Will need MDT consult re: periop mx of cardiac complication.
 - D-Epilepsy, intellectual disability?
 - GI-GORD? – consider aspiration prophylaxis
 - MSK-spasticity?
 - Routine/important AMPLE history + airway, cardio/resp exam.
 - Invx: if known RLD, may have PFT and ECHO – assess to establish baseline function.
- Intra
 - A- Protect airway in view of frequent GORD, oesophageal dysmotility; if severe GORD, perform modified RSI; Sux isn't contraindicated. If apparent difficult airway, consider asleep SV technique with FOI, or FOI through LMA.
 - B- if RLD, need ventilator strategy w small Vt, higher RR +/- permissive hypercapnoea (but avoid if known pulm HTN); key = avoid barotrauma.
 - C- if pulm HTN, RHF, need to careful avoidance of worsening pulm HTN (acidosis, hyperCO₂, hypoxia); and may require pulm vasodilator eg. sildenafil.
 - D- epilepsy care, avoid epileptogenic drugs eg. tramadol, etomidate; continue with anticonvulsant periop. Ensure PONV prophylaxis to encourage continuation of PO meds.
 - Other drug: multimodal analgesia +/- regionals should be used.
 - E- careful maintenance of temperature, avoid hypothermia which worsens spasm.
 - MSK: need continuation of anti-spastic; care with positioning which may be difficult.
- Post
 - Ongoing monitor/maintenance of stable vital signs.
 - Analgesia options – expect high requirement, use epidural +/- opioid +/- ketamine infusions.
 - Likely have increased opioid sensitivity – need close monitor.
 - Ensure continuation of regular meds eg. anti-epilepsy, anti-spastic.
 - Consider ICU/HDU.

NB.

-sux isn't contraindicated

Q8- preeclampsia management, 61%

A 25-year-old primigravida patient presents to the delivery suite at 38 weeks gestation complaining of a headache and difficulty with her vision. Her BP is 180/115 and she has clonus. Cardiotocograph monitoring shows no indication of foetal distress.

Outline your initial management of her preeclampsia.

Q9- peribulbar block, 78%

Describe a technique of peribulbar block for cataract surgery.

Describe how you would minimise complications of this block.

Peribulbar = instil LA into within orbit **outside fibrotendinous ring of extraocular recti muscles.**

Preparation:**CALM&SOBER, PLANs&ACTIONS**

- Consent, assistant, line, monitor.
- Consider Sedation, oxygen supplement and have equipment for resus available, as required.
- Needle-25G 2.5cm sharp needle, local-6-10 mls of bupivacaine 0.5%+2%lignocaine mix + hyalase 15u/ml.

Technique

- Arrange patient (supine, gaze **neutroal**), aseptic technique, timeout.
- LA drop: **oxybuprocaine 2 drops then iodine 2 drops**
- Blood vessels are rich in superonasal quadrant (ophthalmic artery/optic N); hence approach = 2 injections classically. (**infero temporal, midline superior**).
 - Inferotemp: access point = vertical line down from latera limbus to inf border of orbital rim.
 - 1mm above this point, needle entry vertically in until approximately at **post pole of globe (20-25mm)**;
 - walk off bone carefully slight superomedially
 - **watch eye for any rotational** movement which indicates sclera contact = redirect needle inferolateral to avoid sclera perforation
 - **negative aspiration, then ~3-5mls of LA.**
 - **Stop inject if globe becomes tense!**
 - Apply **gentle digital massage or use Honan balloon** to dissipate LA.
 - Midline superior access = 1mm below midline of superior orbit, needle vertically in to ~post pole, negative aspirate, LA~3-5mls.

Complications + risk minimisation:

- Still risk of **perf.** (may be even higher risk than retrobulbar)
 - watch for globe rotational movement;
 - **avoid in pt with axial elgnth >26mm**
- **Haemorrhage**
 - Avoid if INR>2 or coaguopathic
 - **Avoid superonasal approach – rich in blood vessels**
- Infection – aseptic technique
- Optic N damage – ensure neutral gaze, avoid superonasal approach
- **Retrobulbar** blok – watch for early ptosis and proptosis; then consider smaller volume.
- **Brainstem** block → ensure negative aspiration/no CSF or blood drawback; anticipate potential risk and have resus equipment available.

Q10- cerebral vasospasm management, 66.7%**Discuss the management of cerebral vasospasm following the coiling of a cerebral aneurysm.****Aim**

- Risk stratify based on WFNS or Fisher (which predicts vasospasm+prognosis)
- Prevention with nimodipine prophylaxis as soon as practical after SAH diagnosis


- Optimal supportive measures to ABCDE – maintain oxygenation > 90%, Hb >70g/L; maintain low normocarbida, normothermia/normoglycaemia
- Manage ICP
 - In addition to supportive measure, perform HHH therapy and maintain CPP
 - Minimize rise in ICP – mannitol, conc salt, EVD drain, treat seizure/pain
 - Consider ICP monitor to guide CPP management
 - Reverse vasospasm
- Close monitor of patient's neuro status in HDU/ICU – vasospasm risk remain elevated up to 2 weeks post SAH.

Vasospasm Management

- Nimodipine
 - 60mg NG Q4h or 1-2 mg/hr IV, but balance risk of hypotension
- HHH therapy
 - ICU book: HHH: up MAP titrate to neurology, then maintain (likely MAP 90-110 or MAP + 15%). If no improvement after 2-4 hours, consider interventional radiology.
 - hypervolaemia to increase MAP (unless LVF), which will also achieve; CVP>12mmHg
 - haemodilution HCT 30-35% - decrease vascular resistance, optimize flow
- Interventional radiology: consider intra-arterial vasodilator-GTN, papaverine

NB.

Table 16.2 World Federation of Neurosurgeons grading of subarachnoid haemorrhage

Grade	GCS (see  p. 852)	Motor deficit
1	15	–
2	13–14	–
3	13–14	+
4	7–12	±
>5	3–6	±

Q11- chronic pain development, 53%

List the risk factors for the development of chronic pain following a surgical procedure.

Outline possible mechanisms for the progression of acute to chronic pain

Chronic pain = pain persist despite having recovered from initial tissue injury. ie persistent pain >12 weeks.

Risk factors = usual for PPP +

- Patient
- Surgery – high degree of tissue destruction; postop radiation, chemotherapy.
 - High risk surgery type = amputation, breast surgery, thoracotomy, inguinal hernia repair, CABG, LSCS/hysterectomy
- anaesthesia

Mechanisms for progression to chronic pain

- Peripheral sensitization/inflammation (subP, leucotrienes, calcitonin gene-related peptide) → allodynia, hyperalgesia, dysaesthesia
 - Formation of neuroma/nerve spouting may contribute to peripheral sensitisation
- Central sensitization: neuron in dorsal horn sensitized via neurotransmitters on NMDA-R; NK1-R → cause altered gene expression, protein expression, neuronal changes at spinal cord level → wind-up
- → wind-up / NMDA trigger → central neural sensitization
- Other central changes:
 - Changes in somatosensory cortex may lead to development of phantom limb pain
 - Impaired descending inhibitory pathway post CVA, spinal injury
 - SNS involvement – type 1 following tissue injury; type 2 following nerve injury.

Q12 – IABP discussion, 59%

List the indications and contra-indications for the use of an intra-aortic balloon pump. Describe how its performance is optimized

IABP – improve ventricular function by

- Increase myo O₂ supply
- Decrease demand (decrease afterload + enhanced Windkessel effect).

Indications

- Severe/refractory systolic function impairment, failed medical treatment
- Cardiogenic shock
 - Post MI
 - Bridging to cardiac transplant
 - Post MVR
- Symptom control in severe CAD as bridging to imminent CABG
- Weaning from CPB
- Acute MR, VSD leg from AMI

CI:

Absolute

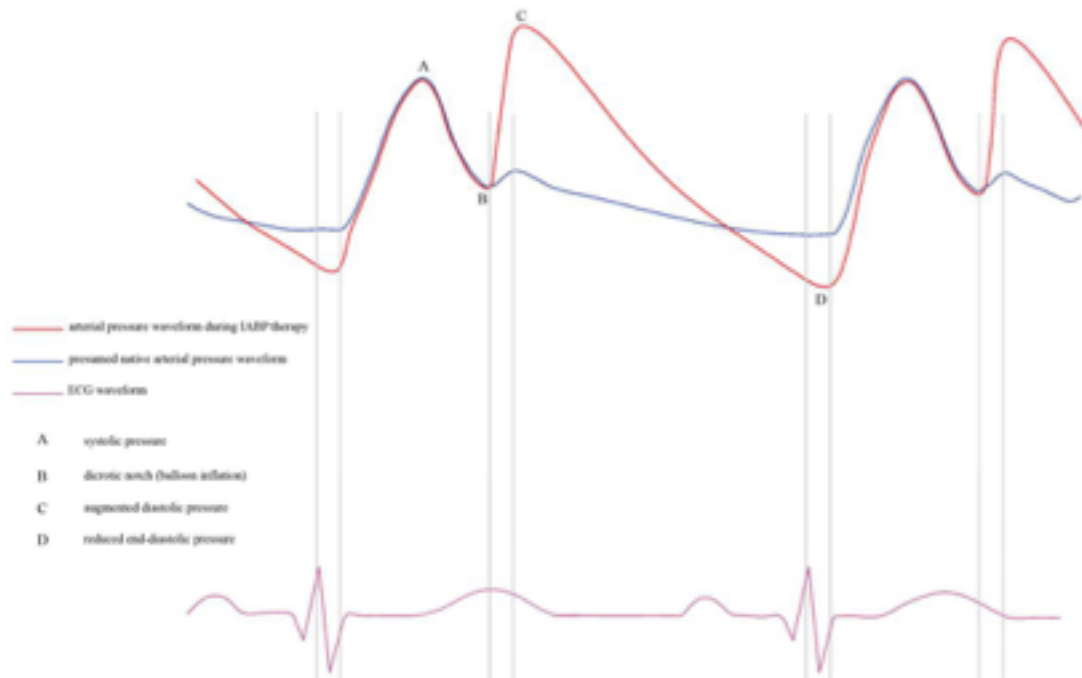
- Aortic regurgitation (>mild)
- Aortic dissection
- Chronic end stage heart disease with no anticipation of recovery
- Aortic stents

Relative

- Aortic trauma or aneurysm including AAA
- Tachyarrhythmia
- Uncontrolled sepsis
- Severe PVD
- Coagulopathy

Optimise performance:

- Size of ABP, balloon volume
- Positioning (3-5cm distal to L SCA)
- Correct trigger = 'counter pulsation'
 - Inflat: arterial pressure trace (dicrotic notch) or ECG (T wave midpoint)
 - Deflat: prior to upstroke & R wave ECG
 - Use arterial / aortic trace intraop, as diathermy interferes with ECG trace!
- Helium for inflation/deflation (low density)
- Sinus rhythm if possible, rate controlled
- Set at 1:1, 1:2, 1:4



Q13- statistics, definitions, 53%

Explain the terms sensitivity, specificity, positive predictive value and negative predictive value when applied to a diagnostic test.

	Disease present	Disease absent
Test positive	True positive (TP)	False positive (FP)
Test negative	False negative (FN)	True negative (TN)

Sensitivity = true positive / (true positive + FN)

- I.e rate of true positive (how many true +ve is picked up of all +ve)
- Ability of test to detect disease among patients with the disease
 - otherwords, high sensitive indicates low false negative rate, in which casce a negative test result is useful at ruling disease out

Specificity = true negative / (true negative + FP)

- I.e rate of true negative (how many true –ve is picked up of all –ve)
- Ability of test to rule out disease among participants who don't have the disease
 - Other wrods, high specific indicates low false positive rate, in which case a positive test result is useful at ruling disease in

PPV = TP / (TP + FP)

- I.e likelihood that disease is correctly identified by a positive test

NPV = TN / (TN + FN)

- I.e likelihood that disease is correctly ruled out by a negative test

PPV & NPV considers prevalence of the disease.

- If disease is common, then a positive test is truly likely to indicate presence of disease; hence PPV would be higher.
- There's reciprocal relationship between sensitivity and specificity

NB.

Just remember definitions. Don't overthink.

Bayes Theorem: $PPV = \text{sensitivity of test} \times \text{prevalence} / \text{number of positive tests}$

Q14- impaired colleague (repeat), 69%

What are the signs that may make you suspect opioid abuse in a colleague?

If you had suspicions of opioid abuse in a colleague outline the principles that should guide intervention.

(following points from Auckland slide) – there's also the SAQ practise

Base management on ANZCA Welfare doc guidance on substance misuse

Patient safety is priority while investigation takes place. If immediate risk likely, needs immediate action.

Signs of opioid abuse / Factors

- Difficult to detect and need high index of suspicion
- Major signs
 - IV access arm, injection marks, swabs/needle/ampoules seen outside of clinical environment eg. changing room/home, observation of self-injection.
 - Falsification of record, signing out increasing quantities, inappropriate high quantity for case, discrepancies in record, illegible/inaccurate/altered recordings; consistent complaint of pain in patients of the anaesthetist.
 - Major change in mood, behaviours, tremors, withdrawal symptoms, intoxicated.
- Minor signs
 - Blood stained cloth, carrying syringes/ampoules in clothing
 - Isolation, refusing breaks, willing to relieve others, volunteer for more on calls afterhours, seen in unusual places in OT, remaining in hospital when off-duty
 - Increased sick leave, unavailability, social withdrawal.
 - Increased accidents or mistakes, unsatisfactory work records.

Principles of intervention (prepare, intervene, post-intervention)

- Confidential investigation – involve welfare Officer, HOD; gather information.
 - Contact previous employers
- Plan for actions
- MDT approach with contingency plan
 - Intervention early in day
 - Colleague well-being is essential and must continuously monitor for suicidal risk

then

- Support: return to work

- Take Time to listen
- **Outline** team roles – including Psych assessment
- **Notify** – doctor of meeting / purpose. Need support person?
- **Escort** – at all times; immediate inpatient facility for detox program (2-3 months treatment time recommended).
- **Document**
- Statutory reporting requirements
- Future retraining opportunities
 - Regulatory Body requirements – AHPRA / MCNZ
 - Health monitor
 - Active preventative programs

NB.

Statutory reporting:

- Regulatory bodies: AHPRA/MCNZ – Australian Health Practitioner Reg. Agency
 - HPCAA 2003 – health pract competency assurance act – mandatory report
 - Mandatory reporting is governed by MCNZ, not by Law.
 - Failure to report isn't a criminal act, but may be a breach of professional obligation set out by MCNZ → disciplinary proceedings.
 - However, if failure to report leads to patient harm, patient may sue the person who failed to report.
- Law = cannot practise if dysfunctional; including judgement, skill, knowledge, behavior, infection risk.

Q15- OSA management, 86%

What symptoms and signs suggest the presence of sleep apnoea in a patient presenting for pre- operative assessment?

How does the presence of sleep apnoea alter your anaesthetic plan?

May-2008, 47%

Q1- Oxygen storage and delivery description, 52%

Outline how oxygen is stored at the hospital and delivered to operating theatres up to and including the wall outlet. In your answer include features that ensure the safety of the system.

O2 =

Storage

- In VIE (vacuum insulated evaporiser)
 - Liquid at -189C (BP=-180C); pressured at 10 bar; double walled, vacuum insulated from environmental temp; has pop-off valve safety mechanism to avoid over-pressurisation/explosion with increasing pressure from increasing temp. Can be heated to increased demand and maintain operating pressure.
 - Supported by 3 legs including 1 measuring weight/content of VIE + alarm.
 - Stored away from main hospital building, fenced, no smoking in vicinity

- Specific indexed connector so only O₂ can be refilled into VIE.
- Back up oxygen cylinder
 - Oxygen cylinder, various sizes – eg. C in Aus/A in NZ.
 - Pressurized gas; full cylinder = 137bar
 - Amount proportional to pressure
 - Bank of multiple cylinders + back up.
 - Filling ratio monitored to prevent explosion of cylinder in extreme temp

Delivery

- VIE to OT gas outlet
 - Safety mechanism: unique size from other gas pipes, labeled, valve to ensure unidirectional flow, pressure regulated down to 4 bar in pipeline; monitored with alarm when 20% pressure change detected which shuts off valves downstream to every OTs. Heating system to maintain stable temperature in pipeline.
 - Has connecting valve to backup oxygen cylinder manifold should VIE supply fall below 4bar.
- Gas outlet
 - 4 bar
 - safety: colour coded, NIST (non-interchangeable screw-threaded connection), self closing valves, gas checked with Pharmacist, alarm system in place of loss of supply.
 - Oxygen = white, N₂O = blue, air = black/white.
 - + colour-coded hoses to machine.
 - Ability to close off oxygen supply to designated area should emergency occur eg. fire/explosion

NB.

Cylinder – 160000kpa → 400kpa

Nitrous oxide - stored as a liquid with vapour on the top at a pressure of 4400 kPa.

Q2 – RA arterial line evaluation, complication, 69%

Why is the radial artery a common site for arterial cannulation? What complications may occur from radial artery cannulation and how may they be minimised?

RA used commonly

- Superficial anatomy
- Dual supply of hand by radial/ulnar arteries, as safety feature if RA occludes
- Discrete from nerves
- Relatively clean area, less risk of infection
- Correlate well with central BP
- Easy to access wrist.

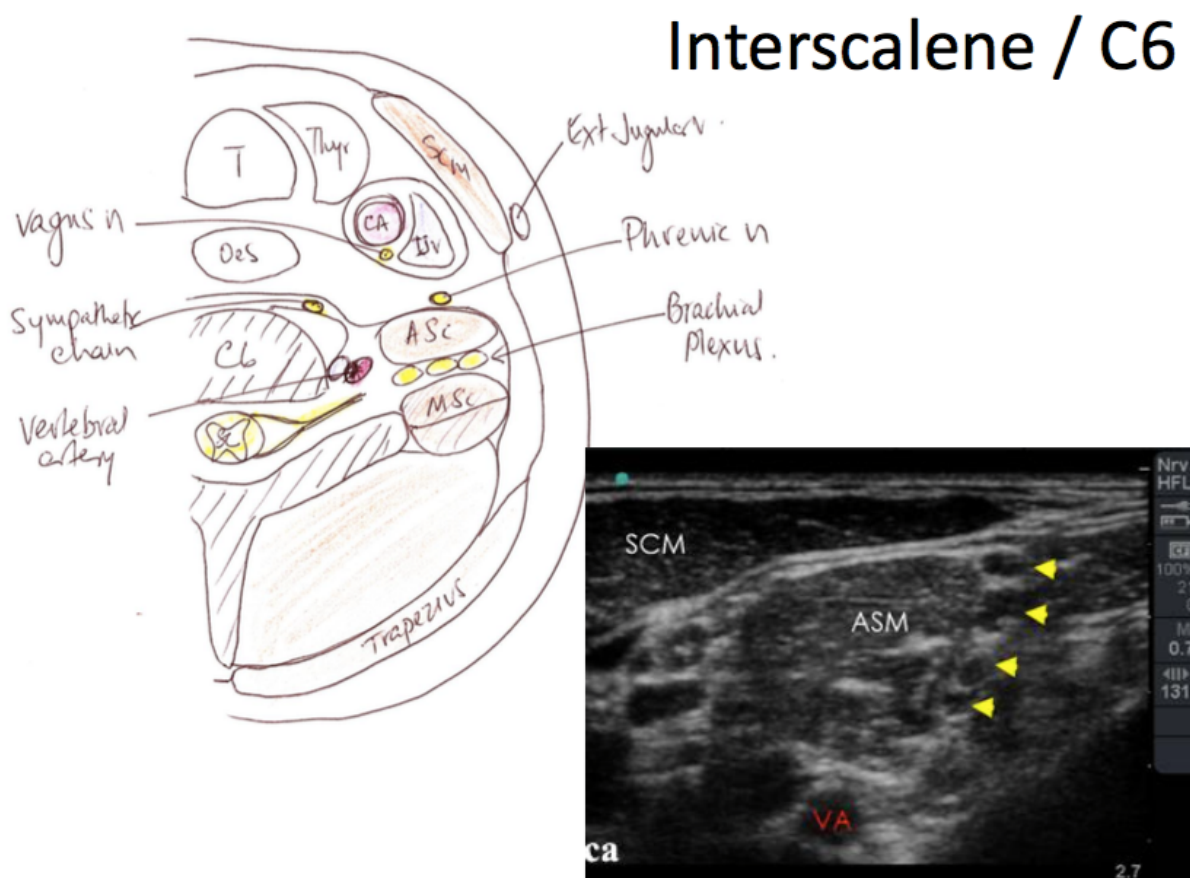
Complications + risks minimization

- Haematoma/bleed
 - Avoid multiple attempts if difficult and use USS guidance
 - Ensure tap closed when not in use.
- Infection

- Aseptic technique on insertion. Clear dressing over line to allow early detection; aseptic technique during sampling from line.
- Thrombosis
 - Remove arterial line asap when not required
 - Pressurized saline bag connected to art line, intermittent flush to prevent line occlusion.
- Ischaemia to hand
 - Allen's test prior to cannulation, however this has poor PPV and NPV.
- Inadvertent arterial injection
 - Ensure clear label, injection port protected by red coloured cap, red line on catheter to indicate its arterial line.
- ~~Inaccurate reading (bubble trapping, disconnection, inaccurate transducer level)~~

Q3- interscalene regional, 49%

Describe the anatomy of the brachial plexus relevant to performing an interscalene block under USS. Include a drawing illustrating the real or sonoanatomy you'd expect to see in a transverse view of the brachial plexus at the point of needle insertion.



Anatomy description:

- Brachial plexus between ant + mid scalene muscle
- C6 = mainly roots + trunks
- Adjust until C5-7 seen; lateral approach, ensure other vulnerable structures not injured by visualizing needle tip continuously away from vulnerable structures
 - Vessels: carotid, jugular. → aspirate before inject.

- Carotid sheath ant to ant scalene muscle
- Phrenic N. anterior to ant scalene.
- Thoracic duct; antmedial to scalene muscle
- Dome pleura (inferior than C6)
- Verteb artery in transverse process
- Cervical SNS ganglion: medial to carotid sheath; antlat to vertebral body.

Q4- Fat embolism syndrome, 73%

Describe the clinical features and treatment of FES

FES:

- Usu. post long bone #, 1-3 days (rarely <12 hours). Or DM, pancreatitis, alcoholic liver dx, bone tumour lysis etc.

Features

- Classic triad of petechiae, CNS/confusion->coma; Resp-dyspnoea->arrest
- Others: fever, CVS-tachy->right heart strain, plm oedema, pulm HTN, thrombocytopenia.

Mx

- (this isn't required by report) Consider differentials – anaphylaxis, PE, PTX, CVA etc.
- early immobilization / reduction of #.
- largely supportive.
- ABCD approach
 - Avoid worsening of PVR; consider NO, sildenafil, milrinone, RV support.
- Surgical prevention:
 - Avoid high intra-medullary pressure during rodding; vent hole.

NB. Know differences between:

- Fat: pulm HTN/pulm oedema, CNS, rash
- Cement implant: similar to FAT, but more CVS feature; similar to anaphylaxis + pulm HTN/RHF
- Air: CO₂, hypotension, tachycardia, JVP, right heart failure.
- Amniotic fluid: anaphylactoid

Pathogenesis of FES: (cause is still unknown)

- **Mechanical** theory – obstructive microemboli
- **Biochem** theory – degrade of fat -> FFA, causing inflammation, myocardial dysfunction.

Q5- intrathecal morphine discussion in TKJR, 48%

A 65yo female weighs 85kg and 165cm tall (BMI 31) is scheduled for TKJR. She has no other health problems. Discuss the pros and cons of intra-theal morphine for post-op analgesia in this patient.

(salient points)

Pros

- Prolonged action
- Ease of administration with spinal anaesthesia

- No motor block, less sympathectomy cf w
- Less systemic effect
- Likely better analgesia than IV/PO morphine.

Cons

- Cephalad migration may lead to delayed resp depression; esp if patient has OSA with high BMI
- Complexity with monitor with additional opioid use for breakthrough pain
- Invasive with spinal anaesthesia – bleed, infection, PDPH
- Adverse reactions: itch, ileus, urine retention, reactivation of herpes simplex

Q6- hyponatraemia management, 53%

The electrolyte here are taken from a 38yo woman, obtunded 30 hours after abdo hysterectomy. She's otherwise healthy. Explain how these electrolytes could have happened and describe how you'd correct them.

Na 110

K3

Cl 80

HCO₃ 25

Glucose 5

Urea 3

Cr normal

Osmolality 225mosmol/kg

(Use same classification system as LITFL)

Electrolyte abnormalities are:

- Hypoosmolar, Hyponatraemia
- Hypochloraemia
- Mild hypokalaemia

Causes of abnormalities:

- Hypovolaemia (losing Na + volume from differentials below)
 - Diuretics use: loop, thiazide
 - Renal impairment with RTA (unable to retain Na hence water)
 - Addison's / adrenal insufficiency
 - Extra-renal Na loss eg. diarrhea/vomit/pancreatitis
- Euvolaemia (holding onto free water due to differentials below)
 - SIADH
 - Voluntary excess PO intake of water (these could be under hypervolaemia too)
 - Over administration of IVF (these could be under hypervolaemia too)
 - Salt restricted diet
- Hypervolaemia (unable to volume regulate, and retaining water greater than salt)
 - Overadministration of IVF, especially if hypotonic fluid used
 - Others: HF, nephritic syndrome or AKI

Correction strategies

- ABC approach + consider hypertonic saline if patient's acutely hyponatremia or symptomatic – obtunded, seizure.
- Depends on patient's volume status based on hx/exam.
 - If hypovolaemic:
 - Volume resus with 0.9% NaCl.
 - If adrenal insufficiency suspected – long term steroid use + profound shock – give mineralocorticoid replacement eg. hydrocortisone 100mg IV TDS.
 - If extra-renal loss: estimate volume loss + replace volume ml:ml.
 - If euvoalaemic/hypervolaemic
 - Give hypertonic saline 3% 1-2.5mls/kg/hr → until symptom improvement or Na >125.
 - Withhold free water administration.
- Admit to HDU/ICU for ongoing monitor/management.
- In all cases, should monitor patient's clinical status + electrolyte closely (eg hourly). Limit daily Na rise to <10mmol/day. Rapid correction is dangerous! Can cause central pontine myelinolysis. Routine ANZCA monitor + place art-line to facilitate haemodynamic mx + monitoring fo electrolytes.

Q7- ant placenta praevia management, 59%

A 34yo woman presents at 36 weeks gestation with an anterior placenta praevia and LSCS is scheduled. She has no intercurrent health problems. She has a history of 2 previous LSCS under regional. Describe and justify the changes this history would make to your routine preop and intraop management plan for LSCS.

Q8- neonatal resus, 56%

You are asked to provide assistance to resuscitate a baby. One min after birth the baby is apneic, grey/blue all over, floppy and unresponsive to stimulation, with a pulse felt in the umbilical cord stump at 60/min. What is this baby's APGAR score? Describe your resuscitation of the baby.

APGAR score = Bit²CH

- Appearance (colour) = 0
- Pulse (HR) = 1
- Grimace (tone) = 0
- Activity (tone) = 0
- Resp rate (breath) = 0

APGAR = 1

NLS description

- Call for help, monitor on, resuscitate warm, dry/stimulate if not properly done already; assess BTCH/sats Q30 sec, equipment ready for likely intubation + drugs – dex, adrenaline, fluid, HCO₃; establish IV via umbilical vein, or consider IO.

- Hx of high risk deliveries should be obtained - ?diabetes, substance abuse, opioid use? Prematurity? Twin pregnancy with risk of anaemia? Chorioamnionitis?
- Keep baby warm
- A-open
 - Chin lift/jaw thrust, avoid over extension/flexion. Suction if meconium seen.
 - Aim = oxygenation and should assess overall status of ABC rather than fixating on intubation. However consider tracheal intubation at several steps
- B-given not breathing, will give insufflation breath x 5; with RA – (2-3sec at 30-40cm water) + ventilate for 30sec (20-30cm water, RR40-60 bpm, depending on post-conceptual age).
 - If no chest expansion, reposition airway/better mask seal, consider suction, OPA or increased Pinsp
- C-30 secs later, assess resp effort + HR (auscultate)
 - If HR>100 + good resp effort, give free flow O2 then gradually wean if able
 - HR 60-100, continue with ventilation + Q30sec reassess
 - If HR<60, perform chest compression with BMV with ratio of 3:1 (100/min); reassess Q30sec; 40% FiO2, then 100% if no improvement.
 - If ongoing HR<60, consider drugs:
 - Adrenaline: 10mcg/kg IV or ETT 100mcg/kg.
 - Dex: 10%, 2ml/kg
 - Fluid (normal saline) 10ml/kg
 - HCO3: 4.2% 1ml/kg
 - + consider intubation = size 3.5 ETT neonate of 3 if prem; depth = 9.5cm in neonate.
- Send cord blood gas + refer to SCBU for ongoing care if any sign of increased WOB.

NB.

	Score 0	Score 1	Score 2
Appearance	Blue/Pale	Blue at extremities but pink all over	No cyanosis, body and extremities pink
Pulse	Absent	<100	>100
Grimace	No response to stimulation	Grimace/feeble cry when stimulated	Cry or pull away when stimulated
Activity	None	Some flexion	Flexed arms/legs that resist extension
Resp Rate	Absent	Weak/irregular gasping	Strong lusty cry

Q9- laser airway surgery (repeat), 70%

A 25yo man is to have laser surgery for a vocal cord papilloma. What are the hazards assoc with the use of a laser in this situation and how can they be minimized?

Q10 – AICD/Bivent pacing management, 62%

A patient with an AICD with biventricular pacing presents for elective surgery. Describe how the presence of this device influences your perioperative management of this patient

Bivent pacing AICD

- = pacing of R + L ventricles
- usu for management of severe CHF, hence must ensure optimisation in elective setting.
- Risk vs benefit carefully assessed
- Consider referral to Cardilogist if any sign of CHF.

Periop mx:

Pre:

- Hx/exam look for symptom/signs of CHF
- Echo: Cardiac function
- ECG: pacemaker dependence?
- AICD/PM technician recent revision report?
 - by local policy, eg. >6/12, then may need referral for technician interrogation.
 - Setting? Battery life? Magnetic placement? Dependence? Underlying rhythm?
- AICD reprogramme preop
 - Disable rate responsiveness, anti-tachycardia fxn by technician or magnet
 - Maintain bivent pacing
 - Consider asynchronous PM if dependent + diathermy use near PPM
- Availability of electrophysiology service on DOS.

Intraop:

- Resus drugs ready eg. isoprenaline, atropine, external pacing device, defib pad applied prior to surgery
- Monitor: routine ANZCA guideline + art line + CVP due to high cardiac risk + 5 lead ECG pace-maker detection on
- Minimise EM interference:
 - Bipolar > unipolar
 - pad placement far away from PPM
 - avoid diathermy <15cm of PPM.
 - 1 sec burst Q10sec to avoid repeated asystole
- having technician service close at hand in case event of haemodynamic compromise from loss of AV synchrony/bivent synchrony.

Postop:

- re-interrogation of PPM, back to preop setting.
- PM check if abnormal ECG indicating PM seen, cardioversion/defib occurred, or diathermy use <15cm of PPM.

Q11- murmur in child discussion (repeat), 67%

You are the anaesthetist at a children's hospital. A 3yo child scheduled for dental restoration and extractions is found to have a systolic murmur during your preop assessment on the day of surgery. They have been on a waiting list for 6 months and have had a dental abscess that settled with antibiotics. Describe how you would evaluate the significance of this murmur and how this evaluation would affect your decision to proceed or not with surgery.

Q12- transphenoidal surgery for acromegaly (repeat), 52%

Outline the issues involved in the pre-operative assessment of the patient presenting for transphenoidal surgery for acromegaly – see 2014A

Q13- Gabapentin as analgesia, 32%

Evaluate the role of gabapentin in acute and chronic post surgical pain management

Gabapentin

= anticonvulsant, structurally similar to GABA.

- Has analgesic property, acts on A2D subunit of VGCC at CNS (spinal cord) level reducing pain transmission.

Role in acute post surgical pain

- Investigated and analysed in meta-analysis to show:
- Efficacy in analgesia and opioid sparing effect – decreased vomit, pruritus
- Preventative analgesia property (Auckland)
- Efficacy in reducing neuropathic pain - Anti-allodynia, anti-hyperalgesia
- Also, anxiolytic effect.
 - However, dose variation widely across studies, hence effective dose difficult to derive; but likely in range of >300mg.
 - Also limited by increased sedation, esp when used concurrently with opioid.
 - Only PO formulation available.
 - Although possible, but hasn't been proven to decrease chronic pain development.

Role in chronic post surgical pain

- Treatment of neuropathic component of chronic pain, esp: in diabetic neuropathy, phantom limb pain, post-herpetic neuralgia, pain following spinal cord injury.
- Also used as part of multimodal chronic pain treatment.
 - Equal efficacy to TCA and has safer side effect profile than TCA.

Q14- Multi-centered trial discussion, 61%

Describe the advantages and disadvantages of multi-centered clinical trials in anaesthesia research.

(report)

Advantages

Study validity:

- Can undertake studies that are not feasible at single institution
- Greater stats power, esp for rare events eg. death
- Recruitment of large numbers of patients
- Quicker patient recruitment
- Wider range of patients and clinical settings, therefore better generalizability of results than a single site study

Research collaboration / network

- New researchers develop skills and beneficial relationships with experienced investigators.
- Develops relationships for future trials and research collaboration.

Clinical

- Patients have benefit of closer supervision than in usual standard of care.

Disadvantages

Complexity of Multicentre trials

- Logistics of managing many centres and staff at remote locations (ie main investigator, site investigator, patients)
- Supervision, reliability, honesty and protocol compliance of remote investigator
- Burden of ensuring data quality, data queries and data cleanup
- Need to develop method of remote data submission
- Data analysis more complicated than single centre study; as it needs to adjust for effect of centres (ie cannot pool all patients as if similar).

Resource intensive

- Expensive. Need to source large funds usu. from competitive grants
- Some sites may not recruit adequately, and not offset set-up costs
- Additional cost of central administration
- Need 24 hr support for troubleshooting; esp. between different time zones.
- May have industry sponsorship that may bias protocol and outcome.

Applicability of protocol

- Protocol must be applicable and approvable at all centres
- Protocol must conform with local standards and practices, and ethics.
- Logistics of getting protocol through different ethics committees. Variable standards, but this is being streamlined through single ethical review;
 - However local review of multicenter studies is a burden for local ethics committee.
- Studies of procedures depend on level of skill at each centre
- Little ability for an individual site to change or influence protocol
- Approval of international studies has possible problems of variable national standards, practices, consent, ethics.

Accredibility of result

- Control of data analysis, writing of paper and publication relinquished to another body.

Q15- MRI discussion, 65%

Outline problems of providing GA in MRI suite for adult.

Environmental

- **Foreign, remote**, limited access to help and resus drugs/equipment.
 - Similar consideration for recovering patient in a remote location.
- **Transfer issue before/after under GA?** Alternatively, likely require Transfer before and after MRI under GA eg back/forth from ICU or OT/PACU

Anaesthetic equipment precaution

- **MRI compatible equipment**: Requirement for MRI compatible **machine/ventilator/monitor**
 - **Airway** equipment – laryngoscope, need to be outside of MRI room
 - **ECG**: Wires should not have coils to avoid **electromagnetic heat induction** causing burn; Pad placed between ECG lead and skin.
 - If machine incompatible, will need to be placed outside of MRI room.
- **Long anaesthetic circuit**, IV infusion lines required with significant **deadspace** and potential **inaccuracy** with sampling of **gas mixture, spirometry**; or **delayed** infor
- **Auditory alarm** of machine not reliable in MRI suite due to noise
 - Place machine/infuser outside of MRI room so alarm can be heard.

Patient safety

- **Limited Access**: to patient limited during scan
- **MRI indication** + **Standard AMPLE/ABC exam**
 - Implication of GA in adult patient? Confused, septic, **unstable**, **claustrophobic**, intellectual disability? → careful assessment.
- **Mandatory MRI safety assessment** to ensure **no ferromagnetic substance/contraindications**:
 - Jewellery, hearing aids.
 - Important safety considerations include:
 - Heart: generally safe: endothelialised/fixed by fibrous tissue eg. stents (unless recent), prosthetic heart valves, sternal wires
 - other ones not endothelialised = not safe: **PPM/ICD**
 - Brain/eyes/ear: **aneurysm, neurosurg clips, intraocular metallic foreign body, cochlear implants** - not safe; unless they're titanium clips
 - Orthopaedic Joint replacements: generally safe, but evaluate each individually
 - **Noise** levels protection as level >85decibels

Staff safety

- **Repeated MRI field exposure effect unknown** – ideally all staff should vacate MRI room during scanning.
- **Emergency helium gas release/quenching** → hypoxic environment, during MRI shut down
 - Familiarize with emergency procedure to evacuate/manage this
 - Have working O2 sensor in scanning room.

Sep-2007, 45%

Q1- macroshock prevention, 40%

Explain the features of the electrical power supply to operating theatres that protect patients from macroshock.

Macroshock =

- when person completes an electrical circuit between active/neutral wire and earth
 - 5mA = pain
 - 10mA = sustained muscle contraction
 - 50mA = resp paralysis
 - 100mA = VF
- much larger current, than microshock (=50uA directly to the heart)

Patients are connected to multiple monitors (ECG, oesophageal temp probes, CVL in theatre), which potentially exposes to more leaky currents, faulty equipments or accidental earthing, with subsequent risk of both macro/microshock.

Robust protective mechanisms must be in place to ensure patient/staff safety:

Protective features of power supply in OT

- Isolated power supply
 - External power supply is isolated to theatre supply by use of electromagnetic induction
 - Hence when patient come into contact, prevents circuit completion/macroshock
- Earthing of casing + fuses or RCD (ie Class I equipment)
 - Hence if live wire becomes faulty and touches casing, current flows down earth which melts fuses/trips RCD to disrupt circuit and raise alarm of fault.
- RCD (circuit breaker/safety switch)
 - Detects current from active and neutral; if discrepancies in flow occurs (ie presence of leaking current, as low as 10mA) → trips RCD which breaks circuit <50ms preventing macroshock
 - Therefore not ideal if continuity supply is essential for life saving requirement; however this is generally not a problem in body protected areas.
- LIM (line isolation monitor):
 - Monitors leaking current continuously; alarms when current sensed.
 - Doesn't break circuit, but allows faulty equipment to be identified to prevent macroshock
- Equipotential device
 - = mechanism where casings of all the equipment in OT are earthed to same potential so no potential difference between 2 live casings hence no potential source for macro/microshock.
- Regular maintenance and checking of electrical supply and equipments
- Others mechanisms:
 - Class 2 equipments - Double insulation of all parts

- Class 3 – safety extra low voltage (SELV) to minimize potential current flow to levels that won't cause macro/microshock (different levels as defined by Body protected or cardiac protected equipments)
- Non-conducting flooring/bedding

Q2- chest drain discussion , 88%

A 60 year old man develops a large haemo/pneumothorax following attempted insertion of a haemodialysis catheter via the left subclavian route.

Describe your technique of chest tube insertion to drain this and the features of the pleural drainage system you would connect to it.

Technique for ICD placement to drain L/ haemoPTX.

- **Prep-CALM & SOBER.**
- **Surgical** opinions.
- Execution: **ACTIONS** (modified from regional acronym) – arrange patient, clean/aseptic approach – (full prep like in neuraxial), time out, note vulnerable structures, place ICD.
 - Acquire Landmark = mid axillary line; 5th intercostal space
 - Insertion: LA, blunt dissect over 6th rib, walk up rib, identify 5th IC space, blunt dissect IC muscle to pleura, then pleural space; large tube clamped inserted (post/superiorly, **30Fr** to drain blood), secure dressing – suture/ties/tight seal dressing.
 - Connect to UWSD lower than patient; then unclamp the tube to start draining blood.

Features of UWSD

- Placed lower than patient; at least 45cm below to avoid re-breathing of fluid drained.
- 3 bottle system.
 - 1st = collection
 - drain of blood + evaluation of volume collected
 - tube is wide to reduce resistance + large >1/2 of patient's max. insp volume to avoid fluid re-entering chest
 - 2nd = UWSD
 - prevents entrainment of air into pleural cavity
 - volume of water in bottle should >1/2 of patient's max. insp volume to avoid indrawing of air
 - 3rd = suction bottle
 - weight/height of water above tube is proportional to degree of suction applied.
- Other safety notes:
 - Clamp drain when moving; unclamp when moving finishes; or even better use a Heimlich valve during transport.
 - If suction is off, then tubing should be unplugged to allow air/fluid draining to avoid PTX.
 - Avoid suction post pneumonectomy.
- Complications:
 - Kinking, occlusion,

- Retrograde flow of fluid
- PTX (esp with prolonged clamping!)
- Bottles can break (if made of glass)
- Drains must be upright to maintain seal

Q3- guideline for epidural abscess risk minimisation , 64%

Outline guidelines you think should be in place for reducing both the incidence and the morbidity of epidural space infections as a complication of epidural analgesia.

Patient selection

Aseptic technique

Handling of catheter

Post-placement FU

Post-discharge education

Management if infection suspected

Q4- blunt trauma to heart , 72%

A 40-year-old woman presents having been trampled on by a horse. She has a compound fracture of her arm requiring surgery and bruising over the centre of the chest with a fractured sternum.

List the injuries to the heart that may be caused by this blunt trauma.

If she had no signs or symptoms of cardiac injury list and justify any screening investigations for cardiac injury you would perform prior to anaesthesia.

Heart injury list

- Myocardial contusion, arrhythmia (RV>LV>RA)
- Rupture of ventricles, VSD
- Coronary injury, ischaemia
- Pericardial effusion, tamponade
- Valvular damage, acute incompetence
- Aortic dissection; aortic valve incompetence

Screening investigations

- Bloods: TnT – very sensitive, take at immediate, 6 hour, then daily for monitor
- CXR – screen of mediastinum, lung, pleural space, heart.
 - Readily available, provides multiple information
- ECG
 - For signs of ischaemia,
 - Tamponade (reduced voltage)
 - Arrhythmia
 - Not specific, but readily available and useful screening tool
- Echo – if signs of cardiac injury, or if cardiac unstable, then intraop TOE is most useful; also assess major vessel injury, pericardial effusion, RWMA, valves; ventricular rupture.
- CT chest – indicated for best detailed screen of blunt chest trauma esp with # sternum (better than CXR) + allows for C-spine assessment at same time.

Q5- beach chair discussion, 36%

A 50 year old, 110kg builder is on your list for an arthroscopic acromioplasty which is to be performed in the beach chair position.

List the problems associated with this position and describe how you could minimise them.

Positioning of patient into beachchair position should be done by both Surgical and Anaesthetic Team, ensuring safety throughout the case. Regular checking should be done. (report)

Problems:

Environmental

- Limited access to patient during surgery; airway, circuit, IV
 - Ensure airway secured with both tape and tie.
- Circuit disconnection during position change → ensure secure joints
- Loss of monitoring during position change → secure monitor to body with tape; vigilance during positioning.

Patient

- C: Hypotension, cerebral ischaemia/infarct; optic ischemic neuropathy; MI.
 - Vigilance with maintaining adequate MAP/CPP throughout
 - cerebral perfusion pressure needs to be carefully maintained. BP to brain likely 15-20mmHg lower than that measured on arm, therefore take into account. avoid excessive compression over jugular vein.
 - Gentle induction, slow attainment of position, fluid/pressor, compression stocking
 - If using Art line, level transducer with tragus to reflect CPP directly.
 - Avoid hypocapnoea.
 - Ensure no compression over eyes.
 - Consider 5 lead ECG, esp if known with IHD.
 - consider cerebral oximetry - sudden reduction may indicate reduced cerebral perfusion, esp known with CVA.
- Venous air embolism
 - Avoid nitrous, hypovolaemia; seal off open venous sinuses with cautery or bony wax, vigilance to haemodynamic changes.
 - (Although usu not a problem in arthroscopy with irrigation fluids present)
- Position related injury:
 - Head malposition, C-spine injury, brachial plexus injury, occipital nerve compression; from vigorous movement
 - Head well secured with head support/tape
 - Ensure neutral head/neck position/padded
 - Vigilance and regular check throughout case.
 - Arm: ulnar N, auricular N, arm falling off table.
 - Ensure arm/elbow/wrist well supported/padded
 - prevent by avoid stretch + appropriate padding
 - vigilance and regular check throughout case.

- Hip: Sciatic nerve → avoid stretch by flex knee slightly
- sacral, vascular compression → appropriate padding, protection

Q6- shock discussion, 61%

Define circulatory shock. Categorise the causes of circulatory shock and give an example in each category.

Circulatory shock = inadequate tissue perfusion, O₂ delivery to meet demand → end organ dysfunction, lactic acidosis, death.

Categories + example

- Cardiogenic = failure of cardiac function to pump blood to meet demand
 - Eg. post MI, post CABG with myocardial stunning.
- Hypovolaemic = insufficient volume / preload to provide adequate blood circulation
 - Eg. multi-systemic trauma, post AAA rupture
- Obstructive = obstruction of cardiac outflow tract hence unable to provide blood circulation
 - Eg. pneumothorax, cardiac tamponade
- Distributive = reduction of volume from vascular system → peripheral oedema, pulm oedema; hence unable to provide sufficient preload / CO / circulation.
 - Eg. anaphylaxis, septic shock

Q7- asthma ventilation strategy, 75%

A 25 year old, 65kg woman with acute severe asthma requires intubation and ventilation. Explain the problems associated with initiating ventilatory support in this patient and describe how you would overcome them.

(report only mentions invasive ventilation; don't worry about non-invasive)

Severe asthma = life-threatening! Risk of

- High airway pressure, resistance due to bronchospasm, inflammation → obstructive airway disease with risk of air trapping, breath stacking → obstructive shock → death!

Problems for severe asthma ventilation + management strategies

Pre-induction:

- Patient assessment can be difficult due to difficulty to verbalise due to dyspnea + need for emergency management; collateral history is essential, AMPLE should be obtained while simultaneously provide treatment.
- Remote location: Patient may be too unstable to move to OT and intubation required in ED – remote, foreign environment, limited help.
 - Ensure presence of airway/anaesthetic assistant + equipment – drug, airway-ETT, laryngoscope, BMV, oxygen, suction.
- Patient distress in tripod position and unable to lie flat and difficult to preoxygenate.
 - Provide FiO₂ 100% through non-rebreather + ensure assistants to position patient safely upon induction of GA.

- However, expect low reserve to cope with apnoea and rapid desaturation! Ensure adequate preparation + clear communication of plans A-D for airway management.

Induction:

- RSI required as probable not starved + need to minimize apnoea time.
- Bronchospasm likely worsens with intubation.
 - Would use propofol+ketamine, sux + vasopressor PRN (balanced induction to minimize haemodynamic compromise from propofol. Propofol however helps to obtund airway reflex and ketamine helps with its bronchodilator effect)
- CVS instability with induction esp if high intrathoracic pressure reducing VR/preload
 - Ensure fluid running + use of vasopressor
 - Patient likely quite tachycardic with bronchodilator therapy, if excessive tachycardia may lead to circulatory arrest. Be aware!
 - perform ACLS if circulatory arrest happens

Post-induction + ongoing ventilation

- expect high airway pressure + risk of breath stacking/intrinsic PEEP:
 - ensure ongoing bronchodilator therapy: regular salb, ipratropium, prednisone, MgSO₄, propofol infusions. +/- antibiotics if concurrent LRTI.
 - Vent setting: IE ratio low (at least 1:2, likely more eg 1:3); reduced RR (to allow adequate expiration time)
 - Aim = oxygenation.
 - MV need to be balanced with hypercarbia and may require permissive hypercarbia.
 - Assess intrinsic PEEP; may require decompression intermittently (ie disconnect circuit to allow deflation of lungs).
 - Be vigilant of barotrauma, pneumothorax → ICD placement if pneumothorax.
 - Admit ICU for ongoing care.

Q8- labour epidural management, 73%

You are asked to provide epidural pain relief for a woman in labour. She is having primigravida, and is 3cm dilated.

Describe and justify both your choice of drugs for and the mode of administration of epidural analgesia in this situation.

Q9- aprotinin discussion, 28%

"It's no longer justifiable to use aprotinin during cardiac surgical procedures".

Discuss.

Cardiac surgeries often involve CPB, assoc with increased bleeding risk due to

- Coagulopathy (dilution, consumption)
- Thrombocytopaenia (plt destruction, consumption)
- Heparin effect
- Hypothermia
- CPB insult – coagulopathy, thrombocytopaenia/dysfunction, fibrinolysis.
- Therefore antifibrinolytic is used to limit bleeding.

Aprotinin = serine protease inhibitor (anti-fibrinolytic), previously used to reduce blood loss complicated by hyperfibrinolysis.

- An important study (BART trial) however showed that using aprotinin, cf with tranexamic acid, led to doubling risk of renal failure requiring dialysis, MI, HF, CVA; therefore

- aprotinin has been withdrawn from the market.
- I agree therefore its use is not justified in cardiac surgical procedure.
- I'd continue to use tranexamic acid (lysine-analogue in treating bleeding due to hyperfibrinolysis).

Q10- SC blood supply and determinants (repeat), 21%

Describe the blood supply to the spinal cord. Explain the determinants of spinal cord perfusion.

SC perfusion determinants:

- = MAP - venous p or CSF p whichever is greater
- MAP determinants
- Venous P determinants – SVC/IVC pressures, avoid obstruction, abdominal/thoracic pressure, PEEP, pneumoperitoneum etc.
- CSF pressure – drainage

Drugs: vasopressor vasoconstrict and limit perfusion, but maintains MAP to drive forward flow which is more important.

Surgery: direct x-clamp of aorta, esp above artery of Adamkiewicz

Q11- Day surgery dental management, 84%

An 18 year old otherwise healthy female is to have 2 impacted wisdom teeth surgically removed as a day stay patient.

Describe and justify features of your anaesthetic technique that may help prevent the common postoperative problems you would anticipate in this patient.

Issue:

- Day stay
- Dental procedure with bleeding, pain
- Potential high anxious patient (age group, reason for needing anaesthesia)
- Problems of GA: sore throat, sedation, PONV
- ~~Rare but important: blood aspiration, laryngospasm (but Q ask 'common'); focus on 'Common only' (report)~~

Anaesthetic management:

- Preop
 - PONV-Risk stratify PONV (Apfel's score) and consider TIVA if high risk.
 - Anxiety-Premed for anxiolysis as required, but care with potential sedation postop and preferably use shorter agent eg. midaz
 - Discuss with Surgeon/patient: Is LA technique with sedation possible for this patient? – avoids risk of GA.
- Intraop
 - Avoid N2O. Use multimodal antiemetics eg. dex + ondans; avoid using neostigmine if possible; ie ultra-short acting muscle relaxant and remifentanyl.
 - Pain-multimodal analgesia+LA infiltration/dental block by Surgeon to opioid spare – less PONV, sedation.
 - Bleed- ensure good intraop haemostasis; consider throat pack to reduce residual blood in airway (but need clear management protocol to ensure safety)
- Postop
 - PONV-Use rescue antiemetics as required eg. droperidol, but care with sedation.
 - Pain-rescue analgesia eg. morphine; has supplies of simple analgesia for ongoing management at home (paracetamol, ibuprofen +/- tramadol/antiemetic)
 - Monitor of ongoing bleed.

Discharge criteria

- When vital signs stable and patient comfortable and not feeling nauseous; without surgical bleed; +/- able to drink.

NB.

PS on Day procedure:

Patient factor

- ABCDE
- no unstable medical condition
- patient/caregiver able to care for themselves after discharge
- side effects controlled, pain/N.V and adequate hydration
- clear instruction on analgesia plan, contact plan if any concern and travel arrangement for medical assessment
- clear instruction on driving, drinking alcohol and legal decision making not to be done until 18 hours later

Social:

- responsible caregiver understand plan
- travel, phone arrangement
- phone follow up (ideally) arranged.

Q12- pyloric stenosis discussion, 64%

A 3 week old male infant who was born by uncomplicated vaginal delivery at term presents with projectile vomiting for 2 weeks. His weight is now 2.8 kg from a birth weight of 3.1kg. His presumed diagnosis is pyloric stenosis. His blood chemistry results are:

	Measured	Normal Range
Na	129 mmol/L	135-145 mmol/L
K	3.0 mmol/L	3.5-5.5 mmol/L
Cl	84 mmol/L	95-110 mmol/L
HCO ₃	36 mmol/L	18-25 mmol/L
Creatinine	69 µmol/L	20-75 mmol/L
Glucose	3.0 mmol/L	2.5-5.5 mmol/L

Explain how these abnormal results come about. Describe an appropriate fluid resuscitation regime for this infant.

List the laboratory criteria by which you would consider him sufficiently resuscitated for surgery.

Pyloric stenosis

- Repetitive vomiting →
 - losing HCl, Na, K, water → increase in HCO₃⁻ initially
 - metabolic alkalosis, hypoCl, Na, dehydration
 - Hypovolaemic/hypoNa stimulates SNS, RAA, ADH release → Na, H₂O reabsorbed by renal tubule;
 - however this is at expense of H/K further lost due to Na/H, Na/K exchanger → worsening of metabolic alkalosis/HypoK
 - K/H exchanger then compensates for hypoK, at expense of losing H and further alkalosis
 - HypoCl: leads to increased renal reabsorption of HCO₃ to maintain neutrality → causing further alkalosis.

Fluid resus regime

- Aim = to replace volume, Na, K, Cl; which will lead to correction of alkalosis + maintain ongoing need
 - Assess volume status: Hx, Exam, Invx: weight, fontanelle, skin turgor, haemodynamics/RR/activity
 - Initially resus volume with 0.9% NaCl, 20ml/kg boluses, then reassess; repeat w 10ml/kg boluses if responsive.
 - Replacement with NG loss should be – ml:ml with 0.9% NaCl.

- Maintenance should be with 0.9% NaCl + 5% dextrose + 20mmol/L KCl;
 - 6ml/kg/hr ie 12ml/hr (as per Starship)
 - NB. Not exactly the usual 4:2:1 rule + consider 1/3 reduction due to surgical stress response/ADH release; but this is as per Starship 2009 Pyloric Stenosis regimen.
- Replace K, at 20 mmol/L concentration with maintenance fluid (not added to resus fluid; Starship only started replacing K after resus; in maintenance fluid).
 - If higher conc is required, then should be given via CVL with ECG monitor.

Lab criteria indicating sufficient resuscitation for surgery

Ideally:

- Cl >105
- Na >135
- K >3.5
- HCO₃ <26

NB.

Priority however is given to correction of volume, acid/base/Cl value; (Cl needs to be >105mmol/litre for the vast majority of infants to have no residual alkalosis)

Mention of urine chloride greater than 20mmol/litre = extra mark.

Paeds: IV K max dose = 0.4mmol/kg/hr

Q13- regional popliteal block for foot/ankle , 67%

Describe a technique of neural blockade in the popliteal fossa for surgery on the foot and ankle including a description of the relevant anatomy.

Popliteal fossa formed by

Upper medial: Semimembranosus and semitendinosus m.

Upper lateral: biceps femoris

Lower borders: gastrocnemius

Technique: CALM, SOBER, PLANS,

A-lateral or prone

C-clean

T-time out

I-image-transversely above crease in popliteal fossa, identify pop A, vein; identify CP/T. N; (tends to be lateral to A)

- move superiorly to see Ns fuse —> sciatic N
- out of plane approach watching needle tip on screen then gradually deepen needle angle to reach N.

O-optimize

N-watch for pop A. V

S-15-20 mls of 0.75% ropivacaine; negative asp, 5ml aliquots, watch spread of LA on US. Wait for ~20 mins for effect.

Q14- ethics of placebo , 38%

A clinical trial is planned to evaluate a new analgesic. Discuss the ethical considerations in having a placebo group in the trial.

Placebo = used to compare with drug to determine true effect or side effect. Commonly used in RCT to reduce bias.

Ethical considerations

- Informed consent from patient to participate in study is required; which should consider these...
- Analgesia = basic human right; hence using placebo to manage pain solely is unethical;

instead it should be used as part of multimodal analgesia.

- To work around this issue, the new drug may be compared to itself in a lower dose or to other established analgesic regimen.
- Equipoise for this new drug needs to be carefully considered and evaluated by Ethics Committee.
 - International Document exist to guide consideration: eg. Helsinki Agreement or American Pain Society Research Ethics guideline.
- On the other hand, bias in research should be carefully considered and prevented in methodology design. Biased study with invalid result is a cost to time and human resource and potentially delays introduction of an effective drug, which is unethical in itself.
- Finally, patient withdrawal from study should be allowed at any time.

Q15- flow volume loop in airway obstruction , 47%

Draw flow volume loops associated with

a) Fixed upper airway obstruction

b) Variable extrathoracic airway obstruction

c) Variable intrathoracic airway obstruction

Explain briefly the physiological reasons for the shape of these loops.

May-2007, 52%

Q1- ARDS ventilation strategies (repeat), 82%

What are the principles of ventilatory management of patients with acute respiratory distress syndrome (ARDS)?

Q2- regional for inguinal hernia repair, 34%

Describe the relevant anatomy and technique for field block for inguinal hernia repair.

Anatomy:

- Need to block ilio-hypogastric, ilio-inguinal and genital branch of genitofemoral nerve. These nerves are formed by T12 and L1 nerves.
- Travel antmed between IO and TA.
- T12 suplat aspect of inguinal ligament
- Iliohypogas N – traverses IO in front of ASIS; runs deep to EO; supplies suprapubic skin
- Ilioinguinal N – traverses IO and enter inguinal canal, supplies skin of scrotum.

Technique

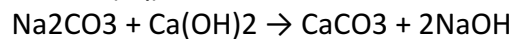
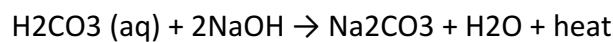
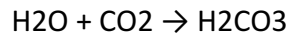
- Iliohypogastric – 22g 5cm needle is passed through the skin at a point 2cm medial and 2cm inferior to the ASIS aiming towards the pubis at an angle of 45-60 degrees. The passage of needle tip through the external oblique aponeurosis can be appreciated as a „pop“. LA is injected ~10ml.
- Ilioinguinal: The needle is then passed a further 1-2cm through the softer resistance of internal oblique muscle. Further 10ml injected.
- Fan-wise SC infiltration superficial to aponeurosis will block the cutaneous supply from lower intercostals and subcostal nerves.

Q3- soda lime discussion , 42%

How does soda lime work? List the hazards associated with its use.

Soda lime

- Calcium hydroxide, $\text{Ca}(\text{OH})_2$ (about 94%)
- Sodium hydroxide, NaOH (about 5%)
- Potassium hydroxide, KOH (about 1%)
- pH indicator: ethyl violet. Turns purple when exhausted.
- Silica to remove moisture

**Hazards**

- Heat enough to cause fire
- Dust inhalation
- Increased resistance
- Skin irritation to staff
- Leak and disconnection
- Interaction
 - Sevoflurane
 - More interaction with baralyme than soda lime
 - Forms compound A-E
 - Compound A produced in greatest amount
 - Nephrotoxic in rats, but at higher doses than clinical use
 - No toxicity in human reported
 - Factors that influence production
 - $\downarrow \text{FGF} \rightarrow \uparrow \text{production}$
 - Dehydration of Baralyme $\rightarrow \uparrow \text{production}$
 - Dehydration of Soda lime $\rightarrow \downarrow \text{production}$
 - $\uparrow \text{temperature} \rightarrow \uparrow \text{Production}$
 - Des>Enf>Isoflurane
 - All contain difluoromethyl ($-\text{CHF}_2$) compound
 - Forms Carbon Monoxide
 - Can be up to 30%
 - $\uparrow \text{Temp}$; Dry; $\downarrow \text{FGF}$ all leads to $\uparrow \text{production}$

Q4- paed burn pain/fluid management , 58%

A 2 year old child has burns to lower body from immersion into a hot bath. Describe your assessment and management of pain and fluid requirements in the first 2 hours following injury.

(report)

observation assessment of pain + titration of opiates in a potentially shocked child.

Pain assessment/mx

- Hx: Severity of injury? MIST - Duration of immersion, water temp, other injuries, treatment so far? Other important AMPLE history

- Exam:
 - burn assessment which gives indication of severity of pain:
 - extent, using rule of nine for children:
 - This kid has lower body, so potentially involve:
 - $\frac{1}{2}$ ant trunk = 9%
 - $\frac{1}{2}$ back trunk = 9%
 - legs = 13.5% each side
 - so total = 27% + 18% = 45%!! Significant!
 - Degree of burn – 1/2/3.
 - Pain assessment – likely significant
 - Subjective report by 2 year old child may be possible
 - Parental report
 - Objective: FLACC – face, limbs, activity, consolability, cry
- Management (as per CCDHB Paeds protocol)
 - Multimodal analgesia – para,
 - NSAID (not if rhabdo)-neurofen 5-10mg/kg Q6H,
 - tramadol (1mg/kg IV/PO Q6H),
 - opioid (0.2mg/kg PO, Q4H).
 - NCA vs. (morphine 10mcg/kg/ml bolus, 1ml bolus, 5 min lockout.
 - Infusion – 10mcg/kg/ml – 0-2ml/hour; under 3/12, 0-4ml over 3 month.
 - Monitor RR + sedation hourly.
 - Monitor pain score 2 hourly initially, 4 hourly when pain stably controlled.
 - Consider ketamine infusion
 - 0.1mg/kg/ml – at 0-2ml/hr; for >3/12 only.
 - Excessive pain, consider compartment syndrome.
 - Non-pharm: distraction, dressing with biosynthetic dressing.
 - Dressing change will likely require GA. If however tolerable can consider Entonox or ketamine sedation.

Fluid requirements assessment/mx

- Hx: drinking still? Passing urine? Wet nappies?
- Exam: CVS/RS/CNS exam - volume status for subsequent fluid mx.
 - UO should be monitored closely and forms part of ongoing resuscitation goal.
- Invx: electrolyte monitor due to large volume fluid shift from significant burn.
- Management:
 - Parkland's formula to guide fluid mx:
 - children 3-4ml/kg/%, Hartmanns.
 - first $\frac{1}{2}$ in 8 hours since injury, 2nd $\frac{1}{2}$ over next 16 hours + maintenance (with dextrose saline).
 - UO: aim for 1ml/kg/hour
 - Need to consider nutrition due to increased metabolism
 - Consider NJ feed early by 24 hours, if not maintaining PO intake.
 - Will need referral to Burn centre due to significant burn extent, extreme of age, and special area over perineum.

NB.

Pain assessment in Paeds: (actually very similar to geriatric)

- Wong-Baker FACES Pain score, usu for >3yo
- Numeric rating scale
- Behavioural scale - FLACC

FLACC SCALE ©University of Michigan Health System			
Face	0 No particular expression or smile	1 Occasional grimace or frown, withdrawn, disinterested	2 Frequent to constant frown, clenched jaw, quivering chin
Legs	0 Normal position or relaxed	1 Uneasy, restless, tense	2 Kicking, or legs drawn up
Activity	0 Lying quietly, normal position, moves easily	1 Squirming, shifting back and forth, tense	2 Arched, rigid, or jerking
Cry	0 No cry (awake or asleep)	1 Moans or whimpers, occasional complaints	2 Crying steadily, screams or sobs, frequent complaints
Consolability	0 Content, relaxed	1 Reassured by occasional touching, hugging or "talking to". Distractible	2 Difficult to console or comfort

Q5- SvO2 discussion, 36%

Discuss the usefulness of the continuous measurement of mixed venous oxygen saturation in the intensive care patient?

SvO2

= mixed venous blood saturation, from pulm A sampled with PAC – can be measured continuously.

- Provides an indication of global oxygenation status, and normal level is ~70%.
- Also used as surrogate measure of CO.
- However SvO2 should be correlated with patient's clinical status, with other measurements eg. acid/base status, lactate value,

Utility of SvO2 in ICU – provides additional information regarding oxygenation/perfusion status;

- Increased SvO2 (If >70%)
 - could indicate peripheral hypoxia and inability to extract oxygen.
 - Cyanide toxicity, mitochondrial disorder, sepsis
 - Or decreased oxygen demand: hypothermia, sedation
 - Or reassurance of adequate oxygenation provided patient's clinical status remain stable.
- Decreased SvO2 (If <70%)
 - could indicate increased oxygenation extraction, hypoperfusion. Anaemia, hypoxaemia.

- Increased O₂ consumption eg. pyrexia, pain, shiver, seizure, MH.
- Bonus features of PAC: can also provide CVP, PAP, PCWP – diagnose pulm HTN.

Diagnostic aid hence guides subsequent management;

- bleed/anaemia: consider transfusion keep Hb > 70g/L
- hypoperfusion: consider fluid challenge then assess response

Limitations:

- requires PAC which is invasive and has potential risk: CLAB, cardiac tamponade, arrhythmia, PA rupture, pneumothorax.
- No proven trials indicating improvement in outcome with use of PAC/SvO₂ alone.

Therefore, given invasive nature of PAC, I would not routinely use PAC/SvO₂ to manage ICU patient. If used, then should correlate with other clinical measures outlined above.

Q6- NMT discussion , 77%

List the patterns of peripheral nerve stimulation that may be used to monitor non-depolarising neuromuscular blockade during anaesthesia and describe how each is used in clinical practice.

- Single twitch
 - Need baseline twitch height for comparison
 - Not very useful cf other modalities
- TOF; 4 stimulations, 2Hz
 - Count: 4th twitch reduction = 75%, 3 = 90% blockade, 1 = 95%; no twitch = complete.
 - TOFR: 70% = weak periphery/cough; >90% = safe extubation condition
 - Need accelerometer/EMG, manual is inaccurate.
- DBS: 2 bursts of tetanic stimulation (50Hz), 750ms apart
 - Ratio >90% indicates safe extubation condition
 - Better cf TOF with manual detection
- Tetanus: 5 seconds of tetanic stimulation
 - Fade = Most sensitive for NMB effect
- PTC
 - Tetanic stimulation, 3sec pause then single twitches at 1Hz
 - Twitch is counted
 - 10 twitch equivalent to 1 twitch in TOF
 - used when TOF is 0, monitors deep NMB

NB.

1e see 1 count, then <15mins for all except panc; see 2 count, then <10min for all to see first T1 count

Q7- risk evaluation for pneumonectomy , 69%

A 65 year old man with a 40 pack a year history of smoking is scheduled for right pneumonectomy for carcinoma. Describe your preoperative evaluation of his respiratory system to decide his capacity to undergo this operation.

Preop evaluation of resp system for fitness of surgery

- Hx

- Presence/severity of symptom? – dyspnea, PND, Roizen score, cough, haemoptysis
- Systemic effect? – SIADH, Eaton-Lambert, Horner's?
- Functional, nutrition status
- Current treatment + resp optimization.
- Other AMPLE history? Smoking hx? COPD, asthma, pulm HTN/RHF?
- Previous surgery, anaesthetic record
- Exam
 - Airway assessment
 - CVS/Resp exams – presence of pulm HTN/RHF?
 - Signs of SVC obstruction? Mediastinal mass effect?
- Invx
 - Staging scans
 - Fitness for surgery = 3 leve:
 - 1st stage
 - PFT, spirometry
 - FEV1>1.5 suitable for lobectomy;
 - FEV1>2 suitable for pneumonectomy or >80% predicted
 - 2nd stage (if not meeting criteria in 1st stage)...
 - Quantitative lung scan
 - % ppo FEV1 >40%? AND
 - % ppo DLCO >40%? (must have both)
 - 3rd stage (if not meeting criteria in 2nd stage)
 - Exercise testing/CPET = most accurate
 - VO2 max >15ml/kg/min?
 - If not, consider other options; as <15 = high risk

NB. Other numbers:

- DLCO >60% has reduced mortality; >80% ha reduced pulm complications
- Other surrogates of exercise testing:
 - Stair climbing - > 2FOS (20 steps, 15cm/step)? If not = high risk
 - 6 min walk – if <300m = high risk (correlate w VO2 <10); 600m ~ VO2 of 15ml/kg/min.
 - drop in sats during exercise >4% = high risk or <90%
 - In CPET:
 - VO2 >20ml/kg/min = no increased risk for complication/death
 - VO2 <10 = mortality rate of ~50%.
 - AT >11ml/kg/min is reassuring for major surgery.

Q8- ECG use in IHD monitor , 55%

Describe how the ECG should be used to monitor for intraoperative myocardial ischemia in a patient with ischemic heart disease.

ECG: noninvasive, continuous monitor of myocardial electrical activity, characterized by rate/rhythm/axis/interval/morphology

- May see changes assc w MI, although can be non-specific. However PPV increases in patients with higher risk of cardiac event. Like in current patient with IHD.

Technical:

- Correct lead placement
- Good quality lead, contact (may need to shave skin; over bony prominence) and minimize interference (movement or diathermy)
- 5 lead ECG allows monitor from more leads: II, V5 + other limb leads & augmented leads
- V5 tends to be most sensitive for MI (80% of all detection).
- Trend monitor used;
- ST segment analysis used (ie diagnostic mode, not monitor mode)
- Auditory + visual alarms

Watch for

- ST segment changes: ST elevation, ST depression, T wave inversion, new LBBB
- (from report)
- Highest sensitivity when a combination of leads is used. Ideally an inferior lead (III) and a 2 praecordial leads
 - (V3 and V5, or V4 and V5). When only one praecordial lead can be utilized (common clinically) the most isoelectric lead of V3, V4 or V5 should be used
 - upsloping ST segment : 2 mm depression, 80 msec after J point
 - horizontal ST segment : 1 mm depression, 60-80 msec after J point
 - downsloping ST segment: >1 mm from top of curve to PQ junction

Q9- T-piece discussion, 68%**The T-Piece is obsolete in modern anaesthesia practice. Discuss.****T-piece aka Mapleson E**

- = open system circuit
- Inflow limb (FGF) → patient → exp limb for exhalation (no valves in system)

Pros

- Simple, light weight.
- Low dead space, low resistance
- Fast wash in
- Modification allows controlled manual ventilation ie Jackson-Ree's/Mapleson F by occluding open end bag
 - Also able to assess compliance/TV with hand BMV (which is more subtle in circle)
- Minimises risk of inadvertently switching to machine ventilator with potentially dangerous settings.

Cons

- Inefficient, needs high FGF to minimize rebreathe (2x of MV in SV) or >3L/min w IPPV; reservoir tube needs to have volume = TV to prevent entrainment of air (if too small) or rebreathe (if too big)
 - risk of rebreathing if low FGF, high MV, high CO₂ production
- non-humidified
- volatile not scavenged, pollution of theatre
- decreasing familiarity with T-piece among non-paeds anaesthetists

Alternative circuit: closed-paeds circle circuit with CO₂ absorber, unidirectional valves

- has low-resistance, low dead space
- allows low flow anaesthesia; less FGF/volatile use/pollution + volatile scavenged
- rebreathing minimized due to one way valve
- controlled manual ventilation also allowed with APL/reservoir bag
- humidification/warming of gas
- **Cons:**
 - heavy/bulky/not easily portable

Summary

- T-piece still has role esp in paed patients, where MV/TV is small, although the increasing efficiency of low resistance, low dead space paed circle system has minimized this benefit.
- However, T-piece is simpler, reliable, more portable esp useful in remote location and is still commonly used by many paed anaesthetists. It's therefore not 'obsolete'.

Q10 – Trifascicular block, complete heart block, 53%

A 56 year old diabetic is scheduled for laparoscopic nephrectomy. This is his pre-operative 12 lead ECG (Chang's Anaesthesia complication p. 18). Ten minutes into the procedure his BP is 70/30 and his ECG lead 2 monitor looks like this. What does ECG 1 show? What Does ECG2 show? Outline your management of the situation associated with ECG 2.

ECG1 = trifascicular block

ECG 2 = complete heart block, slow vent rate

Management of complete HB.

- Differential need to be considered simultaneously as mx:
 - Vagal stimulation (pneumoperitoneum, organ stimulation)
 - Drug error (eg. b-blocker inadvertently given).
 - MI, electrolyte disturbance, hypoxaemia, hypercarbia.
- Mx:
 - Declare emergency as complete HB with haemodynamic compromise.
 - Remove vagal stimulation – pneumoperitoneum and stop surgery.
 - Get help, need external pace-maker immediately
 - Titrate current up until captures, then increase a further 10mA.
 - ABC approach:
 - Maintain oxygenation.
 - Support haemodynamics with fluid + atropine 600mcg (repeat up to 3mg), adrenaline 5-10mcg increments and set up isoprenaline infusion 0.01-0.05mcg/kg/min.
 - Investigate electrolyte, UECr, Mg/Ca/P, Trop + 12 lead ECG ?ischaemia + ECHO to assess for RWMA.
 - Will need HDU/ICU postop with Cardiology management. Patient likely will require transvenous pacing or PPM.

Q11- Informed consent, 52%

Why is consent for a medical procedure necessary? What makes consent for a medical procedure valid?

Why consent?

- **Ethical** –
 - **right** of patient to have conduct of procedure and risks explained + alternatives and opportunities for questions.
 - shows respect for patient **autonomy** and acknowledges patient's **right of decision making**.
- **Medicolegal** – detailing risk and benefits may provide **protection against claims** for negligence should a discussed complication arise, despite the procedure being carried out competently.

Conditions for a valid consent

- **Preassess: Patient** -> competent to consent, appropriate age, no mental/cognitive illness, no sedation.

- In terms of language that patient can understand – use qualified interpreter for patient who does not speak/understand English.
- **Prepare: Time, environment** -> private, quiet, unrushed, enough time for patient to consider options
- **Perform:**
- **Consenting anaesthetist; PARQ**
 - Ideally performed by the procedural anaesthetist, who has adequate knowledge/experience of person responsible/conduct/benefit/risks/alternatives.
 - Defines what risks are important to discuss.
 - Rare but significant
 - Common but relatively minor
 - If detailed consent was done by another Anaesthetist, the procedural anaesthetist should still discuss with patient before operation for any unanswered questions, issues.
- **Consent by patient**
 - Given voluntarily without coercion
 - Informed in terms of knowledge of conduct, benefit, risks + alternatives + implication of not doing the procedure.
 - If patient firmly refuses to know about risks involved, should not enforce and should document this.
 - Patient has right to refuse to consent or withdraw consent at all times.
 - Document + signature from anaesthetist / patient.

NB.

- If consent impossible eg. in severe trauma, unconscious patient, then treatment without consent may proceed provided that it's in patient's best interest and attempt to ascertain collateral information has been made.

Q12 – bedside airway assessment, 77%

How do you assess an otherwise well patient with regard to difficulty of intubation at the bedside? How accurate is this assessment?

DI definition: occurs there's difficulty in aligning mouth opening to laryngeal inlet to obtain Cormack Lehane view of 1 or 2; can be due to:

- limited mouth opening,
- oral cavity factors,
- limited neck movement or obstruction.

History

- history of difficult intubation – from patient report, patient bracelet or previous documentation.
- comorbidities such as morbid obesity, OSA, RA/AS, C-spine fusion, Ex-Fix device, or other congenital abnormalities: Down's, Pierre Robin, Klippel-Feil syndromes.
- previous laryngeal surgery, radiotherapy to head/neck, dental wiring.

Exam

- Mouth opening
 - Trismus = dangerous sign!
 - Interincisor distance: <3cm = intubation tricky; <2.5cm LMA tricky = reliable sign.
- Prognathism
 - If lower incisor cannot reach beyond upper incisor, intubation likely difficult = moderately accurate sign.
- Mallampati

- 1/2 likely easy; but small false negative rate
- 3/4 likely difficult (but false positive rate high)
- Oral cavity lesions?
 - Loose teeth, crowded teeth, prominent front teeth; reliable sign of potential difficulty due to loose object or teeth obstructing space for laryngoscopy
 - Enlarged tongue, oral tumour, abscess; = good accurate warning sign of difficulty
 - High arched palate (report); assc with likely difficulty
 - Gaps in dentition may trap laryngoscope
- Neck movement
 - Inability to perform atlanto-occipital extension or assume sniffing air position = accurate warning sign of difficulty due to malalignment of view, especially severe limitation present.
- Thyromental distance
 - <7cm likely difficult, the shorter the distance the higher predictability of difficulty, but measurement often done inaccurately;
 - combined with Malampati would give higher PPV, but lower sensitivity.
- Neck circumference
 - >40cm assc with difficulty with intubation, more reliable than Malampati alone.
- other factors:
 - large breast likely will obstruct space for laryngoscopy
 - morbid obesity: due to association with other risk factors

On balance, individual test isn't as good and combined test tends to give better indication of potential difficulty.

Q13- ACLS, VF (repeat)59%

Ambulance officers performing CPR with bag and mask ventilation. She has been rescued from a swimming pool.

Describe how basic life support should be provided in the emergency department. She has no pulse and her ECG shows ventricular fibrillation. Outline the advanced life support algorithm you would now follow.

BLS part:

- ACLS principle
- DRSABCDE
- Danger include: wet patient, floor which can cause electrocution of patient/staff → needs thorough drying.
- Check response + signs of life (respiration/pulse)
- Open airway
- If no pulse → chest compression + BMV at 30:2 ratio.

2nd part:

- VF → CPR + defib in earliest instance possible providing patient is thoroughly dried.

Q14- flow optimization in microvascular surgery, 34%

An otherwise fit 30 yr old man is having microvascular reimplantation of his forearm.

Describe methods available to optimise the perfusion of the reimplanted limb in the post-operative period.

Optimise oxygen delivery and perfusion (postop period)

- B: maintain oxygenation > 90% + Hb > 70g/L
 - Avoid excessive high Hb as increased viscosity → decreased flow, aim Hct ~0.3
 -
- C: maintain perfusion pressure (MAP – venous P)
 - Maintain MAP within 20% of baseline or >65mmHg (70mmHg if known HTN/renal dx)

- Maintain euvolaemia and manage hypotension with modest dose of vasopressor/inotrope.
 - Avoid excessive vasoconstrictor as it may compromise flow through anastomosis
 - Multimodal analgesia to reduce stress response.
- Enhance venous drainage:
 - Avoid tight dressing
 - Maintain modest degree of arm elevation (close to level of right atrium)
- Monitor distal perfusion closely postop – doppler + clinical assessment of CWMS (colour, warmth, motor/sensation)
 - Early detection and reexploration in OT if perfusion compromised.

NB.

OHA said dextran may help maintain graft patency., depending on surgical preference.

However, 2015 review discouraged use of dextran (1b) as associated with increased systemic complications and flap failure; if anticoagulation is desired, use LMWH prophylaxis.

- Intraop factors:
- Anaesthesia: consider regional – SNS blockade, vasodilate + best analgesia.
- Surgery: Ensure good anastomoses and check perfusion

Q15- brain death diagnosis , 72%

Outline the steps necessary to diagnose brain death in a 38 year old woman who is comatose following a subarachnoid haemorrhage.

Brain death diagnosis steps

- **Precondition** = having a diagnosis to suggest brain death (24 hour after TTM; >4 hour after coma before testing commences)
- **Exclusion:**
 - Adequate MAP
 - No drug effect, ETOH.
 - Not hypothermic; no severe electrolyte/metabolic/endocrine disturbances
 - MSK: intact MSK function.
- **Examinable:** Able to perform apnoea test, brainstem test (at least 1 eye, 1 ear)
- **Clinical testing**
 - by 2 independent medical specialist trained in ICU.
 - Procedure =
 - Apnoea test: absence of breathing despite PaCO₂ >60. Ensure tube patent.
 - Fixed dilated pupils
 - No brainstem reflexes: corneal, gag, cough, vestibule-ocular reflex.
 - No motor response to noxious stimuli (face/trunks/limbs)
- **Other test:**
 - If cannot test: do cerebral angiography (absence of flow to brain) = gold standard; EEG/SSEP not considered valid.

NB.

Not compatible with brain death

- Decorticate/decerebrate posture
- Seizure

Spinal reflex can be compatible with brain death.

Vestibulocular reflex:

- cranial nerves III, IV, VI, VIII
- Inspect the auditory canal with an otoscope to confirm that the eardrum is visible. If not visible the ear canal must be cleared before testing can begin.
- Elevate to 30 degrees to place the semilunar canal in a horizontal position. Instil 50mL of ice cold water into the ear canal using a syringe. Hold the eyelids open and observe for a minimum of 60 seconds.
- Response – no movement. ANY movement precludes brain death.

Sep-2006, 42%

Q1 – LMA in laparoscopy, 81%

Discuss risk and benefits assoc with IPPV through proseal LMA for laparoscopic cholecystectomy

Proseal

Laparoscopic chole – depends on context; likely acutely unwell with delayed gastric emptying and bowel obstruction, therefore proseal LMA use isn't appropriate.

Risk with proseal:

- not secure airway
- ventilation may be difficult
 - due to air leak around cuff at high pressure eg. pneumoperitoneum, obesity (although reverse Trendelenburg may lessen compliance problem)
 - gastric insufflation → aspiration risk with an unprotected airway
 - issue of underventilation, hypercapnoea, SNS stimulation, increased ICP/CBF, CO₂ narcosis

Benefit with proseal:

- may be easier insertion and lower failure rate than intubation.
- Less invasive, avoids airway trauma, haemodynamic instability due to laryngoscopy (although LMA insertion may to lesser extent still cause airway trauma)
 - Allow FOI through LMA.
- May allow faster theatre turn over as patient may be transferred to PACU with working LMA in-situ.
- Proseal cf. classic:
 - Higher seal pressure, due to dorsal cuff (may withstand pressure up to 30cmH₂O)
 - Separate oesophageal lumen allowing drainage of regurgitant / NG insertion
 - Integrated biteblock.

On balance: I'd intubate and protect airway for patient undergoing laparoscopic cholecystectomy.

Q2- paravertebral block, 55%

Describe your technique for performing a continuous paravertebral block in a 50 year old man with fractured 5th – 10th left ribs. Include possible complications and relevant anatomy.

Anatomy

Paravertebral space is located just anterior to transverse process and borders are:

- Medial: vertebral body and pedicle
- Posterior: Transverse process and costotransverse ligament
- Lateral: ribs and costotransverse joint
- Anterior: costovertebral joint

Contains spinal nerve of corresponding level

Technique

- 2 levels above and below; T7 insertion.
- 2-2.5cm lateral to spinous process, lignocaine, 18G tuohy, LOR, contact T. process, walk off above, insert <1.5cm deeper; may feel LOR.
- Infusion 5-15ml/hr of 0.2% ropivacaine.

Q3- clamping/unclamping aorta management, 57%

Describe the cardiovascular changes which occur during clamping and unclamping of the supra-renal aorta during repair of an abdominal aortic aneurysm in a patient with normal ventricular function and outline your strategies to maintain critical organ perfusion during these

Clamping (in terms of clinical parameters)

- haemodynamic change: Hypotension distal to clamp; hypertension proximal to clamp (up in SVR/SVC flow/SNS response)
- HR: reflex bradycardia, although may see tachycardia due to SNS stimulation + increased SVC flow → Bainbridge reflex
 - o Change depends on balance of these factors
- Cardiac workload:
 - o Sudden increase in afterload → increased cardiac work
 - Usu. balanced by increased CBF/O₂ supply, but may cause MI if demand>supply
- Regional BF:
 - o Cerebral blood flow maintained by autoregulation and not disrupted by clamp
 - o SC/RBF/splanchnic BF reduced esp distal to clamp

Management

- Minimize haemodynamic change;
 - o counteract afterload increase with vasodilators, eg. deepen anaesthesia, use GTN, hydralazine, phentolamine,
 - o if epidural in-situ, consider load epidural, but balance risk with hypotension.
 - o Release clamp if LV failure apparent (ECG change, hypotension) and use gradual clamp.
- Minimise increase in cardiac workload
 - o As above to minimize increase in afterload.
 - o Also, consider esmolol.
- Minimize regional BF ischaemia
 - o Minimize clamp time
 - o Optimal supportive measure to maintain ABCDE: normovolaemia, oxygenation, haematocrit.
 - o Consider distal perfusion with shunt, or other specials: eg. for SC perfusion: lumbar drain, cool saline via epidural, hypothermia.
- Monitor
 - o Cardiac ischaemia – ECG, art line, CVP
 - o End-organ ischaemia – UO, SSEP, MEP

Unclamping

- Haemodynamic change; drop in BP/coronary BF with
 - o Sudden drop in afterload (decrease by 70-80%)
 - o Reduced VR
 - o Venodilation/cardiac depression from metabolic waste (acid, K, CO₂)
 - o arrhythmia
- Management:
 - o Minimize haemodynamic change
 - Reclamp if severe hypotension and gradual unclamping, sequential iliac unclamping
 - Maintain high normovolaemia prior
 - Low normocarbida to compensate for acidosis, CO₂ waste product.
 - Vasopressor/inotrope to maintain MAP
 - Treat arrhythmia w calcium
 - Consider HCO₃⁻

Q4- phantom limb pain, 66%

Describe the features and management of phantom limb pain.

(Auckland)

Features

- Noxious sensation in missing limbs; a type of neuropathic pain.
- Incidence 30-80%
- Immediate or delayed, intermittent; variable intensity, but tends to resemble pre-amputation pain.
- Risks:
 - Pre-amputation pain, postop stump pain, poor pain coping strategy, psychiatric disorder.

Mx

- MDT input.

Pharm tx:

- calcitonin useful in acute phantom limb pain
- epidural, ketamine = maybe effective; esp used as preemptive analgesia.
- nerve sheath catheter, opioid, gabapentin = treat acute pain, although no evidence or preventing chronic phantom limb pain developing.
- Multimodal analgesia to treat acute pain.

Non-pharm:

- mirror box, motor imagery treatment = effective (ie sensory discrimination training)
- Psychosocial support: distraction, reassurance, education, expectation management.
- Physiotherapy: massage, ensure correct prosthesis fitting, stump support.
- TENS

Q5- LMWH & epidural, 19%

Describe and justify an appropriate strategy for the use of low molecular weight heparin in a patient undergoing knee replacement surgery with an epidural block.

AAGBI:

- LMWH tx: not recommended
- prophylaxis: with caution

Strategy:

Last dose of clexane before epidural insertion or catheter removal – 12-24 hours

Next dose of clexane after epidural insertion or catheter removal – 4-6 hours

- W caution for prophylaxis and not recommended with tx.

Hence in tx clexane; I'd recommend alternative analgesia due to high risk of epidural haematoma.

Ongoing care – regular review, daily review, monitor for problem, consider Xa level (although Andrew Cameron says it's useless).

Q6- renal failure electrolyte discussion, 45%

List and explain the typical electrolyte abnormalities of chronic renal failure.

- Na – normal – excretion maintained + volume regulation intact
- Cl – normal – follows Na to maintain neutrality
- K – high – reduced excretion
- Mg – high – reduced excretion
- Ca – low – low production Vit D, reduced Ca reabsorption from GI/Kidney
- P – high – reduced P excretion
 - 2nd hyperparathyroidism
- H – high – reduced excretion
- HCO₃ – low

Q7- dural puncture management (repeat), 28%

While performing an epidural for labour analgesia in an otherwise healthy primigravida in first stage you inadvertently cause a dural puncture with the Touhy needle. Describe and justify your management of this complication.

Q8- neuroprotection principles (repeat), 45%

Describe the principles of cerebral protection in a patient with an isolated closed head injury – (Oct 2009 Q15)

Q9- Nitrous oxide discussion, 68%

Nitrous oxide should not be used routinely as a component of general anaesthesia. Discuss.

N₂O – used with other agents in GA or alone as analgesia.

Pros

- Cheap, available
- Rapid onset/offset

- Concentration/ 2^{nd} gas effect
- Inert, and elimination via ventilation not affected by impaired organic metabolism
- MAC-spare property and advantages: haemodynamics, uterine tone etc.
- NMDA-antagonism analgesic property

Cons

- Supports combustion
- Risk of hypoxic mixture when high conc used; cannot be used a sole anaesthetic
- Causes expansion of air space (ETT cuff, PTX, GI tract, venous air embolism)
- Diffusion hypoxia if not supplemented with O₂.
- Worsens pulm HTN. High ICP.
- Bone marrow suppression - oxidises cobalt ion in vit B12, inhibits methionine/THF (tetrahydrofluoride) synthesis, impaired DNA synthesis, megaloblastic changes in bone marrow, agranulocytosis, central neurodegenerative effect.
- Environmental green house effect.

On balance, N₂O has role in GA, but most of pros can be achieved by other means of balanced anaesthesia – eg. use of opioids to MAC-spare, use of ketamine for analgesia via NMDA-antagonism; use of sevo/O₂ alone for gas induction; therefore N₂O isn't used routinely in most modern anaesthesia, and is only reserved in selected situations – obstetrics or paed's gas induction.

Q10- RSI in child, 46%

Discuss in detail the technique of rapid sequence induction with cricoid pressure in a child. Include the reasons for your choice of relaxant.

RSI =

Detailed discussion of technique with cricoid in child

- Assessment: Patient assessment for indication of RSI + airway – is this for life-threatening surgery or urgent surgery but with option of wake up if failed intubation?
 - Difficult airway features?
 - Any contraindication to muscle relaxant choice? Anaphylaxis, sux apnoea, electrolyte disturbance, MH, significant burn >48 hr, paraplegia, myopathies, hyperkalaemia.
 - If no contraindication for suxamethonium, and if optimal intubation condition required, eg. appendicectomy, bowel obstruction; then will use sux.
- Team communication: Clear communication with technician, nursing staff for plan of RSI
 - Including
 - Airway equipment: laryngoscope blade size, ETT size/type.
 - back up plan if failed intubation
 - eg. maintain oxygenation and wake patient up
 - maintain oxygenation with BMV or 2^{nd} gen SGA + size
 - cricoid plan
- Pre-induction – DAMSIP: ensure machine checked and ready, reliable IV line, drug choice (prop 2-3mg/kg + sux 2mg/kg IV + dose predetermined); patient well

positioned (sniffing position/ramped), optimal preoxygenation aim for $\text{EtO}_2 > 80\%$; suction closeby; monitor attached + vital signs stable → may be difficult in young children and practical limitation applies.

- Resus drugs ready: ephedrine + metaraminol prefilled syringes. Atropine 20mcg/kg IV.
- Would not involve parents in RSI due to need for complete focus with patient from very beginning.
- Induction:
 - Cricoid require dedicated, experienced assistant to apply correctly. 30N pressure vertically 90 deg to patient horizontal axis; on cricoid. Maintained until ETT placement confirmed and cuff inflated.
 - Issues in children – cricoid lies higher C3-4; and can distort laryngoscopy view; in which case cricoid should be removed to improve view. Also concern w oesophageal rupture if patient vomits (pressure should be removed).

Relaxant choice

- Sux:
 - (given no contraindication)
 - gives fastest/optimal intubation condition.
 - Clear end-point (fasciculation stops).
 - However can cause bradycardia, requiring atropine.
- Roc:
 - If sux contraindicated
 - 1.2mg/kg IV. Not associated with bradycardia, but long duration can be a problem.

Q11 – periop betablocker use (repeat), 47%

Critically evaluate the use of Beta blockers in the perioperative period to prevent myocardial infarction. = repeat

Q12- Ketamine discussion, 56%

Discuss the role of ketamine in current anaesthesia practice.

Ketamine

- non-competitive NMDA-R antagonist
- Use = induction agent for GA, part of TIVA, sedation, analgesia.

Induction: IV or IM (1-10mg/kg). Quick onset due to high lipid solubility and offset due to redistribution.

- Therefore needs infusion to maintain anaesthesia.
- Useful if haemodynamic unstable because of increased SNS tone with ketamine hence tends to maintain haemodynamics on induction (although in extremely high risk cases, due to myocardial depressant effect, can still cause CVS collapse).
- Also good bronchodilator for use in asthmatic.

Maintenance of GA?

- Good agent for TIVA, esp in field anaesthesia due to relative maintenance of SV/ CVS.
- Offset $t_{1/2}$ beta is by hepatic metabolism; and C_{SH}T increases with duration of infusion (although this is comparable to propofol)
 - $\text{Vd} 2\text{L/kg}$, $\text{Cl } 20\text{ml/kg/min}$, $t_{1/2}$ 2-hours.

Sedation: multiple formulations available (PO, IV) with relative maintenance of CVS/Resp functions hence can be used as premed.

Analgesia – opioid spare, preemptive + preventive analgesia property. Treatment of neuropathic / chronic pain.

Cons:

- However, increase airway secretion, does not obtund airway reflex hence need coinduction with muscle relaxant or propofol.
- CBF/ICP, relative contraindication in high ICP;
- Dissociative anaesthesia making BIS/EEG monitor unreliable.
- Psychomimetic effect with vivid dreams, hallucination; not ideal for use in confused, psychiatric patient or patient with cognitive dysfunction.
- Abuse potential.

Q13 – CVL risk, 70%

List the risks associated with the placement of a central venous catheter? Discuss the ways in which these risks may be modified.

Risks + Risk minimisation

- Arterial puncture/dilatation
 - USS guidance, see needle tip at all times, and to verify guideline position IV not IA.
 - Pressure transduce cannula to ensure IV placement before dilatation.
- Pneumothorax
 - Site selection: SC highest risk > IJ > femoral.
 - Vigilant of needle position and avoid deep needle puncture beneath neck.
- Nerve damage – vagal, phrenic, brachial plexus
 - USS to visualize structure and avoid needle coming in contact
- Airway/oesophageal trauma
 - USS to avoid contact
- Pericardial tamponade/arrhythmia
 - Avoid deep insertion of guidewire + dilator.
 - Verify CVL tip position post-insertion with CXR, ensure tip not in cardiac shadow (ideally just outside it or <2cm below carina) and ensure CVL tip lie parallel to vessel wall, not digging into it.
 - Secure catheter carefully at 2 points to avoid migration.
- Thyroid gland trauma
 - USS to avoid contact with structure
- Venous air embolism
 - Prime line with saline before use. Close all lumen.
 - Trendelenburg to increase venous P when using IJ route. IPPV/PEEP if patient intubated.
- Bleeding
 - Do not cut skin excessively. Check coagulation, avoid insertion when coagulopathy presents.
 - Insert at site where compression possible (Tricky with SC)
- Infection/CLAB.
 - Site selection: IJ better than femoral.
 - Strict aseptic technique. Clear dressing and daily site check to allow early detection.
 - Aseptic technique when using CVL.
- Venous thrombosis:
 - Remove line asap when not required.
 - Hep saline lock.
- Anaphylaxis to chlorhex

Q14- F7a discussion, 36%

Critically evaluate the role of recombinant factor VIIa in blood loss requiring massive transfusion in the trauma patient.

Pros

- Theoretical basis
- Success in case reports
- No risk of infection transmission
- Accepted by some Jehovah's witness
- Long shelf life in powder formulation
- Avoids problems assoc with transfusion: hypothermia, electrolyte, volume overload

Cons

- No good evidence; likely publication bias
- ?side effects ?thrombotic risk
- only considered for use after MTP packages have been tried and abnormal physiology corrected, but still persistent coagulopathy
- off-label use; consent problem esp in Paeds patient.
- Cost / availability
- No agreed protocol

On balance (report wants it)

- F7a is unlikely to be effective if acute physiological derangement isn't corrected first. My priorities will be on correction of these + surgical haemostasis. After all these have been done and patient is still bloody, I'd consider using F7a 90mg/kg.

Q15- ASA discussion , 45%

Discuss the usefulness of the ASA grading as a measure of perioperative risk.

ASA = grading of patient's physical status.

- 1 - A normal healthy patient
 - 2 - A patient with mild systemic disease without functional limitation (under control)
 - 3 - A patient with severe systemic disease with functional limitation
 - 4 - A patient with severe systemic disease that is a constant threat to life
 - 5 - A moribund patient who is not expected to survive without the operation
 - 6 - A declared brain-dead patient whose organs are being removed for donor purposes
- E – Emergency Surgery

Evaluation of ASA use in perioperative risk assessment

Use

- Standardized grading of patient's overall physical health, allows for synthesis of patient's overall clinical status and aids in team prelist briefing, communication.
- Although not designed for direct periop risk assessment; ASA grade is correlated with periop risk.
- On management level, ASA information is commonly collected by hospital, DHB for audit purpose and possibly risk prediction of public health, and for health economics analysis and funding allocation.

Limitation

- Does not include class between ASA 2 + 3, which may be 'moderate' in nature.
- Does not indicate number of medical problems or allow for correct classification with 'frail' patient – in whom significant functional limitation isn't easily attributed to a 'systemic disease'.
- Does not consider significance of 'age'
- Is subjective to author's interpretation of ASA definitions. Eg. some would classify pregnancy as ASA2, some would classify as ASA1.
 - Making inter-hospital comparison of study results difficult based on ASA classification.
- Problems with 'E' – some author include current acute condition when scoring ASA, eg. young fit healthy patient with multi-trauma would get ASA 4E, but some would use

premorbid condition, hence grade such patient as ASA 1E.

May-2006, 62%

Q1 – Aspiration prophylaxis, 87%

List the predisposing factors for aspiration of gastric contents in a patient undergoing general anaesthesia. Discuss the measures you would take to prevent this complication.

Risk factors & Increased acidity/volume – GORD, hiatus hernia, obesity, pregnancy

- Delayed gastric emptying – Intraabdo pathology (bowel obstruction, GI sepsis), drugs (opioid, ETOH), pain (trauma after food, labour)
- Increased risk of aspiration if regurgitation happens
 - Not protecting airway - Low GCS, LA to larynx, unable to cough
 - Uncoordinated swallow – CVA/TIA, LN palsy

minimization strategies

- Preop
 - Identifying risk factors – previous aspiration? GORD?
 - Ensure preop fasting (as per ANZCA fasting guideline) – 2 hours of clear fluid, 6 hours for solids
 - Antacids: Na citrate 0.3M 30ml <30mins. Ranitidine 150mg BD, omeprazole 20mg for 2 days.
 - Aspiration of NGT if in-situ.
- Intraop
 - RSI/cricoid –
 - Ensure ETT cuff adequately inflated
 - Optimise extubation condition: reversal of NMBD, mouth/NG suction, fully awake and consider position L/lateral head down.
- Postop
 - Recovery position + ongoing monitor.

Q2 – IV drug error prevention, 39%

Describe the factors that contribute to intravenous drug errors in anaesthesia practice. Discuss the methods available to reduce the incidents of such errors.

IV drug error could mean wrong drug/dose or given to wrong patient etc. Human error known to be predominant factor.

Factors

- Human factor
 - Slips = an unplanned action was performed ie skill based attention failure
 - Eg. writing down wrong units such as mg instead of mcg
 - Failure to check ampoule label, expiry date
 - Lapses = missed action ie forgotten to perform action ie skill based memory failure
 - Eg. forgotten to give antibiotic

- Forgotten to enter all necessary data while programming IV infusion pump
- Mistake = wrong plan as carried out leading to error ie rule based failure
 - Eg. wrong label on syringe
 - Wrong concentration of drug
 - Inadequate knowledge on drug effect
- Other contributing factors to Human factor:
 - Distraction eg. teaching, multitasking (performing TOE and GA at same time), previous patient in recovery.
 - Stress eg critically ill patient, crisis
 - Fatigue eg working overtime
 - Boredom
 - Interpersonal factor eg lack of communication between anaesthetists during handover
- Systemic factors: error in system
 - Similar appearance of different drug ampoules
 - Changes in appearance of drug ampoule to a different form without informing Clinicians
 - Poor rostering → fatigue
 - Poor drug organization in trolley
 - Poor labelling system with similar colour for different classes of drugs
 - Unfamiliar environments in understaffed wards without adequate orientation

Risk minimization

- General
 - Good roster to avoid fatigue
 - Avoid distraction during case
- Drug
 - Well organized trolley
 - Tidy workspace
 - Avoid similar packagings within trolley
 - Prefilled syringes for high risk medications eg. ketamine, sux, insulin
 - Clear communication within team of drug drawn up and label all syringes
 - Establish rule of checking label on ampoule, on syringe before use
 - Colour coded label for different classes
 - Bar code reader with audiovisual alarms and rule of scan before administer
 - Rule of 2 persons check for complex drug dose calculations
- Quality assurance
 - Report of error and root cause analysis to allow quality improvement taking place.
 - Involve Pharmacy in ensuring consistent vial stock used throughout hospital
 - Standardise drug concentrations used and label system throughout hospital

Q3- DM management, 75%

A sixty-five year old woman presents for a total abdominal hysterectomy. She has non-insulin dependent diabetes mellitus that is normally controlled with an oral hypoglycaemic agent. Describe your perioperative management of her blood sugar.

Q4- NSAID use , 77%

Discuss the role of non steroidal anti-inflammatory drugs for post operative analgesia in adult day surgery patients.

NSAID = non-selective (COX-1 + 2); or selective (COX-2). Analgesia achieved through inhibition of COX-2; SE profiles are from inhibition of COX-1 and homeostatic prostaglandin production.

Use in day case

- **Aim** = good analgesia, minimal SE: PONV, sedation, bleed, CVS/Resp effect.
 - NSAID works well to achieve these goals.
- **Pros**
 - Multiple formulations, cheap – IV, PO, rectal.
 - Effective analgesia esp used in multimodal analgesia.
 - Opioid spare – less PONV, sedation, urine retention, resp depression.
 - Has formulation to achieve prolonged effect eg. etoricoxib OD or IV parecoxib OD-BD.
- **Cons**
 - Still require strong opioid for managing high level pain
 - Multiple contraindications (relative or absolute)
 - Asthma, CHF/IHD, Renal, GI, bleeding risk, several stages during pregnancy (cat C); allergies (implicated in some sulphur allergy)
 - Potential SEs:
 - Bleed, gastritis, ulcer, potential impaired bone healing (although controversial);
 - Interaction with high PPB drugs – causing displacement and increased effect.

Q5- Myasthenia Gravis (repeat) , 73%

A fifty year old man taking corticosteroid and pyridostigmine for myasthenia gravis is to have an elective right hemicolectomy under general anaesthesia. Discuss your management of his myasthenia pre and post operatively.

NB.

Use of neo may cause cholinergic crisis; hence spontaneous recovery from NMJ recommended if practical

Q6 – smoke inhalation management, 57%

Describe your immediate assessment + management of airway in patient with smoke inhalation injury

Smoke inhalation = inhales heat and chemical smoke, can cause

- Thermal injury – airway swelling, tissue sloughing, scarring, stricture
- Chemical injury – inflammation, oedema, hypoxaemia due to CO toxicity or methaemoglobinaemia
 - leading to airway obstruction

Assessment

- Hx-
 - duration of smoke inhalation and time course since inhalation;
 - facial burn?
 - Mechanism? Blast injury may involve multisystemic injury
 - Plastic burn? May cause cyanide poisoning, hypoxaemia, methaemoglobinaemia
 - Other important routine AMPLE history.
- Exam
 - Is patient in severe resp distress / desaturation / agitated, decreased LOC requiring urgent intervention?
 - Extent of facial burn, especially close to airway (nose/oral cavity, singeing of eyebrows).
 - Oral cavity exam – any swelling, sloughing, presence of soot/carbon deposit? Carbonaceous sputum? Change of voice
 - Nasoendoscopy assess laryngeal swelling
 - Presence of pulm oedema from inhalational injury/chemical pneumonitis?
 - Other important routine airway assessment – Malampati, mouth opening, TMD, neck movement etc.

Management

- Consider if urgent intervention required. Even if non-critical, would still consider timely intubation as indicated by potential worsening of airway swelling.
- If severe swelling suspected, consider surgical airway or AFOI.
- Otherwise, plan for RSI +/- C-spine immobilization; Note the contraindication for sux for burn >2 day old.
- (still required by report) Subsequently, watch for:
 - Hypoxaemia from CO toxicity/methaemoglobinaemia → oxygen supplement therapy; sats may be misleading with CO toxicity.
 - Bronchospasm → bronchodilators
 - Ventilatory difficulty with eschar → escharotomy
 - LRTI/VAP → high vigilance, ICU care and timely antibiotic
 - ARDS → lung protected ventilation strategy
 - Significant burn requiring care in burn center?

Q7 – restless in TURP, 89%

A seventy five year old man having a transurethral resection of the prostate under spinal anaesthesia which has been uneventful, becomes restless 70 minutes into the procedure. He had 2 milligrams of midazolam at the start of the case and no further sedation. Describe your assessment and management of this problem.

Assessment of restlessness during TURP

- **Consider differentials:**
 - **A:** OSA, airway obstruction
 - **B:** hypoxaemia, hypercarbia, pulm oedema, PE,
 - **C:** MI, hypotension, anaemia from excessive blood loss,
 - **D:** CVA, pain, inadequate block, discomfort, drug error, hypoglycaemia
 - **E:** hypothermia, TURP syndrome,
- **Management**
 - **(simul)** Manage patient at the same time consider differentials
 - Scan monitor, are the vital signs stable? ECG changes?
 - Scan surgical field: Is there large volume of irrigation fluid used with deficit in fluid output to suggest TURP syndrome? Sign of pulm oedema?
 - Invx: blood gas for electrolyte, osmolality, UECr, FBC.

- Mx ABCDE
 - Is patient in severe distress requiring GA, airway + ventilate to facilitate care?
- Frequency gambling, would mx TURP
 - Depends on differential, however in this context TURP syndrome most probable diagnosis = absorption of excessive glycine based hypotonic fluid → hypoosmolar hyponatraemia.
- Notify staff/Surgeon, call for help for job delegation
- 1st instance: stop operation if safe, stop IV fluids.
- A: maintain airway, intubate if patient becomes unconscious of require GA to facilitate management
- B: maintain oxygenation titrate FiO₂. Likely require 100% initially. Maintain normocarbida.
 - Consider frusemide if signs of pulm oedema with coarse crackles, desat and resp distress. Balance risk with hypovolaemia.
- C: maintain MAP. Note that if excessive fluid absorbed patient may have HTN with reflex bradycardia.
- D: if seizure → give IV midazolam and consider GA.
- E: check electrolyte levels with blood gas.
 - If confirms acute hyponatraemia Na <120 with seizure, need to treat with hypertonic saline: 3% NaCl 1-2.5ml/kg/hr → until symptom improvement of Na >125.
 - Hourly Na level check. Limit acute Na rise to <10mmol/day.
- Montior: routine ANZCA guideline + arterial line + CVL to guide electrolyte/fluid therapy.

Q8 – pacemaker management (repeat), 86%

The first patient on your orthopaedic list tomorrow is scheduled for left total hip replacement. He has an implanted (permanent) cardiac pacemaker. Discuss the relevant factors in your pre-anaesthetic assessment of this patient.

PPM used usu. for symptomatic bradyarrhythmia

Preop assessment:

Hx

- indication
- concurrent medical problem, cause for bradyarrhythmia
 - CAD, CHF, HTN, DM
- Hx/exam of decompensated CHF or unstable angina? Needing Cardiology referral?

Invx:

- PM interrogation from recent electrophysiology service?
 - Dependence, mode, underlying rhythm, battery life, magnet response?
 - ?AICD function
- Referral for check as per local policy, eg. >6/12 in my own institution.

Planning:

- Patient: usu no reprogramming required given surgery >15cm away from PPM. However, if at risk of EM interference, will need to consider disabling rate responsiveness, asynchronous pacing.
 - Ensure
- Surgical factor: discuss diathermy precaution, bipolar w lowest feasible energy, burst duration, pad away from site as far as possible.
- Anaesthetic: resus equipment ready: drug, ext pacing pad / defib applied.

- Monitor
- Postop care plan: need to have EP service available if re-interrogation required.

Q9- Bupivacaine toxicity, 56%

Describe the clinical features and management of bupivacaine toxicity.

LAST

Feature

- Systemic – CNS: circumoral tingling, metallic taste, paresthesia, seizure, coma, death.
- CVS – hypotension, heart block, VF (refractory), death
- Anaphylaxis – very rare – CVS/resp/cutaneous features.

Mx

- STOP LA, call for help, if systemic toxicity seen, this is medical EMERGENCY!
- ABC approach + early defib as per ANZCA endorsed LAST guideline + ACLS protocol.
 - With caveat of very careful use of adrenaline – as 1mg bolus assc with 100% mortality. If using adrenaline, consider small boluses of <1mcg/kg.
- Key = hyperventilate to low normal CO₂, to reduce unionized portion of LA which acts on effect site. Balance risk with seizure induced by hypocapnoea.
 - Avoid hypoxaemia and acidosis that would worsen LAST.
- Timely administration of 20% intralipid.
 - 1.5ml/kg bolus followed by 15ml/kg/hour infusion. Repeat bolus Q5 mins. Maxium dose given = up to 12ml/kg.
- Seizure control.
- ICU/HDU care.

Q10- peribulbar eye block anatomy , 33%

Describe the anatomy of the orbit relevant to a peribulbar eye block.

Peribulbar = instil LA into within orbit outside fibrotendinous ring of extraocular recti muscles.

Anatomy for Peribulbar block

Orbit:

- Orbit = pyramidal shape, 40-50mm deep.
- Extraocular muscles, for fibrotendinous ring encasing the cone-shaped orbit, attaches sclera.
 - 4 recti
 - SO+IO
- Blood vessles are rich in superonsasal quadrant (opthamlic artery/optic N); hence approach = 2 injections classically. (infero temporal, midline superior).

Neuroanatomy

- SensaEon to the Eye
 - Cornea and Supero-nasal conjunctiva → nasociliary N (V1)
 - The Rest → Lacrimal, Frontal, Infra-orbital
- Motor supply
 - SC, levator palpebral – III (upper)
 - MR, IR, IO – III (lower)
 - LR – VI (abducens)
 - SO – IV (trochlear)

Optimal block = sensory block and akinesis of the globe (motor block) is required.

- NB. ie inside muscle cone = 2, 3, 5, 6.
- Outside = 4

NB.

Globe (superficial → deep)

- Conjunctiva → tenon's capsule → subtenon space (potential space) → sclera → choroid/ciliary body/iris → retina

Q11- Carotid endarterectomy management, 77%

Discuss the principles underlying the management of a general anaesthetic for carotid endarterectomy.

Issues/Aims (from Auckland 2016)

- BC: These patients often have comorbidities: IHD/CHF/CVA/DM/renal failure
 - Myocardial protection from ischaemic injury
 - Ablation of surgical + stress responses
- D: Cerebral circulation may be compromised by preexisting disease + also clamping intraop
 - Cerebral protection from ischaemic injury + bleed from CVS instability
 - Control of HR and BP
 - Awake patient at end for neurological monitoring

Management

Pre

- Thorough preassessment, look for comorbidities outlined above. Routine AMPLE hx + airway + cardioresp exam; document existing neuro deficit.
- Carotid doppler result.

Intra

- A: secure intubation, as access may be difficult intraop.
 - LMA could potentially reduce carotid BF.
 - Obtund airway reflex with prop/remi/roc, avoid hypotension with ephedrine/phenyl.
- B+C: maintain optimal oxygen delivery with oxygenation > 90% (and Hb > 70-80g/L), normocarbida + MAP within 20% of patient's baseline.
 - Care w hypocarbida as → reduced CBF!
 - Avoid venous congestion: no excessive PEEP, avoid venous compression from tube tie.
- Monitor: ANZCA routine + art line, 5 lead ECG + cerebral BF monitor:
 - TCD, EEG, stump pressure monitor, NIRS, SSEP
- X-clamp: keep MAP high normal for patient.
 - May need shunt distal to clamp if cerebral perfusion dysfunction evident.

Post

- Cough-free extubation with remi extubation or LMA exchange;
 - minimize risk of haematoma, wound dehiscence.
- Multimodal analgesia, consider superficial cervical plexus block to opioid spare + avoid cough → facilitates neuro assessment + wound dehiscence.
- HDU/ICU close monitor of potential complications:
 - A. Neck haematoma
 - C. MI, Hyper/hypotension
 - D. Stroke, Neurological deficit; Hyperperfusion syndrome

NB.

-airway oedema; cervical haematoma occurs ~5-10% of cases.

Q12 – AF causes and management in PACU, 71%

List the causes of acute atrial fibrillation in the perioperative period. Describe your management of acute atrial fibrillation which occurs in the PACU (Post- anaesthesia

Care Unit) in a patient who has had a total hip replacement.

List:

- Preexisting
 - PAF, cardiac disease (LVF, valvular, dilated LA), Pulm dx
- Stress induced: pain, inflammatory response, bleed, anaemia
- Acute cardiac event:
 - Hypoxaemia, hypovolaemia,
- hypoK, Mg.
- Hypothermia
- VTE – PE
- NB: AF in PACU setting often a short lived complication that resolved once acute peri-operative physiological changes were reversed

Mx:

- Decide if life threatening with haemodynamic compromise or not, fast vs. rate controlled?
- If compromise → emergency, help, manage ABC, urgent DC cardioversion indicated.
- If not compromised, then consider causes and support concurrently:
 - Causes? History of previous AF? Medical condition? Chest pain, dyspnea, palpitation? Pain, fever.
 - r/v anaesthetic chart – drugs, blood loss, fluid balance.
 - Exam to rule out heart failure. Vital signs. Hypovolaemia?
 - Monitor: ECG/pulse ox, NIBP; Art line if necessary
 - Invx: electrolyte, lactate, acid/base, Hb. ECG. CXR +/- ECHO.
 - Mx:
 - Treat hypoxaemia with O2 supplement
 - Support BP with fluid +/- vasopressor
 - Rate control vs. rhythm control
 - In context of acute AF, I'd rate control. Agent choice:
 - BB, eg. esmolol if no CI and esp patient already on BB. 10-20mcg bolus. If tolerable without haemodynamic compromise, consider IV metoprolol
 - Digoxin if concern with haemodynamic lability esp hx of heart failure.
 - Amiodarone for rate control which is relatively haemodynamic stable 300mg loading over 1 hour, followed by 900mg over 23 hours.
 - Notify Surgical Team +/- Cardiology referral
 - Consider HDU level care.

Q13 – preoxygenation (repeat), 25%**What is the physiological basis of preoxygenation? Describe method of preoxygenation and how to assess its adequacy (Chang's airway)**

(report)

- Few candidates addressed alterations in FRC, such as posture, pregnancy, anaesthesia, age or disease processes;
- Closing volume and oxygen consumption were seldom mentioned;
- Method of pre-oxygenation was often incomplete in detail;
- End tidal oxygen was often given as the sole determinant of adequacy of pre-oxygenation.

Q14- Desflurane use, 73%**Discuss the role of desflurane in current anaesthesia practice.**

Desflurane: methyl ethyl ether, halogenated.

- Low blood:gas partition coefficient, hence rapid onset
- Low fat:blood partition coefficient, hence very low accumulation in adipose tissue and quick offset despite long duration of use.
 - Elimination via ventilation. Minimally metabolized (0.02%).

Use = GA, prolonged case, obesity, neurosurgery.

Other properties:

- Ischaemic preconditioning
- Relative maintenance of metabolic autoregulation of CBF – esp with $1 < \text{MAC}$; hence use in Neurosurgery is acceptable.

However limitations:

- Pungent, bronchospasm in smokers
- Need special vaporizer due to high SVP (dual circuit gas vapour blender)
- Produces carbon monoxide when react with sodalime/baralyme, esp with low flow.
- Expensive,
- High greenhouse effect and global warming potential.

Q15- epidural analgesia consent, 62%

Discuss the elements you consider important when obtaining consent for epidural analgesia in labour.

Sep-2005, 62%

Q1- croup, paed management, 76%

What are the indications for tracheal intubation in a 3 year old who presents with “croup”? Describe your technique for intubation.

Indications

- Respiratory failure
 - Increased WOB with signs of fatigue
 - Cyanosis
- Reduced LOC
- Croup score can be calculated based on resp distress/cyanosis/WOB.
- To facilitate transport

Intubation technique = CARE WITH AIRWAY OBSTRUCTION SUBGLOTTICALLY

- Obtaining view is not necessarily difficult, however passage of ETT likely difficult.
- Transfer to theatre
- Temporize for transfer to OT with Medical Treatment:
- Medical management to temporize while optimizing intubation condition...
 - Minimise patient distress. Do not force IV access if patient fights.
 - Humidified O₂ - as tolerated
 - Adrenaline neb 1:1000 - 5ml (0.5 ml/kg if $< 10\text{kg}$;) Q 30-60 minutes
 - Dexamethasone 0.6 mg/kg IV or IM
 - Heliox
- Obtain important AMPLE history.
- Anaesthetic management (Auckland 2016).
 - Inform Tech, ENT surgeon, OT nursing staff + 2nd Paeds Anaesthetist.
 - Gas induction-100% oxygen, sevoflurane, maintain CPAP
 - Can take long
 - LA to airway
 - IV access once asleep

- Smaller than normal ETT tube (croup tubes – ie long tube to fit past obstruction in trachea) – nasal tube allows for superior fixation in children and facilitates in PICU (report) – use age/4 + 3.5 uncuffed +/- one size down. ie 3.5-4 ETT.
- Needs ENT backup with rigid bronchoscopy +/- surgical airway
- Transfer to PICU

NB.

Croup usu. viral, due to parainfluenza, influenza A/B, RSV, rhinovirus.

Very risky if have to intubate paed in ED, if necessary...

- inform MDT to optimize intubation situation in ED – tech, ENT surgeon, ED staff. Ensure availability of equipment – airway, drug, oxygen, suction, difficult airway equipment including surgical airway equipment.

Q2- Statistics, bias reduction, 72%

Discuss ways in which you can decrease bias in a clinical trial for a new antihypertensive agent.

Bias = systematic error in a trial. Increasing sample size doesn't remove bias.

Potential source of bias include

- Selection bias:
 - sample unrepresentative of population
 - controls not comparable with study group
 - define inclusion and exclusion criteria that allows for good generalizability of sample to the population it represents.
 - Consider multicenter trials to improve sample representativeness and better generalizability.
- Intervention bias:
 - patients receiving more attention because of their treatment group
 - esp if unblinded comparison.
 - Blinding, ensure adequate randomization.
 - Ensure similar background characteristics between intervention and control arms.
 - Ensure protocolised treatment for both arms to achieve standardisation
- Follow-up bias:
 - when patients are lost to the study it may be due to confounding effect eg. less capable to continue with study due to illness
 - minimize effect by using intention-to-treat analysis
 - minimize lost to follow up or withdraw if practical.
 - Minimize crossover of patients.
- Recall bias:
 - patient mistaken recollection eg. ability to describe pain when very unwell post-laparotomy
 - questionnaire/interview conducted in timely manner, when patient clinically stable. Use objective assessment in combination to subjective.

- Measurement or information bias:
 - exaggeration of effect: eg it is well known that patients included in trials often do better than those not included, the patients included in the trial will have better analgesia than those not included (ie Hawthorne effect)
 - minimize by careful study design to ensure appropriate definition of inclusion + exclusion study criteria. Refer to already published high quality study during study design.
 - Confusion of outcome measure and data collection
 - Clear definition of outcome to avoid confusion
 - Do not change outcome measure from study protocol
 - inaccurate or uncalibrated instruments
 - minimize by ensure working, calibrated equipment before study take place.
 - Use standardized machine to allow objective measurement, rather than by manual sphygmomanometer.
- Analysis bias
 - withdrawals or design violations
 - minimize by sample-size calculation with Qualified Statistician Consult and dedicated research team to follow up patient.
 - Good data handling with appropriate statistical analysis method
 - Statistician consult
- Conclusion:
 - No exaggeration and no oversimplification.
 - Must accurately reflect study result generated.
- Publication
 - avoid publication bias; publish if it is well designed even if the result is negative.

Q3- ANS neuropathy management in DM, 36%

What are the symptoms, signs and anaesthetic implications of an autonomic neuropathy associated with diabetes mellitus?

manifestation

CVS, GI/GU, sweat

Signs:

- loss of HR variability – Valsalva, respiration, postural change; BP

Issues:

- CVS, silent MI, thermoregulation, poor glycaemic control
- Aspiration prophylaxis

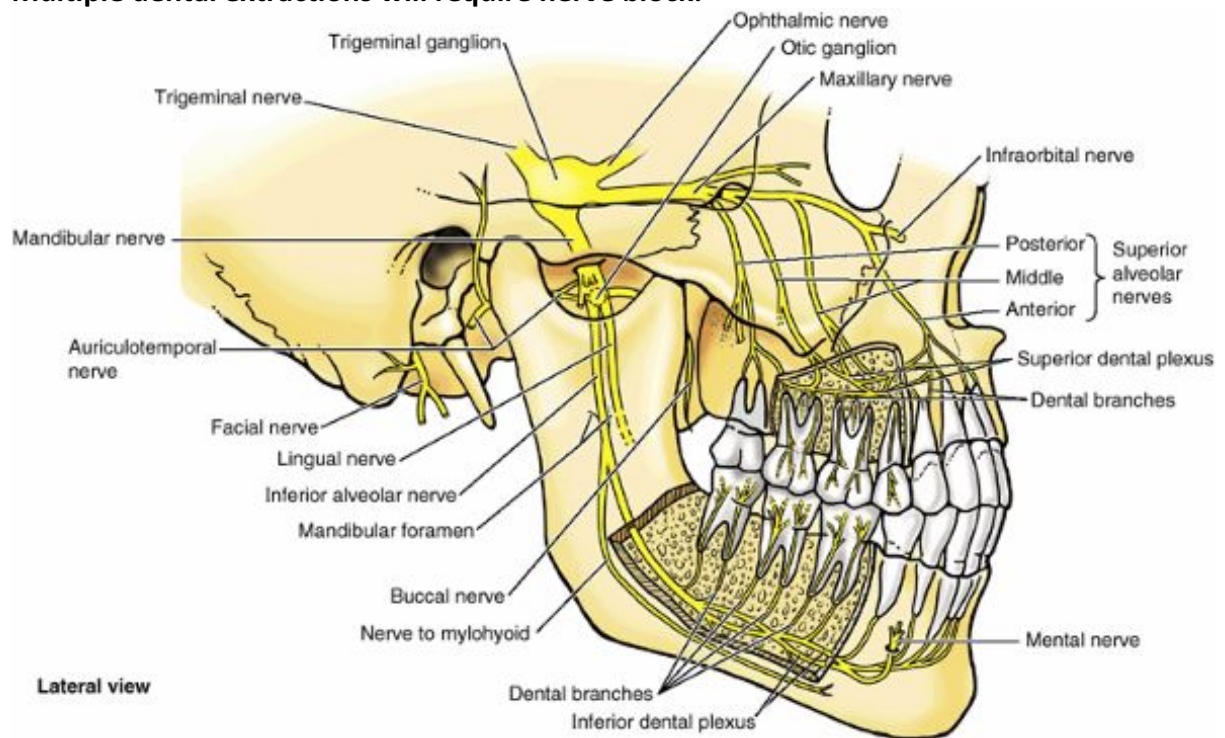
Q4- Cr V anatomy for LA/dental, 44%

Describe the anatomy of the trigeminal nerve relevant to local anaesthesia for dental extraction

Dental extractions relevant nerve: (report)

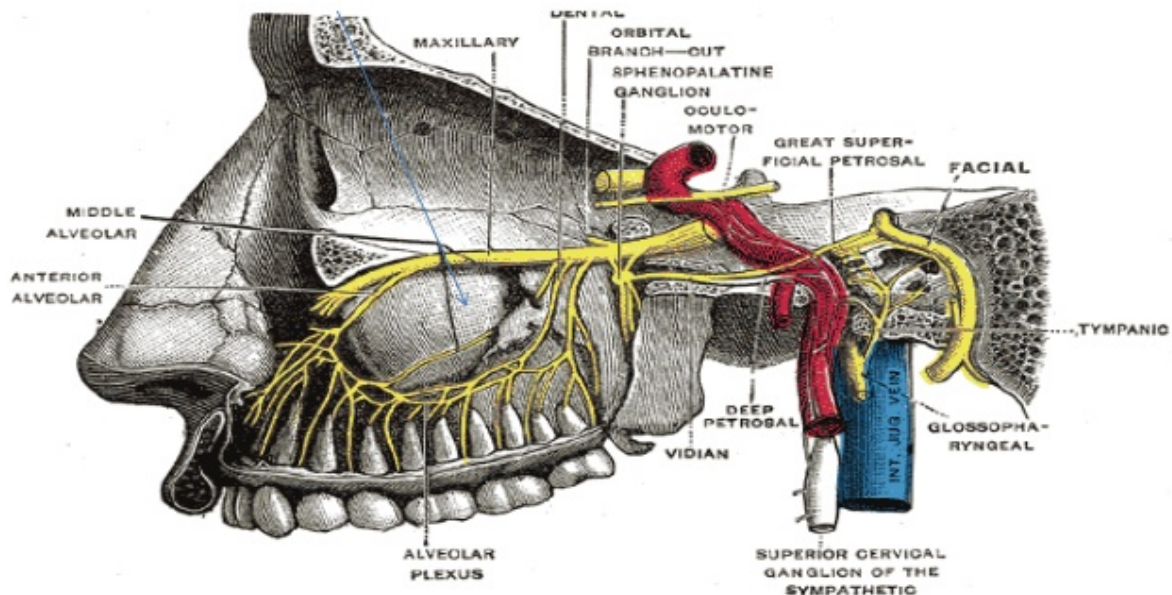
- Maxillary N V2
 - Upper molar: post sup alveolar N. (PSAN)
 - Upper premolar: mid sup alv nerve (MSAN)
 - Upper canine/incisor: ant sup alv N (ASAN)
- Mandibular N V3: Lower teeth: inf alv N (IAN)

Multiple dental extractions will require nerve block:



The contents of the pterygopalatine fossa

All the upper teeth receive their innervation and blood supply from the maxillary nerve [V2] and the terminal part of the maxillary artery, respectively, that pass through the pterygopalatine fossa.



Hard plate:

- Greater / nasopalatine nerve blocked (=branches of pterygopalatine ganglion (aka sphenopalatine ganglion)).

Upper extractions: 1-2 of SAN.

- PSAN in pterygopalatine fossa
- MSAN/ASAN = continuation of infraorbital N.
 - Can do pterygopalatine ganglion block for most N. above, but risk of haematoma + injury to maxillary artery, venous plexus.

Lower extractions:

- IAN block (also blocks lingual, mental, incisive N); run medial aspect of mandibular ramus.

1-2 teeth extraction can be with LA infiltration.

Q5 – LMA use in laparotomy, 94%

What's role of LMA in failed intubation for laparotomy

LMA in failed intubation –

- Supraglottic device allowing for airway maintenance + ventilation.
- may be a necessary life-saving rescue technique to provide oxygenation when intubation has failed.

If LMA succeeded in oxygenation, subsequent management depends use in laparotomy depends on

- risk assessment of aspiration
- urgency of case – is wake up a practical option?

Emergency case:

- LMA allows ventilation. If emergency surgery where time is critical, may have to proceed; balancing urgency of surgery with an unprotected airway + aspiration risk.
- Consider cricoid pressure to minimize risk of aspiration; however may compromise airway or injure oesophagus and benefit may be limited.
- Alternatively, consider fiberoptic guided intubation through LMA to protect airway – smaller ETT eg. 6.5 should be used, with size 5 FOB, which would fit through size 5 LMA, lubricate ETT.

If non-critical surgery eg. elective with low risk of aspiration

- Then may wake patient up and consider AFOI.
- Alternatively, can also attempt FOI through LMA.

Once intubated, LMA can be left in-situ, which allows for interval extubation postop. Care with airway oedema and monitor LMA cuff pressure. If removing LMA, need to be vigilant not to dislodge ETT.

Note, if oxygenation fails with LMA and BMV, ie CICO situation = emergency and requires cricothyroidotomy immediately.

Q6- Anaesthesia and thermoregulation, 59%

How does anaesthesia alter temperature homeostasis?

Thermoregulation is normally interated by hypothalamus, where threshold is set for behavioural changes (clothe change, body posture) or autonomic response eg. shiver, sweat, vasomotor activity; these work to maintain body temp within the interthreshold range.

Interthreshold range (body temp) = range of body temp where no ANS response occur; usu +/- 0.2C at 37C.

However, under GA

- interthreshold range is widened in dose-response fashion, and lower threshold (2 deg) more than upper threshold (1 deg).
- Patient is unable to perform behavioural change; which further impair thermoregulation.
 - Net effect is the tendency for patient to become cold.
- GA also induces 3 phases of temperature change via:
 - Redistribution (1st hour) where core body temp lower and equalizes peripheral body temp due to vasodilation
 - Ongoing heat loss by rad 40/convec 30/evap 15/conduct 5+ resp heat loss 10+ reduced metabolic rate
 - Plateau phase where thermogenesis equuibrates with heat loss.
- Shiver may also be inhibited by muscle relaxant + neuraxial may abolish vasomotor response, which all further compounds effect of patient becoming cold.

NB.

- Interthreshold range (body temp) = range of body temp where no ANS response occur; usu +/- 0.2C at 37C.
- Thermoneutral zone (environmental temp) = range of environment temp in which heat production is minimal; thermoregulate largely by vasomotor activity.
 - Range 22-28C adult; 32-34C neonate.

Q7 – Latex allergy, 46%

How would you diagnose a clinically significant latex allergy occurring intraop?

Latex allergy = mainly 2 types (as described in ANZCA Welfare resource on latex allergy)

- Type 1: anaphylactic reaction = usually immediate, potentially life-threatening
- Type 4: delayed hypersensitivity reaction

Diagnosis intraop:

- Hx
 - Symptom onset? Clear temporal-relationship to exposure of latex?
 - Other potential concurrent exposures excluded? Eg. antibiotic, chlorhexidine, muscle relaxant.
 - Other causes for CVS collapse, severe bronchospasm? PE, MI, hypotensive agents
 - Risk factors:
 - Known allergy to latex? Assc with some food allergies eg. kiwifruit, banana.
 - Occupational exposure? Eg. health professional
 - Comorbidities? Spina bifida, atopy.
- Exam
 - Cutaneous sign? Localized, systemic urticaria
 - Angioedema? Swelling in lips/tongue/pharynx?
 - Resp: bronchospasm, wheeze
 - CVS: hypotension, CVS collapse?
- Invx (as per report)
 - Tryptase taken at 1, 4, 24 hours as per ANZAAG guideline to observe rise+fall of level to diagnose anaphylaxis. Although trigger still need to be confirmed.
 - Skin prick test:
 - Can confirm latex allergy or exclude other differentials; performed >6weeks post incident for histamine to replenish.
 - Intradermal test
 - RAST (radioallergosorbent test): test for latex antibody in serum.
 - NB: potential fulminant reaction could happen, therefore testing should be done at Specialist Allergy Testing center where resuscitation facility is available.
- On balance, diagnosis intraop is difficult and further investigation is required.

Q8 – Pneumothorax management, 61%

A 35 year old female is found to have a small pneumothorax following removal of a breast lump under local anaesthesia in a day surgery facility. How would you manage this?

Immediate management = simultaneously assess severity + manage

- A: is patient maintaining airway? Is there surgical emphysema with airway swelling
- B: provide FiO₂ 100% and maintain spontaneous ventilation. However if severe resp distress will need urgent needle pleurocentesis + chest drain placement.
 - Call for help from Surgical Team and need anaesthesia assistance.
- C: is patient shocked from tension pneumothorax indicating urgent decompression? Maintain MAP with fluid + vasopressor.

Ongoing monitoring:

- In recovery with O₂ supplement. Monitor full vital signs + extent of surgical emphysema.
- Need repeat CXR eg 6 hours later.

Subsequent care:

- If unstable, need admission to hospital HDU for monitor
- If stable without evidence worsening of pneumothorax, may consider outpatient management, providing:
 - Physical proximity to hospital / medical assessment
 - Sensible Support person
 - Transport vehicle, phone available.
 - Clear instruction on warning signs to return to hospital immediately: eg. worsened SOB, presyncope, chest pain, worsened surgical emphysema.
 - Patient should return to hospital daily over next few days to confirm resolution of pneumothorax.

Prevent worsening of PTX:

- Don't give N2O
- Explain to patient on flight restriction, diving restriction until resolution of pneumothorax.

Q9- Postop visit purpose, 63%

Discuss the purpose of a postoperative visit.

PO visit should be in PACU but also on the ward the following day or more as required.

Purpose is to assess

- **Patient's general well-being**
 - Provide general info – reassurance, answer questions
 - Assess airway, pulm, CVS functions to ensure any issues are addressed
 - Eg. sore throat? Any resp distress? Any CVS instability
 - Periop medication rationalization
 - Neuro function? – recovery from regional block? Any sign of neuro injury?
 - Pain? PONV? – provide appropriate multimodal treatment.
 - GI/GU – po intake + return of bowel function? Urinary function? – consider laxative if constipation developing esp with opioid use.
 - Any other concerns? Eg. PP, itch, coagulopathy, ongoing bleeding?
- **Follow up any anaesthetic complications**
 - Inform patient of any anaesthetic complication
 - Eg. difficult airway -> needs documentation and explanation of future plan
 - Others eg. dental damage, anaphylaxis, MH etc.
 - Further investigation or follow up planning explained eg. allergy testing after anaphylaxis; patient information sheet provided + medical alert systems in place.
- Ask for patient's feedback and overall satisfaction of care

Q10 – Cardioversion in intraop arrhythmias, 38%

Critically evaluate the role of cardioversion in the management of intraoperative arrhythmias.

Intraop arrhythmias are common

- From Surgical stress and anaesthetics on haemodynamics
- Usu. self-limiting

- Causes include:
 - Preexisting
 - PAF, cardiac disease (LVF, valvular, dilated LA), Pulm dx
 - Stress induced: pain, inflammatory response, bleed, anaemia
 - Acute cardiac event:
 - Hypoxaemia, hypovolaemia,
 - hypoK, Mg.
 - Hypothermia
 - VTE – PE

Cardioversion = treatment aim at restoring sinus rhythm.

- mainly indicated if there's tachyarrhythmia causing haemodynamic compromise
- Can be electric or chemical

Benefit, can be life saving in event of tachyarrhythmia induced shock. Especially in context of VF/VT/Torsades de Pointes cardiac arrest. Defibrillation is immediately required.

- Mortality increase by 10% with every minute of persistent VF/VT arrest without cardioversion.
- Externally pacing may also be performed

Risks:

- dislodging thrombi → CVA
- not always successful if cause not treated
- other treatment may be more effective and more accessible eg. adenosine for SVT
- complications from DC cardioversion: skin burn, myocardial stun/scarring, fire risk, staff injury
- chemical cardioversion eg. amiodarone: thyroiditis, pulmonary fibrosis, arrhythmia (eg. VF in torsades de pointe), corneal deposits, peripheral neuropathy.

Q11 – HF assessment, 66%

How would you assess the severity of cardiac failure in a 75 year old man presenting for joint replacement surgery? Include any relevant investigations.

Cardiac failure: dysfunctional myocardium causing hypoperfusion to organs

Causes include:

- IHD
- Valvular disease eg. AS → hypertrophy → ischaemia → HF
- Restrictive cardiomyopathy
- Dilated cardiomyopathy: ETOH, post-partum

Severity (not aetiology) Assessed by:

History

- NYHA classification – functional capacity – SOB at rest, on minimal exertion or strenuous exercise?
- Symptoms of: orthopnoea, PND, oedema, Chest pain, palpitation.
- Treatment of heart failure
 - CRT → indicate severe heart failure
 - Medical: if high dose of multiple diuretics, HF likely be severe
- Look for other systemic complications
 - Liver cirrhosis, portal HTN (LFT, abdo USS)
 - Renal impairment (Cr/UE)
- Cardiology clinical letter;

Exam

- Pulm oedema, S3, gallop, elevated JVP, peripheral oedema, poor peripheral circulation, resp distress, heave.
- Haemodynamic instability - HR, BP, RR, sats.

Investigations (severity grading + diagnostic)

- Echo
 - LV/RV function, EF
 - Ventricular dimensions
 - Other problems such as valvular disease
- CXR
- BNP
- FBC

Q12 – upper limb nerve injury, 59%

Describe the symptoms and signs of commonly seen perioperative nerve injuries in the upper limb. List the causes and possible strategies for prevention. Do not include injuries due to neural blockade or direct surgical trauma.

Common periop upper limb nerve injuries s/s

- Sensory changes in affected nerve distribution; paresthesia, numbness or neuropathic pain development: allodynia, hyperalgesia.
- Motor changes: with weakness over upper limb over muscle group innervated by damaged nerve.
- If sensory changes only, tends to have better recovery than if mixed sensory/motor.
 - Brachial plexus injury – deficit/weakness can extend over large area over upper limb, outside of single N distribution
 - Radial nerve – posterior aspect of arm and forearm; wrist drop; unable to extend thumb
 - Ulnar nerve – medial aspect of palm (little finger + ½ of ring finger); weakness in lumbrical muscles; unable to ab/ad fingers.

Cause list – STOP: surgery, tourniquet, obstetrics, position

- Position of shoulder, neck, head turned away from abducted shoulder, arms fallen off from table unnoticed under drape → brachial plexus injury
- excess pressure point over elbow, inappropriate elbow hyperflexion → ulnar N. palsy
- median/radial nerve injury from excess compression or stretch.
- Limb tourniquet ischaemic injury
- CVL insertion injury brachial plexus
- Other pathophysiology:
 - Hypoxia, hypotension, hypothermia, hypoglycaemia.

Increased risk in eg. diabetes, PVD, smoker

Strategies for prevention

- Preop: optimize risk factor control: DM, PVD
- Intraop: optimal physiology control to avoid hypoxia, hypotension, hypothermia, hypoglycaemia
 - Meticulous care on position:
 - Neutral head/neck position
 - Shoulder abducted <90 deg and ext rotated <90.
 - Elbow not hyperflexed, ideally <90 deg.
 - Avoid excessive wrist extension or compression.
 - Pressure point protection with gel pad
 - Limit tourniquet time to <2 hours or have tourniquet break for 15 mins after 2 hours. Soft cotton bandage underneath tourniquet.
 - USS guidance for CVL placement.

Q13- Ethics re: discontinue treatment supply, 49%

The hospital pharmacist notifies you as Director of Anaesthesia that Thiopentone is to be withdrawn from the hospital formulary due to minimal usage. Outline and justify your response.

Data collection

- **Use in department:** Review recorded use, pharmacy record, explore rationale for withdrawal
- **Anaesthetist's opinion:** Collect data on departmental usage, collect anaesthetic staff opinions with this proposal. Discussion need to include:
 - Indications
 - Literature review
 - Drawback
 - Current use across department +
 - Consider impact on potential high usage area ie obstetric anaesthesia, paediatric or emergency response team for management of status epilepticus.
 - Decision making as Department.

Ethics:

- **Beneficence vs non-malevolence vs. justice/utility**
- Based on ethical principle of non-malevolence, thio removal needs to be carefully considered to ensure no potential harm is caused by lacking supply of it.
- Based on principle of utility – if resource funding can be justified to reallocate to another use, this potentially makes use of resource more efficiently and reduce wastage.

Response depends on...

- Depending on **Departmental use record** + **Anaesthetist's overall consensus**, will decide whether to put forward a structured argument to the hospital Pharmacy against this proposal.
 - Based on personal experience in my Department, thiopentone is still largely used in obstetric anaesthesia.
- Pros of thio:
 - Thio: rapid onset, offset, less haemodynamic impact as propofol; potent anticonvulsant; ideal for use in Obstetrics GA esp if there's refractory seizure in eclampsia.
 - However, these can be effectively achieved by propofol too +/- vasopressor use.
- Cons of thio:
 - Thio also requires reconstitution with water, has problem of tissue necrosis if extravasates, and causes intra-art thrombosis, damage if given intra-arterially.
 - Not suitable for use as infusion due to long CSHT. Metabolism becomes zero-order kinetic after hepatic metabolism is saturated.
 - Induces CYP 450 system; potentially lessening effect of other medications
 - Risk of inducing acute porphyria.
 - Much less airway suppression of propofol; difficult with LMA insertion.

Q14- Ethics re: alternative medicine use, 52%

You see a patient in the APC who asks you do administer an alternative medicine as part of their anaesthetic for total hip replacement. How would you respond to this?

Alternative medicine = practice not integrated into mainstream of evidence based health care system.

Issue here = tension between clinician's obligation to provide evidence based health care service vs. respecting patient's autonomy. It is important not to disregard patient's belief system.

I'd respond as follows:

- **FIFE**: Discuss with patient their view, belief, reason of requesting use of this alternative medicine.
- Establish patient's expectation of outcome.
- **Establish source** of patient's belief – from internet? From friend's experience? Personal experience?
- **Explain my view**: I'd then explain my appreciation of patient's view, but outline:
 - Alternative medicine use **outside my scope of practice**
 - **No endorsement** of alternative medicine use by governing body ie ANZCA
 - My personal **lack of knowledge of its: pharmacology** + potential interaction with my anaesthetics
- **Ethics**: Therefore as per ethical principal of 'non-malevolence', I am unable to administer this alternative medicine. Provide an apology for this act.
- **Review thoughts/2nd opinion**: Explore patient's view/feeling about this and offer second opinion if requested by patient.
- If patient insist on alternative medicine, I would politely refuse to provide anaesthesia and document our discussion. I'd offer to seek further advice from Pharmacy regarding Safe Medication Administration policy.

Q15- ECT, 70%

List the physiological effects of ECT and how they may be modified?

Aim of ECT = induce gen seizure w characteristic EEG changes to treat refractory psychosis, depression.

Phys effect + modification

CVS due to activation of ANS

- **Initially PSNS, first ~15 sec** → brady, hypotension, likely asystole!
- **Followed by SNS, longer lasting** → tachy, hypertension; likely arrhythmia.
 - → increased myocardial O₂ consumption + increased metabolic demand from seizure → likely ischaemia esp with tachycardia reducing O₂ supply.
 - **Modified by**
 - Obtained haemodynamic changes
 - PSNS: consider atropine/glycol – but balance potential tachycardia esp when SNS tone occurs
 - SNS: propofol, remifentanyl/alfentanil, sux
 - If high risk patient of cardiac decompensation, consider betablocker esmolol (0.5mg/kg)
 - GTN for HTN control if at high risk

CNS due to seizure – increased CMRO₂, ICP, CBF, seizure.

- Risk of cerebral ischaemia for susceptible patients unable to maintain CBF due to carotid stenosis.
- Long term effect assoc with memory impairment, cognitive impairment.
 - **Modified by**
 - Control of haemodynamics, ensure maintenance of CPP + oxygenation.
 - All induction agent has anti-convulsant activity, therefore balanced induction with remi/alfen to MAC spare or MAC-Bar spare.
 - Use methohexital 0.5-1.5mg/kg;
 - Use sux 0.5mg/kg or miva 0.1-0.2mg/kg
 - Remi 0.5-1mcg/kg bolus

Others:

- Fracture and dislocation -> use of muscle relaxant plus continuous watch by staff to ensure safety.
- Trauma to tongue/lips -> bite block
- Headache/myalgia -> simple analgesia
- Drowsiness, weakness, nausea -> antiemetic

NB.

Contraindication for ECT:

- CVS: HF, phaeo
- CNS: cerebral aneurysm
- Eye-glaucoma, retinal detach
- MSK-unstable #, severe osteoporosis
- Coag-DVT
- Other-cochlear implant.

May-2005, 44%

Q1- Nimodipine in aneurysm, 37%

Discuss the perioperative use of nimodipine for a patient undergoing clipping of a cerebral aneurysm.

Cerebral aneurysm issues

- Prone to bleed (SAH) and subsequent vasospasm → delayed cerebral ischaemia and neuro deficit (3-15 days) (haemolysed blood, oxyHb spasmogenic)
- Nimodipine shown to be effective in preventing vasospasm, should be commenced **as soon as practical and continued for 3 weeks**

Nimodipine =

- Dihydropyridine CCB, with **effective penetration of BBB and** work preferentially on cerebral vessels
 - prevents Ca influx to cells via L type Ca channels
- Used as prophylaxis of vasospasm
- Used as treatment of vasospasm in conjunction with HHH therapy
- Dose = PO/NG 60mg Q4h or IV 1-2mg/hr; but balance against risk of hypotension
 - Close monitoring required.
- Shown to be effective in preventing reduction in CBF, secondary ischaemia and cerebral oedema

Q2 – DVT prophylaxis (repeat), 76%

Discuss ways in which risk of DVT can be minimized in adult patients having intra-abdo surgery

Q3- RIJ anatomy, 62%

Outline the anatomy of the right internal jugular vein as it is relevant to your preferred method of percutaneous cannulation.

Intro

IJs are common sites for CVL in anaesthesia due to ease of accessing patient's neck during anaesthesia + ease for setting up medication infusions + asss with less CLAB rate than femoral site.

Reasons for preference

R/IJ is common site for CVL as

- Shorter distance to SVC cf. L/IJ
- Straighter angle to SVC cf. L/IJ
- Easier for PAC catheter floating

R/IJ courses: in carotid sheath in neck, joins R/SC vein → joins innominate vein from L/IJ → SVC → RA.

Superficial to deep: Surface anatomy: skin-(EJV)-SCM-carotid sheath-IJV.

Vulnerable structures to avoid – visualize clearly with USS and ensure needle tip is seen to avoid going close to these structures

- Artery – carotid A; usu. medial to IJV, but tends to lie post to IJV as it travels distally.
- Nerve – vagus nerve in sheath; phrenic nerve post to sheath + ant to ant scalene
 - Brachial plexus lie in the interscalene groove
- Lung – lie below clavicles
- Thyroid gland/esophagus/trachea – anteromedially

Q4- PCA discussion, 21%

Discuss the requirements for and limitation of the use of patient-controlled analgesia (PCA) as a technique.

Requirements

- Patient

- Understand principle of PCA; age/intellectual capacity
- Physically able to use PCA (may have difficult with severe RA in hands)
- Low risk of drug-abuse and no family/visitor at risk of drug-abuse

- System/Technical

- PCA management, monitor protocol
- Working IV + carrying fluid to keep vein open + non-return valve to ensure 1 way flow.
- Pump – reliable, robust, portable, lock to prevent tampering; able to set bolus dose, lock out and hourly limit +/- background infusion; recording of dose + alarm for occlusion.

- Monitor

- Patient needs regular monitor, sedation, RR, pain levels;
- Daily review by APMs.

Limitation

- Need all of the requirement above to be met.
- Inadvertent double dosing of opioids ie PO given in addition to PCA.
- Faulty setting on pump
- Tissues IV line.

- Needs adequate initial analgesia loading prior to starting PCA to be effective, as PCA delivers small dose bolus only which would take long time to reach adequate analgesia.
- Short duration of action with infrequent PCA use; esp during sleep as patient discontinues PCA use with sleep then wakes up with pain.
- SE with opioids – resp depression, sedation, NV, pruritus. (although theoretically less likely with principle of PCA – as if patient is sedated they cannot continue to use PCA to cause excessive sedation).
 - Still need multimodal analgesia.

Q5- fluid option comparison, 48%

Compare the relative merits of gelatin-based intravenous solutions and dextran intravenous solutions.

Q6- PAC vs TOE comparison, 85%

Compare the use of a pulmonary artery catheter and transoesophageal echo in evaluating cardiac function intraoperatively.

PAC = via IJV → catheter floated to PA (may then be wedged to assess PCWP)

- Pros

- Assessment of: - pressure, sats, CO
 - CVP (fluid status, RV function)
 - PCWP (LV function)
 - SvO₂ monitor (global oxygenation = surrogate measure of CO)
 - CO monitor using thermodilution technique (continuous)
 - PAP; PVR
 - Trace monitor also allows diagnosis of some valvular pathology

- Cons

- Risk of insertion as any CVL access (infection/bleed/arterial puncture, nerve damage, PTX), arrhythmia, pericardial effusion, tamponade + pulm A rupture.
- Accuracy dependant on many variables eg. LV/RV functions, valvular fxn, pulm disease, timing of injection (for CO monitor w thermodilution)
- Needs skills to place and interpret data.

TOE

- Pros

- Assessment of:
 - Cardiac function quantification, EF calculation
 - CO
 - Volume status - LVEDV
 - Valvular disease and severity assessment
 - Structural abnormality
 - Intracardiac thrombus
 - Pericardial effusion
 - Aortic pathology – aneurysm, dissection.
- continuous, timely assessment possible.
- Relatively non-invasive

- More direct assessment of cardiac function evaluation than based on PAC
- Cons
 - Needs skills to perform and interpret data
 - Expensive
 - CO output monitor not continuous
 - Risk in oesophageal rupture, dental damage; CI in oesophageal stricture/tumour/varices.

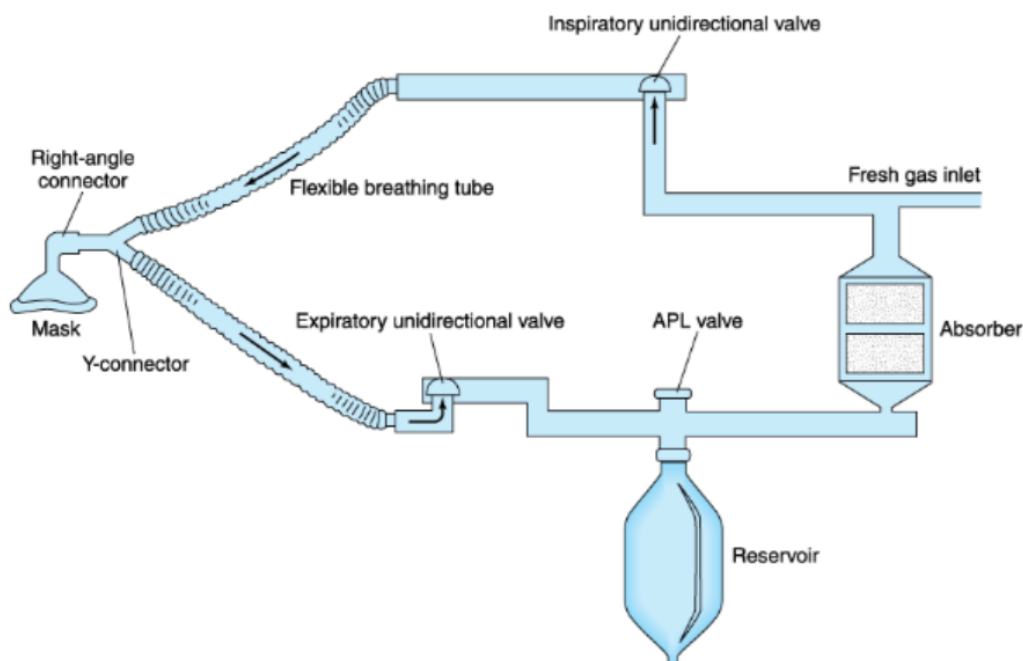
Q7 – failure to emerge from GA (repeat), 78%

List the possible causes of failure to emerge from general anaesthesia and describe how you would differentiate them – see 2015A Q9

Cerebral pathology
Systemic pathology
Drug effect

Q8- Circle breathing system, 49%

Draw a circle breathing system and give reasons for the location of the components.



Components (EAR-Aii, 6) – positioned strategically to minimize rebreathing + CO2 absorber workload or venting of FGF

- **Exp unidirectional valve** ← circuit from patient's mask Y connector
 - Prevents backflow of expired gas; avoid rebreathing when IPPV occurs
 - Maximal efficiency if placed close to Y-connector, but due to its bulky size is usu. placed at the machine side.
- **APL valve**
 - Before CO2 absorber to reduce absorber workload +
 - After exp valve to prevent FGF venting

- **Reservoir bag**
 - After exp valve to **prevent CO2 rebreath**
 - Before CO2 absorber to **decrease resistance to expiration**
- **CO2 absorber**
 - After APL to **reduce absorber workload +**
 - Before fresh gas inlet to **prevent mixing of CO2 with FGF/CO2 rebreath**
- **Fresh gas inlet** to provide FGF
 - Before insp valve to minimize mixing of CO2 with FGF
 - After exp valve + APL to minimize venting of FGF
- **Inspiratory unidirectional valve** → circuit to patient's mask Y connected to circuit out
 - Prevents backflow and ensure expiration into exp. Limb → ensures unidirectional flow of gas

NB.

Most efficient circle system arrangement with the highest conservation of fresh gases

- **Unidirectional valves near the patient**
- **APL located just downstream from the expiratory valve.**
 - Minimizes dead space gas and preferentially eliminates exhaled alveolar gases.

Miller's 3 Rules to make circle system work

- I&E unidirectional valve between patient and reservoir bag – avoids CO2 rebreath
- FGF cannot enter the circuit between expiratory valve and the patient – rebreathing of CO2 and preferential venting of fresh gas
- APL cannot be located between patient and inspiratory valve – Loss of gas with low CO2 level, becomes very inefficient
 - If above rules are followed, then any arrangement of other components will prevent rebreathing of carbon dioxide.

Q9- Antiemetic, 61%

What significant side-effects are associated with the use of anti-emetic agents?

- Droperidol causes a dose dependant increase in QT interval and is associated with torsade de pointes. This has been associated with the FDA issuing a "black box warning"
 - CVS: hypotension (droperidol-alpha-antagonism effect), tachycardia (anticholinergic)...etc.
 - Sedation, EPS, NMS, increased prolactin level.
- Dexamethasone:
 - BGL esp in DM; perineal pain. Immunosuppression (although controversial)
 - Chronic use changes is unlikely to be seen with single dose: Cushing's response, adrenal suppression, osteoporosis, PUD.
- Ondansetron: headache, constipation, QT prolong (although clinically insignificant with the low dose used in antiemetic)
- Cyclizine, promethazine
 - Anticholinergic effects.
 - Antihistamine effect.
- Scopolamine: sedation, dry mouth, blurred vision, urine retention, constipation, mild tachycardia.

- Aprepitant: fatigue, GI upset, hair loss, allergy

Q10- Prone position (repeat), 47%

What are the problems with the prone position for surgery

Environment

- **Transfer**: During transfer, at risk of losing airway, IV access, monitoring, IDC, chest drain.
- **Safety**: Potential injury during transfer:
 - patient due to poor body support
 - staff due to heavy lifting
 - ensure enough number of helpers to turn/support patient
- **Access**: Limited access to patient during surgery; airway, circuit, IV
 - Ensure airway secured with both tape and tie.
- Circuit disconnection during position change → ensure secure joints
- **Loss of monitoring** during position change → secure monitor to body with tape; vigilance during positioning.

Patient

- **Airway** dislodgement (Endobronchial or ETT fallen out) while prone and difficulty with management:
 - Prevent dislodge by extra secure, with tie+tape.
- **B**: pulm compliance decreased due to chest wall/abdo compression; although increased FRC may balance effect from decreased compliance.
 - Minimize compression from ensuring proper support over chest wall + abdomen with Wilson Frame.
- **C**:
 - May have significant haemodynamic change during transfer; venous pooling → hypotension; esp with monitor temporarily stopped:
 - Optimize haemodynamics before turn: fluid, vasopressor
 - Resume monitor and vasopressor infusion without delay after turn
 - In event of cardiac arrest, performing CPR is very difficult in prone:
 - Have low threshold to turn patient supine whenever possible with protection to surgical field.
 - Prone CPR should still be performed as temporizing measure
- **Position related injury**:
 - **C-spine**: ensure neck neutral position and head well supported by foam.
 - **Eye** protection: vigilance of avoiding compression and regular check throughout case
 - **Nerve** damage: brachial plexus, ulnar nerve; ensure abduction/ext rotation <90 and elbow not hyperflexed ie <90.
 - **Pressure** sore: iliac crests, knees, feet – padding mandatory

Anaesthesia

Q11- epidural abscess management, 47%

Discuss the management options for an epidural abscess.

Surgery

- Early decompression/washout and prolonged antibiotic (6-12 weeks) course are the mainstay treatment.
- Commonly involve post laminectomy, although ant approach sometimes is require; which aim to remove pus, debride infective tissue and drain affected area of any further collection.
- CT-guided percutaneous drainage may be an option in selected patients. – eg. well delineated abscesses on imaging

Conservative

- As sole treatment, may be considered in small proportion of patients.
 - Eg. no/minor neuro signs and patient is already on antibiotics, or patient refusal to surgery, or severe comorbidities rendering excessively high risk for sugery/GA.
- Consult Infectious Disease Physicians for advice on 1st line antibiotic treatment based on local guideline for empirical treatment or definite treatment based on culture + sensitivity.
 - Typical microorganisms include S. aureus, E. coli.
- Antibiotic choice should be sensitive based on culture, able to penetrate bone effectively and has low toxicity profile for prolonged course.
 - Eg. staph → flucloxacillin or 2nd gen cephalosporin
 - If MRSA → clindamycin or vancomycin

Osteomyelitis may complicate epidural abscess and will require likely even longer course of IV antibiotic / surgical debridement, washouts.

- monitor of symptom esp red flag symptoms: weakness, paresthesia, urinary/bowel incontinence should be ongoing.
- Monitor CRP, radiology to guide progress of treatment.

NB. (apart from B-lactam, all are poor in CSF; most are good for tissue; gent good for fluids but poor in CSF/eye/biliary tree/adipose.

- **-Beta lactam** distribute widely to tissues/fluids; CSF-IV limited unless inflamed meninges
- **-Aminoglycoside**: eg gent; hydrophilic, widely distributed in body fluids, but very poor into CSF, eye, biliary tree, prostate, tracheobronchial secretions, adipose; very effective in UTI as 90% of drug eliminated unchanged via kidney
- **-Macrolide**: eg erythro; great tissue/intracellular penetration, (so not much in serum), but poor in brain/CSF. Crosses placenta/breast milk.
- **-Fluoroquinolones**: eg. Cipro; good tissue distribution, poor CSF. (great for abdo/UTI, but usu. 2nd line as high risk for C. diff)
- **-Tetracycline**: eg doxycycline. good tissue, poor CSF. (good for skin/bone/joint)

Q12- Case reports in EBM, 39%

Discuss the value of case reports to anaesthetists in the era of evidence based medicine.

EBM = conscientious use of result derived from high quality research to make decisions about the clinical management of patients.

Type of research considered to provide different levels of significance to clinical practise

- highest = systemic review, metanalysis
- RCT
- Non-randomised trials eg. case control, cohort
- Case series
- Lowest = Expert opinions

Pros of case reports

- 1st line of evidence esp for new treatments or rare conditions
- Stimulation for
 - Hypothesis generation for further studies
 - New diseases, new side effects of drugs
- Complement other levels types of research
 - Eg. certain rare side effects of medications generated from case reports can significantly affect practice guided by RCTs.

Cons

- Unable to confirm cause-effect relationship.
- Unable to control for confounders which could lead to generation of multiple false hypothesis – however this is where other study types complement the shortfall of case reports – by proving or rejecting hypothesis
- the limitations of case reports in terms of bias and perhaps undue influence on practice

Q13- assessing thyroid function clinically, 70%

How would you assess a patient's thyroid function preoperatively at the bedside?

Q14- impaired colleague, (repeat) 63%

A recovery charge nurse approaches you as Supervisor of Training because she is concerned at the amount of opiates one of your trainees has been signed out for patients. What will be your priorities in addressing the nurses concern?

- Signing out increased amount of opioid = a major sign indicating opioid misuse.
- Concern from charge nurse should be taken seriously + confidentially to avoid reputational harm.
- Confidential investigation should take place.
- Involve Welfare Officer, HOD.

Q15- Intraop blood salvage (repeat), 54%

Discuss the advantages and disadvantages of intra-operative blood salvage.

Sep-2004

Q2 – visual los

Outline the possible causes of postoperative loss of vision

Q3- What are the problems of using the beach chair position for shoulder surgery? (repeat)

Q7- Diabetes insipidus

Describe the pathophysiology and diagnosis of diabetes insipidus following head injury.

Diabetes insipidus, has 2 types

- Central: decreased ADH release
- Peripheral: renal tubule unresponsive to ADH
- Characterized by free water loss, hypovolaemia, hypernatraemia.

Pathophysiology (similar to diabetes mellitus)

- Normally: Increased serum osmolarity → ADH release from post pituitary → V2 receptor on renal tubule → water reabsorption
- In head injury (esp damage to posterior pituitary), ADH release mechanism is disrupted, water conservation mechanism disrupted → diabetes insipidus.

Diagnosis

- Hx
 - Head injury, polydipsia/polyuria?
- Exam
 - Sign of hypovolaemia? (although this may be compensated by increased water intake) Tachycardia, hypotension.
 - Neurological exam and GCS
 - Large UO? Up to 30L/day
- Invx
 - Serum ADH level
 - Electrolyte disturbance? hyperNa, hyperosmol
 - Urine electrolyte: hypotonic, low Na <20mmol/L
 - CT/MRI head scan
 - Fluid restrict challenge: UO wil still be high;
 - DDAVP response: will reduce UO.
 - Cautious with DDAVP test, should be done/monitored closely in ICU. dose no more than 1-2 mcg only
 - 0.4mcg PRN IV or 100-200mcg intranasal
 - monitor Na closely eg up to Q2h

NB.

know how to distinguish with SIADH, serum salt wasting syndrome: low Na due to excess Na excretion, dehydration.

- Bleed prevention dose = 0.3mcg/kg over 30 mins.

Q8- regional ankle block

Describe the anatomy relevant to providing an ankle block for surgery on the big toe.

Block:

- Deep peroneal – lateral to DP artery, between ant tib + ext halx

- Superficial peroneal – same needle entry point as above, then direct towards lat malleolus; lies between ext halx + lat malleolus
- Post tibial – post to med malleolus, palpate A then inject post to A.

NB. Ankle block in full detail:

Need to block above three nerves:

Supine:

- -Deep peroneal N. - lie lateral to DP artery, between Ant Tib + Ext Halx tendon: contact bone, withdraw slightly, instil 2-4mls LA.
- -superficial peroneal N - direct needle from above towards anterior surface of lateral malleolus. It lies between extensor halx and lateral malleolus. 5mls LA
- -saphenous N: between tib ant tendon and medial malleolus. 5mls LA
- -posterior tibialis N - palpate post tib artery (lies behind medial malleolus), insert needle posteriorly to artery. 3-5mls
- -sural: between achilles tendon, lat malleolus, SC infiltration along course 5ml.

Q9- Bier's block discussion

Give reasons for your choice of local anaesthetic agent to provide intravenous regional anaesthesia for a reduction of a Colle's fracture in an 80 year old woman weighing 95kg.

NYSORA:

Lignocaine 2% plain

Dose - <3mg/kg; depending on weight of patient; usu. ~10-15mls is enough in this patient, could use up to 285mg ie 14mls.

would choose 10mls for a potentially frail/elderly patient.

Reasons:

- widely used formulation in literature, cheap, available.
- well studied to provide safe, effective IVRA.
- avoids risk of methaemoglobinaemia with prilocaine or potential cardiotoxicity with bupivacaine.
- fast acting,
- -Since the duration of anesthesia depends on the length of time the tourniquet is inflated, there is no need to use long-acting or more toxic agents. it is used typically for procedures lasting 30 to 45 minutes.

Q11 – cardiac scan utility

What is the role for radionuclide imaging in the assessment of ischaemic heart disease prior to general anaesthesia for non-cardiac surgery?

Radionuclide imaging is a form of non-invasive cardiac function investigation.

- o coronary vasodilator (dipyridamole) and radio isotope (thallium) which is up taken into perfused myocardium
- o impaired perfusion shows up as reversible perfusion defects caused by dipyridamole causing a steal phenomena
- o dobutamine induced tachycardia to assess response to stress.

- non-perfused areas show up as permanent perfusion defects
- key findings one is looking for = reversible perfusion defects, permanent perfusion defects and cavity dilation

(report said: Details of techniques of Radionucleotide Imaging were not required)

Role in CAD assessment:

General Indication: As of any cardiac functional investigation, indication include:

- History of poor exercise tolerance with functional capacity less than 4, especially undergoing moderate to high risk surgery.
- Also: unstable angina, severe arrhythmia.

Specific indication:

- Difficulty in functional assessment due to OA or claudicaion.
- Abnormal ECG making other forms of assessment difficult.

Detection of IHD:

- High sensitivity ~90%
- Limited specificity 75%
- High negative PV

Assessment of severity, risk stratification

- LV function, EF and performance with chemically induced tachycardia

Limitation:

- False positive
- Radiation exposure (~1x of CT chest or abdo)
- MI risk
- Arrhythmia risk

Q12- chronic impaired colleague

What are your obligations if you suspect a colleague to be chronically impaired?

- See PD doc summary

May-2004

Q1 – MI management (repeat)

A 50yo patient with a past history of well controlled ischaemic heart disease is anaesthetised for an emergency laparotomy. Thirty minutes into the surgery, you notice new ST segment depression on the ECG. Describe your management (repeat)

Q6- Acute herpes zoster

A 71 year old man presents with acute herpes zoster involving the ophthalmic division of his left trigeminal nerve. He complains of severe unrelenting facial and eye pain which started 3 days ago. Discuss the pharmacological treatment options. Include information about the relevant efficacy of the treatments you prescribe.

HZ

= reactivation of varicella-zoster virus ie shingles – burning, throbbing, shooting, lancinating, dysaesthesia, allodynia.

- Self limiting, but may lead to PHN.

Treatment options:

Goals:

- Treat the infection
Acyclovir 800mg tds for 7days, within 72hrs of rash reduces acute pain. Conflicting evidence about PHN effect.
 - however not applicable in this patient as already >3 days; does not prevent PHN.
- Ophthalmic involvement = Eye spec within 48-72 hours.

- Pain – treat aggressively and early

Strategies: (NNT all ~2-4).

1. Lignocaine 5% patch NNT 2
2. TCAs NNT 2.8 (Nortriptyline less cardiac toxicity than Amitriptyline in elderly)
3. Gabapentin (Pregabalin similar) NNT 2.4
4. Capsaicin (0.025-0.075%) NNT 3.2 (Capsaicin 8% patch not available in NZ)
5. Opioids NNT 2.6 (including Tramadol)
6. TENS level 3
7. Corticosteroids reduces acute pain (?PHN effect)
 - Oral prednisone start 30mg BD taper to nil over 3 weeks
 - Epidural steroid NNT 10, no evidence alters PHN
8. RA; Series of PVB every 2nd day for 7/7 (2009 A/A)
9. Neurosurgery procedures controversial (DRG rhizotomies)
10. Sympathetic blocks conflicting evidence

(from Auckland)

- VZV vaccine prevention = NNT 40 in >60yo; to prevent PHN;
- NNT 11 to prevent shingles
- Acyclovir <72 hour of acute attack eg. 800mg tds for 7 days
 - If eye involvement, see Specialist <72 hrs.
- Aggressive treatment of acute pain, low threshold for inpatient care.
 - Lignocaine 5% patch NNT2
 - TCA NNT 2.8
 - Lose dose amitriptyline for 90 days
 - Gabapentin NNT 2.4
 - Capsaicin (0.025-0.075%) NNT 3.2
 - Opioids/tramadol NNT 2.6
 - Steroid/prednisone 30mg bd taper over 3 weeks (for acute pain, not for PHN)
 - PVB RA series over 7/7.
 - Psychosocial input.

NB.

Cf. trigeminal neuralgia:

- = neuropathic pain in trigeminal dermatomes; episodic, paroxysmal, severe.
- Often has compression of trigeminal nerve near connection to pons; vascular or neoplastic
 - MRI to rule out
- Mx: carbamazepine NNT 2, others eg. topiramate
 - Other antineuropathic analgesia eg. gabapentin, TCA, ketamine.
 - Surgical decompression, destruction.
 - Psychosocial input

Q7- Pros/cons of subtenons block (repeat)

Discuss the advantages and disadvantages of sub-tenon's eye block compared with other eye block techniques.

Q11- renal protection in AAA

Discuss the strategies you would consider in order to protect renal function during a laparotomy for an abdominal aneurysm repair.

Overcapping issue: AAA repair = major surgery with large volume fluid shift, bleed likely

putting stress on multi-systems including kidney.

- **Aortic clamping** in particular imposes compromise on renal blood flow and renal dysfunction is common.
- **Myoglobin** release from ischaemia with clamping also could cause ATN.
- If at high risk, consider EVAR which is associated with reduced early periop morbidities.

Pre

- **ABC:** Optimize oxygen delivery
 - o Avoid hypoxaemia, anaemia
 - o Avoid hypotension, hypovolaemia
 - o Avoid hypervolaemia as $RPP = MAP - \text{renal venous pressure}$; high CVP may potentially reduce RPP
- **Renal:** Optimize renal function; treat any concurrent infection
 - o Stop or minimize nephrotoxins (unless indicated for life-saving reasons): ACEi, NSAID, gentamicin, IV contrast, large volume of normal saline.

Intra

- Minimize cross-clamp **time** = strongest factor
- **Infrarenal** clamp if possible
- Consider **aorto-renal shunt**
- Maintain optimal **perfusion**, oxygen delivery: volume, BP, sats, Hb.
- Avoid large volume resus with normal saline (as hyperchloraemic acidosis assoc with worse renal dysfunction); use balanced fluid eg. Hartmanns/P148.
- May consider **mannitol** to enhance renal blood flow and for oxygen free radical scavenging effect (although balance with risk of hypovolaemia)

Post

- Continue with maintaining oxygen delivery: volume, BP, oxygen, Hb.
- Monitor urine output closely
- Avoid nephrotoxins

Q12- NLS (repeat)

Working in a small obstetric unit you are asked to attend at the birth of a child where there is meconium stained liquor. How will you manage the infant's resuscitation?

Q13- neonatal ventilator characteristics

Describe the characteristics of a ventilator suitable for neonates.

Why ventilator characteristics should be different.

Neonatal has very different respiratory physiology and anatomy.

Key differences include:

- smaller TV, airway caliber, tubing and airway devices; higher RR.
- Apparatus deadspace contributes to greater proportion to total deadspace (+ physiological deadspace)

Therefore in order to measure spirometry (volume, airway pressure, $pCO_2/pO_2/AA$) accurately, different ventilator characteristics is desirable.

Ventilator features suitable for neonates.

- **General** – **non-bulky** and **portable**, low **resistance**, low **compliance**
- **Ventilator modes** – should have at least: volume/pressure control, pressure support, SIMV modes + manual ventilation mode with APL adjustment.
- **Adjustability** – can deliver **small TV** + **high RR** required to maintain neonatal physiology; IE ratio adjustable, **PEEP** setting to prevent atelectasis (esp with closing capacity above FRC in neonates).
- **Measurement** – for **accurate measurement of TV/MV/ $FiO_2/CO_2/AA$** – low **resistance/compliance circuit** is essential to allow for accurate measurement.
- **alarm system** – good visual display and auditory feedbacks.

- Alarm for Maximal pressure limitation to prevent barotrauma.
- Low FiO₂ alarm.
- Apnoea alarm.
- Low/high TV/MV alarm.

(report)

- Some excellent answers detailing why Neonatal ventilators need to be different.
- Volumes to be measured are extremely small, and compliance of the equipment can alter the results.
- Adult ventilators can be used with appropriate monitoring. (But to accurately measure tidal volume is difficult).
- High frequency oscillatory ventilation is done in the Neonatal Intensive Care (8-12 cps).

Sep-2003

Q15- DLT position check (Thoracic)

Evaluate the methods available to confirm correct placement of a double lumen endobronchial tube.

Clinical

- Auscultation + inspection of bilateral lung fields and ensure isolation possible with alternative isolation/ventilation. I.e for L/DLT
 - Firstly, tracheal cuff up only; ensure ventilation of both lungs possible
 - Then both cuffs up;
 - Isolate tracheal lumen to isolate right lung, ensure ventilation L/lung possible;
 - Then isolate bronchial lumen to isolate left lung, ensure ventilation of R/lung possible; if cannot, probably bronchial cuff herniation; → assess depth and attempt to place deeper then reassess.
- **Pros**-quick, ventilation not interrupted, no need for bronchoscope
- **Cons**-potentially less accurate than bronchoscope, difficult to assess if endobronchial/tracheal mass; R/DLT may be difficult to place correctly; difficult to assess intraop as patient's lateral + access to surgical lung is limited making auscultation difficult.

Bronchoscope

- Confirm with direct visualization of position.
 - Enter trachea, see primary carina, then check position of endobronchial cuff; should just see cuff and no herniation.
 - For L/DLT, then enter right main bronchus into RUL to see trifurcation.
 - Then enter bronchial lumen, ensure LUL lumen isn't occluded.
 - For R/DLT, confirm correct position of endobronchial cuff, ensure it's not occluding RUL orifice; then enter RUL to ensure correct placement.
- Pros-gold standard, most accurate, able to assess disease, able to suction, easier to verify R/DLT correct position; can still perform clinical assessment; able to reassess easily during surgery without interruption to surgery.
- Cons-cost, skill, if bleed/high secretion, visualization is poor.

Sep-2002

Q4- Bowel prep discussion

Healthy 34yo man requires colonoscopy under IV sedation because of strong FHx of bowel Ca. Describe the composition and effects of bowel prep solutions commonly used before colonoscopy

Bowel prep=used for **purging** feces to ensure **optimal view** during colonoscopy; surgical **access**; reduce **contamination** risk

2 main types

- **Polyethylene glycol (PEG)** solution
 - CHD based, in balanced electrolyte solution → holds water in GI tract
 - Need to **drink 2-4 L** of solution; hence likely less compliance
- **Sodium phosphate solution** (fleet's phosphor-soda)
 - Osmotic laxative, hence adequate H₂O intake essential
 - Avoided in **renal impairment** due to potential serious **electrolyte** disturbance
 - **Smaller volume (45ml BD)** or tablet form with 200mls of water TDS; hence likely better compliance
- Others
 - Magnesium sulphate-increase water content and stimulate peristalsis
 - Diphenylmethanes (bisacodyl, sodium picosulfate)-stimulates peristalsis

Adverse effects

- Abdo cramping, nausea, vomit, bloating, diarrhea, sleep disturbance
- Electrolyte disturbances:
 - hyperNa, hypoK, hypoMg, hyperPh and hypoCa
- Dehydration

NB. (Auckland)

- Mechanical bowel preparation (MBP) has gone out of fashion, but recent meta-analysis suggest bowel prep plus orals AB's may decrease infection rate.
- MBP effects depend on which type
 - Osmotic cathartic ie Na phosphate
 - Non-absorbed osmotic eg PEG
 - Stimulant laxative eg. bisacodyl
 - Combinations of above eg. Na picosulfate/Mg citrate
- Osmotic cathartic have more complications but are better tolerated

MBP	Complications
Common side effects	Electrolyte disturbance esp potassium Dehydration Paradoxical water intoxication from too much free water Postural hypotension ECG changes/arrhythmias Constitutional Sx Confusion/convulsions/vomiting
Osmotic cathartic (due to electrolyte composition)	Hyperphosphataemia +/- AKI Hyponatraemia Hypocalcaemia Hypermagnesaemia

Q14 – MI investigations discussion

Discuss the methods available for investigating a clinical suspicion of acute postoperative MI

ECG

- Serial as time-sensitive
- TWI, ST seg changes, Q wave, LBBB.
- Pro: Cheap, easy to obtain, allows continuous monitor, and likely site of CAD.
- Con: non-specific, old changes may be hard to differentiate from new changes. Need old ECG to compare.

Troponin

- Elevation very likely to suggest MI. detectable 6 hours post MI, peak 12-24 hrs. remain detectable for 10 days.
- Pros: Sensitive. Peak assc w degree of MI.
- Cons: However may see false positive eg. in old MI w renal failure. Serial sample required. Slower detection than CK-MB.

CK-MB

- Rise may suggest MI.
- Pro: earlier detection than trop (2-3 hrs), sensitive, more specific than CK.
- Cons: serial samples required, false positive likely (eg. from damaged non-cardiac muscle), less specific than trop.

Echo-

- Wall motion abnormality indicative of MI.
- Pros: allows assessment of LV fxn, EF,
- Cons: Need baseline to compare to be reliable.

Should be interpreted with history, exam finding. Crushing chest pain radiating down to left arm with ECG change is strongly indicative of MI.

May-2002

Q14- ECT anaesthetic risks (repeat)

Outline the anaesthetic risks specific to the patients undergoing electro- convulsive therapy

Sep-2001

Q12- TBI, fixed dilated pupil mx

On transfer to the CT scanner his left pupil dilates. Describe your management.

NB.

LITFL on intracerebral bleed: (C target similar to SAH)

- C: blood pressure control – aim for SBP <140 (e.g. labetalol, esmolol, nicardipine, SNP – aggressive BP control reduces haematoma expansion and no real prenumbra in ICH)

Specific therapy

- reversal of any preexisting coagulopathy (aim for an INR < 1.4):
- > stop warfarin and other anticoagulants
- > FFP 15mL/kg
- > prothrombin X 25-50IU/kg (factors II, IX, X) (increasing given as the sole agent for warfarin reversal)
- > vitamin K 5mg IV (onset 6 to 24 hours) -> important for sustained reversal

Stroke in general:

- Consider BP control with an ischaemic stroke if BP elevated > 220/120 mmHg, though no agent significantly affected outcome from the 43 suitable trials reviewed.
- Be cautious with no more than a 10-20% change maximum (i.e. not lower than 180/100 mmHg initially).

In TBI:

- **avoid intracranial hypertension**; sustained ICP > 20mmHg causes ischaemia maintain CPP of 60mmHg
 - higher produces more ARDS
 - lower produces a fall in brain tissue PO₂

control PaCO₂ to 35

- mannitol 0.25-1g/kg Q3hrly
- hypertonic saline (3%) 3 mL/kg over 10 min or 10-20 mL 20% saline

May-2001

Stem: A 63 yo man who lives independently, presents with a perforated ulcer requiring laparotomy. He has been treated for cardiac failure for 5 years

Q1 – Clinical assessment of CHF (repeat)

How would you assess the severity of his cardiac failure at the bedside?

(repeat)

Q2 – VTE prophylaxis (repeat)

Justify your choice of deep venous thrombosis prophylaxis

= repeat

General:

Anaesthetic:

Mechanical should be used:

- Thromboembolic deterrent (TED) stockings

Chemical considered

Q3 – intraop pulm oedema management

How would you manage him if he developed pulmonary oedema during his surgery?

If emergency: call for help

Mx aim: optimize oxygen supply to myocardium + reduce demand.

Intraop (assuming GA with ETT in-situ having IPPV)

○ ABC

- Give Oxygen, consider PEEP +/- bipap
- Optimize preload, maintain contractility, afterload. Consider transfusion if Hb <80. Avoid tachycardia/arrhythmias.
 - Decrease SNS drive with analgesia. Control temperature. Maintain normocarbida.
 - Use A-line, CVP to guide further management.
 - If overload, and haemodynamic stable, consider **furosemide** (eg. 20mg IV) carefully.
 - Reduce afterload with **GTN** to improve CO.
 - Support **contractility** with inotrope : ephedrine, adrenaline, milrinone (inodilator)

○ Cause control

- IHD
- Arrhythmia

- Valvular disease
- Sepsis/SIRS from bowel perforation
- Iatrogenic (too much crystalloid)
- Invx with FBC, UECr, ABG, ECG, Echo.

Postop

- Consider HDU/ICU
- Cardiology consult
- Mx goal set – prolonged IPPV may not be appropriate in severely compromised heart failure, where **??palliation** should be considered.

Aug-2000

Q1- lung isolation method discussion

Stem: A 57 yo man with a primary lung tumour is scheduled to have a thoracotomy for a left pneumonectomy. Justify your choice of airway device for this surgery and describe how it is placed.

Left pneumonectomy, prefer use right side DLT for lung isolation.

- **Isolation** is required to **prevent soiling**, improve **surgical access**.
- R/DLT used as it avoids getting in the way of surgical field
 - L/DLT may be contraindicated if tumour invades into proximal L/bronchus.

R/DLT evaluation

• Pros

- **Easier** than bronchial blocker to place;
- can be placed without **bronchoscope**
- can **alternate** lung isolation easily
- can **suction** with bronchoscope on either side
- more **rapid deflation** of isolated lung
- Can apply **PEEP** to non-ventilated lung

• Cons

- Maybe **difficult** to place esp if features of difficult airway;
 - Trouble shoot: stylet, bougie, fiberoptic assisted,
 - Need long scope; otherwise, use following techniques:
 - place DLT until in trachea; insert scope, locate carina and cannulate bronchus & slide tube over
 - Use aintree mounted over scope / ETT
- Easy to **obstruct** RUL bronchus; check with bronchoscope is preferred; otherwise accurate position of DLT may be difficult based on clinical assessment alone.
- Sizing of tube is big and potentially more **traumatic** to airway
- Requires **tube exchange** postop if continuous IPPV required
- R/DLT may **dislodge** easily esp during position change; need frequent check

• CI for DLT:

- Very **distorted** tracheobronchial anatomy contraindicates DLT.
- **Intraluminal** tumour → as may cause bleed from trauma

How it is placed:

- Choose correct size
- Prepare for laryngoscopy with routine precaution; then pass DLT through vocal cords, then tilt tip to side to be inserted, turn patient head slightly to contralateral side may assist with better alignment for DLT to pass endobronchially, advance tube to estimated depth.
 - ~29cm for height of 170cm; with 1cm adjust for each 10cm of height.
- Assess position (see other SAQ answer)
 - Clinically
 - Inflate tracheal cuff
 - Inflate both cuff

- Clamp bronchial side then tracheal side
- Bronchoscope – 4.2mm size.

NB.

- (OHA) use largest DLT that can pass easily; usu. 41/39Ch male; 37Ch female.
- Mallikrodt; (other brands include Sheridan, Rusch)

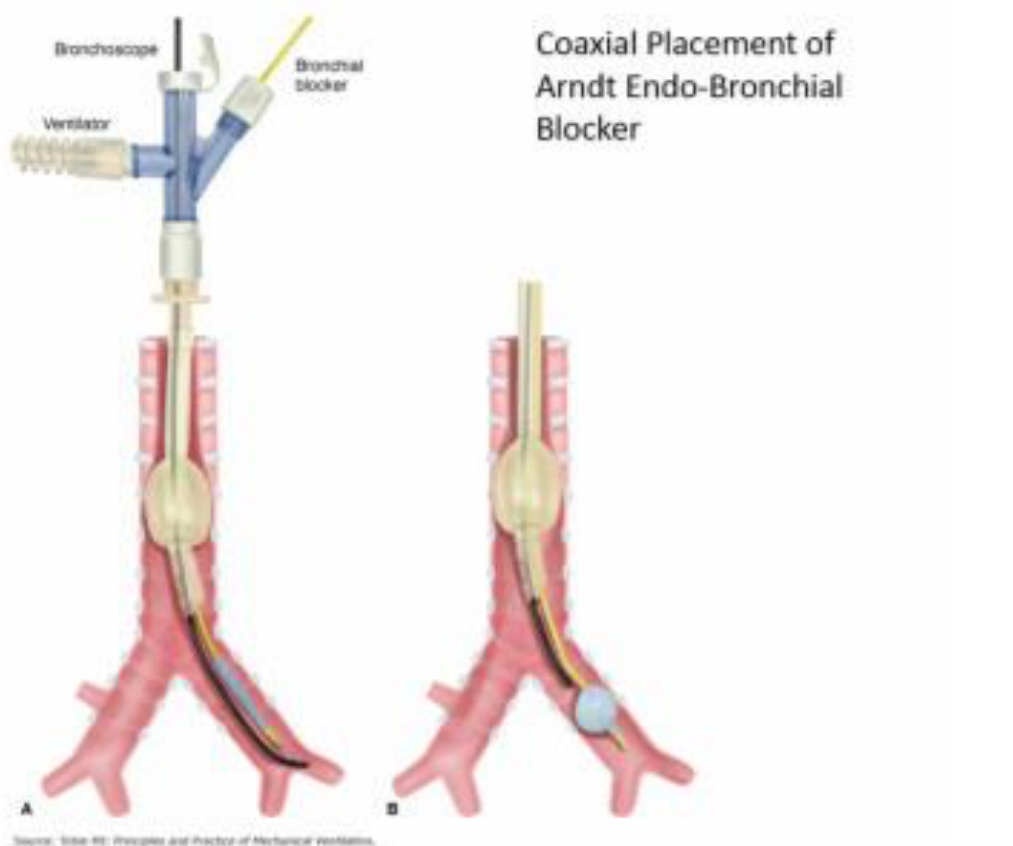
In Children: (Auckland course)

- Neonate bronchoscope = 2.2mm; paed = 3.2mm.
- < 6 yrs - **elective bronchial intubation or bronchial blocker**
- 6-8 yrs - bronchial blocker, bronchial intubation, **univent**
- 8 yrs - bronchial blocker, bronchial intubation, univent, **DLT**

Extra: Compare lung isolation methods

Bronchial blocker with arndt endobronchial blocker

- 2 types: univent vs. cook wire-guided blocker (in or outside of ETT; outside preferred if ETT small <4.5)
- **Pros:**
 - **easier** to insert than DLT.
 - Allows **isolation of lobar** bronchus, eg. lung abscess, bronchP fistula.
 - Avoids **reintubation** if postop vent required.
- **Cons:**
 - **Slower deflation** of isolated lung (improve with FiO2 100% + inflate cuff by end of expiration + suction + surgical facilitated)
 - **Easily dislodged**; need recheck after positioning pt; cannot suction.



Elective bronchial intubation

- **Pros:** easy, esp in emergency – PTX, haemorrhage...etc; FO to confirm position.
- **Cons:** poor seal with uncuffed ETT, poor collapse of operative lung; contamination of non-op lung, unable to suction op lung; RUL obstruction with RMB intubation can → hypoxaemia

Q2- DLT position check (repeat)

Discuss the advantages and disadvantages of using a bronchoscope to check the position of the device.

(see SAQ)

- also; allows for bronchial blocker placement
- allows assessment of disease within lumen
 - Cons: potential trauma to airway; leak in ventilation during use.

Q3- hypoxaemia under OLV

Outline your management of an oxygen saturation of 82% during one lung ventilation.

Notify Surgeon, Anaesthetic Tech, OT Team

Simultaneously manage + assess differentials

- Ensure ventilating possible + FiO₂ 100%
- If EtCO₂ is present, then problem is most likely related to ventilation:
 - Optimise ventilation:
 - Ensure adequate ventilation with TV (5-6ml/kg) + RR; consider muscle relaxation;
 - If cause is V/Q mismatch related to OLV
 - Give FiO₂ 100% to non-ventilated lung (apnoea oxygenation, moves ~50-100ml of air)
 - CPAP to non-ventilated lung 5-10cmH₂O; communicate with Surgeon. Distends lung slightly ~100ml, but shouldn't interfere with surgery
 - Recruit ventilated lung + balanced use of PEEP (to prevent atelectasis but avoid diverting blood to non-ventilated lung)
 - May need intermittent ventilation of operative lung – avoid overdistension.
 - PA occlusion of non-ventilated lung; if RV can cope with increased PVR.
 - CPB/ECMO.
- If EtCO₂ absent; consider other differentials
 - Machine/circuit intact + working.
 - Airway – not obstructed, not in wrong place.
 - Ensure adequate CO/Hb
 - Monitor error?

NB.

oxygen flux = chemical O₂ delivery + dissolved O₂ delivery

= [CO x [Hb] x SaO₂ x k] + [CO x PaO₂ x 0.003]

CO in unit of dL/min; Hb g.dL

- EMAC Differentials:
 - O₂ supply
 - Machine/Circuit (machine)
 - Airway – obstruct or wrong place?
 - Vent/Lungs
 - Hypoventilation, lower resp drive, MSK impair
 - Dead space, shunt, V/Q mismatch

- Circulation
- Tissue uptake – hypermetabolism: sepsis, thyroid, MH

Apr98

Stem: A 59 yo patient presents for the first time with a subacute bowel obstruction requiring laparotomy in the next two or three days. You are asked by the surgeon to review the patient because on admission his blood pressure is 210/120. Hypertension has not been previously diagnosed in this man and he is on no medications.

Q1) Describe your assessment of his hypertension by history and examination.

Q2) How would you proceed with investigation of his hypertension if no cause was apparent from the assessment described above?

Q3) How would you manage his blood pressure in the peri-operative period if no cause had been found for this hypertension?

HTN assessment by hx + exam

- HTN diagnosis need repeat measurement (at least 3 separate occasion) and exclude external causes like drug, pain etc.
- **Assess:** If HTN confirmed, need to assess:
 - **Severity** / CVS risk status
 - **End organ** damage?
 - **Cause:** Differentials for HTN
- **Hx + exam**
 - CVS: Angina, MI, PCI? SOB, decreased exercise, heart failure, PVD?
 - CNS: CVA, TIA?
 - Renal: AKI? Weight gain, swelling? Malaise, anorexia, itch, tendency to bruise (uremia)?
- **Causes:**
 - **Drugs**
 - **C-** Coarctation? Essential HTN?
 - **B-** OSA? - STOPBANG
 - **Renal** dx – bilat RA stenosis; RA bruit?
 - **Endo- Phaeo** – abdo masses, weight loss, sweat?
 - **Conn's** syndrome
 - **Thyrotoxicosis** – weight loss, heat intolerance, palpitation
 - **Hyperparathyroidism**/hypercalcaemia

Invx of HTN

- Aim: assess end-organ dx? CVS risks? Differentials?
- Bloods: FBC, UECr, glucose, TFT, PTH level, cortisol level
- Urine: microalbuminuria, urine metanephrine/normetanephrin for phaeo, aldosterone serum level.
- ECG: LVH, ischaemia
- Imaging: CXR, CT/MRI/Doppler for renovascular abnormality
 - CT for coarctation
 - ECHO for function, LVH.
- PSG for OSA if high risks by screen

Management of HTN in periop period

Preop

- Normally in elective setting, would postpone until investigation and better control.
 - Risk benefit ratio may tilt towards delay/cancel in elective if SBP >180. But controversial
- But this semi-urgent case, will try optimize within limited time available.
- **Aim** = **control** BP, **minimize** CVS risk, + **optimize** end-organ damage
- Control BP
 - Labetalol
 - Hydralazine
 - GTN

- BB -
- CCB -
- ACEi
- Alpha blocker
 - Key = avoid large drop in BP suddenly; a realistic aim = SBP160 in this acute setting.

Intraop:

- Minimise CVS risk
 - Monitor – routine ANZCA + art line + 5 lead ECG.
 - Optimize O2 supply and minimize O2 demand.

Postop:

- Ongoing care + monitor in HDU. Cardiology for input.