NOVICE DISCUSSION TOPICS

Suggestions to support IAC SLEs

Roberts, L., Ellis, B., Tsiopanis, G., Mitra, S.

Introduction

Welcome to anaesthesia! Some of you many have had previous experience in the anaesthetic world and for some this may all be very new.

During the first few months of being an anaesthetist, there are a lot of challenges not only in knowledge and skills acquisition but also equipment familiarisation. Anaesthetists are an integral part of the perioperative care and the first months are the important foundation.

The new RCOA curriculum no longer has a prescriptive table or a checklist to complete for your Initial Assessment of Competency (IAC). The Entrustable Professional Activities (EPA) 1 and 2 includes assessments called Supervised Learning Events (SLE). These can be A-CEX, CBD or DOPS. This document will be able to help and guide you in attaining the EPA 1 and 2 with relevant learning outcomes related to day-to-day practice.

This *Novice Discussion Topics* is a brief guide and only suggestions of potential topics to discuss and learn in further details with your supervisors. This booklet is designed to give you ideas and prompts, so you can use in daily practice. This is not a revision guide and deliberately lacks details; this is more to encourage regular conversations and help you be familiarised with the anaesthetic equipment, curriculum and knowledge required during novice period.
Useful resources to be used along with this document are:

- https://rcoa.ac.uk/documents/2021-curriculum-assessment-guidance/entrustable-professional-activities-iac-iacoa
- Be familiar with the AAGBI Quick reference handbook https://anaesthetists.org/Home/Resources-publications/Safety-alerts/Anaesthesia-emergencies/Quick-Reference-Handbook it includes lovely checklist for common emergencies, save a copy on your phone!
- Critical incidence have not been covered here, you will be required to keep a separate log of these for ARCP, the critical incident logbook (see the Welsh School of Anaesthesia website). https://www.welshschool.co.uk/#gsc.tab=0
- Ask around if the ACID simulation course is running, this is a very practical approach to managing critical incidences, usually run locally.
- eLearning for health. E-learning modules to work through, there are some introductions to theatre and clinical anaesthetics and they progress to cover more in-depth exam specific topics. You will be very familiar with this website when you sit exams. https://portal.e-lfh.org.uk
- Paediatrics: another topic not covered here but you will need to cover during your first 6-12 months. Be familiar with the local network website
  North Wales: NWTS https://www.nwts.nhs.uk
  South Wales: WATCh The Wales and West Acute Transport for Children Service (WATCh) Bristol |
  The APAGBI have a good trainee section - https://www.apagbi.org.uk/professionals/trainee-section
- DAS is the Difficult Airway Society – produce guidelines and lead in any airway related matters - https://das.uk.com

I hope you find some of this information useful, please feedback any comments for improvement, good luck and enjoy your introduction into a great specialty!

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21. Drug Conversion and Concentration
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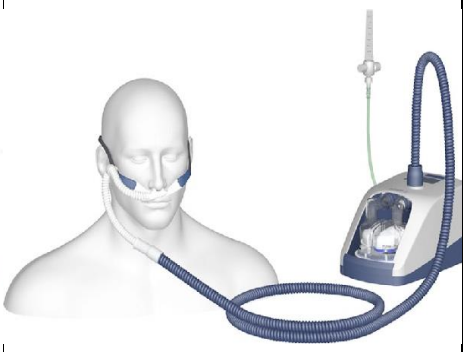
Oxygen Delivery Devices

Face mask	Nasal cannula	Hudson mask
		
Non-rebreath mask	**Venturi mask**	**Optiflow**
		

Suggested topics for SLEs

- CBD on the difference between variable and fixed performance devices
- ACEX on the use of different devices for your patient e.g. using high flow for preoxygenation

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Supraglottic Airway Devices/Laryngeal Mask Airways

1st generation LMA	2nd generation LMA	Reinforced LMA
		
Intubating LMA	**I-gel**	
		

Suggested topics for SLEs

- CBD around the different devices available, their features, pros and cons
- ACEX on the use of different supraglottic airway devices
- ACEX for airway management plan
- DOPS for managing an airway with a supraglottic airway device
- CBD around the use of supraglottic airway devices within the difficult intubation pathway

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Laryngoscopes

Macintosh laryngoscope	McCoy laryngoscope
	
Miller laryngoscope	**Handles**
	

Suggested topics for SLEs

- CBD around the different blades and their features, their shape, sizes and special uses
- CBD around the different handle sizes and their use
- ACEX using different scopes appropriately

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Videolaryngoscopes

Airtraq	C-MAC
	
Glidescope	**Flexible fibreoptic scope**
	

Suggested topics for SLEs

- CBD around the indication for use of variety of VLs
- ACEX on airway management with the use of a videolaryngoscope
- DOPS on using the glidescope or C-Mac

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Endotracheal tubes

Cuffed oral endotracheal tube	Uncuffed oral endotracheal tube	Armoured / Reinforced tube
		
RAE (Ring, Adair and Elwyn) tube	**Nasal tube**	**Microlaryngeal tube (MLT)**
		
Laser resistant tube	**Laryngectomy tube**	**Double lumen endobronchial tube**
		

Suggested topics for SLEs

- CBD around the features of an ETT e.g Size, Length, Bevel, Murphy eye, Cuff, Pilot balloon
- CBD around the different types of ETT and how you pick which to use

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Basic Airway Equipment

Oropharyngeal (Guedel) airways	Nasopharyngeal airways	Magill forceps
		
Bougie	**Stylet**	**Oxford HELP pillow**
		

Suggested topics for SLEs

- CBD on the use of the different equipment
- DOPS sizing an oropharyngeal and nasopharyngeal airway
- ACEX on airway management of a patient

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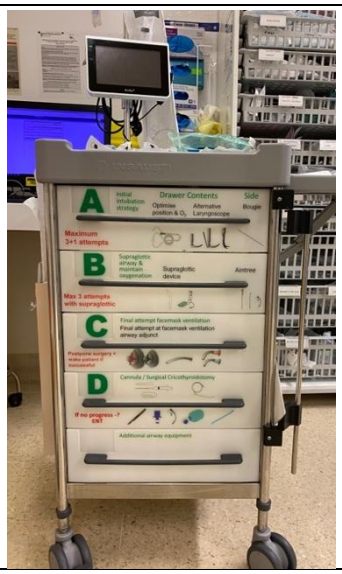
Airway Trolley

Airway trollies exist for standardisation of equipment, reducing mental load in emergencies!
Find the one that exists in your department. Examples below:

Standard Airway Trolley

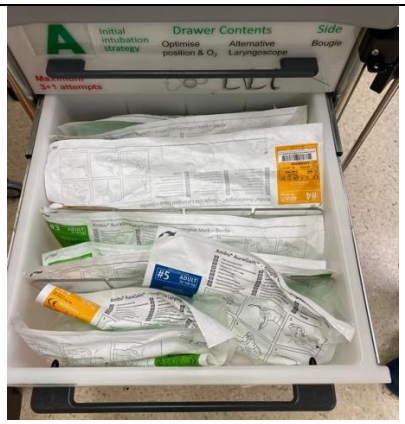


Will have a standard location – find yours!

Equipment (in photo, may vary)
Top/Side – Bougie. Some have ambuscope screen.
Drawer A – Optimise Position & O2, Alternative laryngoscope
Drawer B – Supraglottic device
Drawer C – facemask Ventilation, airway adjunct
Drawer D – cannula & surgical cricothyroidotomy

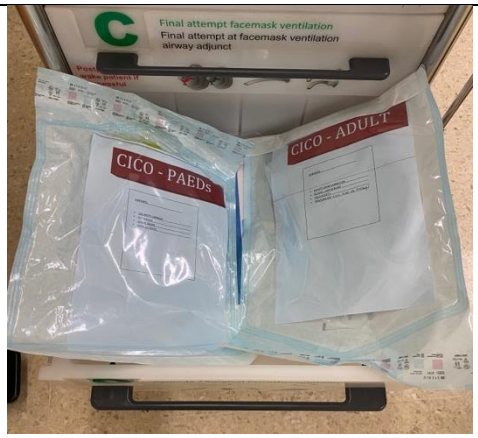
Drawer A

Drawer B



Drawer C

Drawer D



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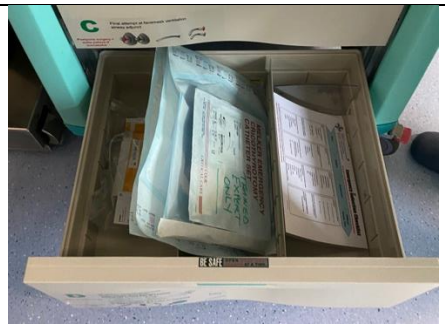
Difficult Airway Trolley	
	**Will have a standard location – find yours!** **Equipment (in photo, may vary)** Top/Side – ambuscope screen & bougie Drawer A – Optimise Position & O2, Alternative laryngoscope Drawer B – Supraglottic device, ambuscope, aintree catheter Drawer C – facemask Ventilation, airway adjunct Drawer D – cannula & surgical cricothyroidotomy
Drawer A	Drawer B
	
Drawer C	**Drawer D**
	

Suggested topics for SLEs

- CBD around the design of the standard trolley and its attempt to reduce errors
- CBD around the DAS guidelines and its association with the design of the trolley
- CBD standard equipment trolley vs difficult airway trolley and how to prepare for difficulty

Familiarize yourself with the locations of the difficult airway trolley and its contents

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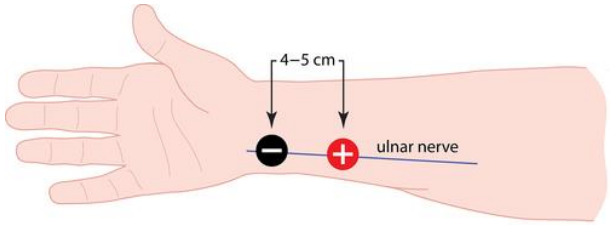
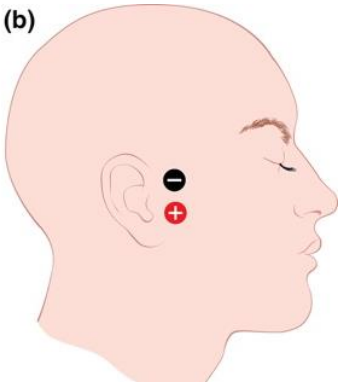
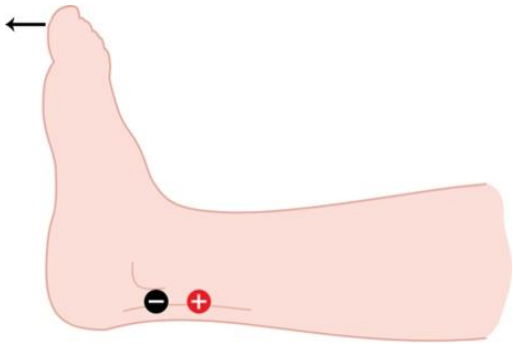
Neuromuscular Blockade- Monitoring

Nerves, electrode placement and expected response

Ulnar nerve → **Thumb adduction**	Facial nerve → **Contraction of orbicularis oculi / oris**
	
Deep peroneal nerve → Dorsiflexion	Posterior tibial nerve → **Plantar flexion**
	

Suggested topics for SLEs

- Discussion around the neuromuscular junction physiology
- DOPS in appropriately placing NMB monitor
- CBD around the usefulness of neuromuscular monitoring/ AAGBI guidelines

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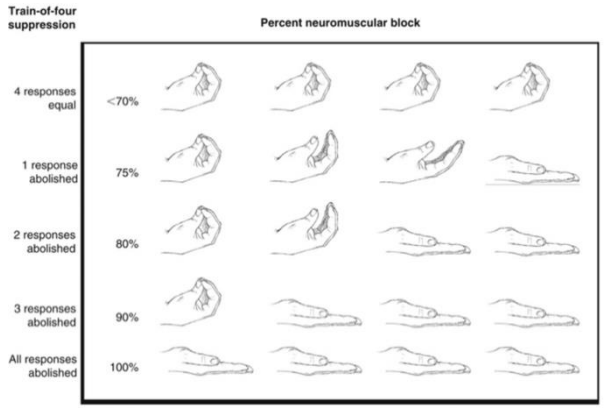
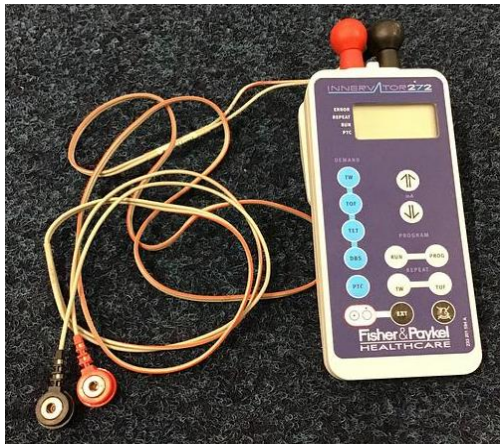
Neuromuscular Blockade – Monitoring Devices

Many devices exist and they all work slightly differently due to their construction. These are the commonly used methods

Visual or palpation	Accelerometer	Electromyography
Observing or palpating for twitches when stimulus is applied to patient. Also know as qualitative analysis.	e.g. Drager TOF Monitor	e.g. innervator or simuplex monitors
		

Suggested topics for SLEs

- CBD around the different devices, similarities, differences and their limitations
- DOPS for using the devices and interpreting its results

References
Nagelhout, J. Anaesthesia Key Chapter 12: Neuromuscular Blocking Agents, Reversal Agents, and their Monitoring. https://aneskey.com/neuromuscular-blocking-agents-reversal-agents-and-their-monitoring/
TOF Scan Drager. https://www.draeger.com/en_uk/Products/TOFscan
GB Medical Equipment https://www.gbmedical.co.uk/listings/1025967-used-fisher-and-paykel-innervator-nerve-stimulator-272

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Thromboprophylaxis in theatre

Mechanical Devices - Flowtrons	TED stockings
	

Which to use? The decision will be based on anaesthetic and surgical assessment of risk of VTE, choose one of the above options.

Patients should be encouraged to walk to theatre, reminded not to cross legs!

Suggested topics for SLEs

- DOPS for appropriate placement
- CBD about the importance of perioperative thromboprophylaxis
- CBD around the patients that are at increased risk of VTE and appropriate steps to reduce their risk
- CBD – does anaesthesia alter your risk of VTE?

References
1. All Wales Thromboprophylaxis Policy, 2020.
2. NICE: Venous Thromboembolism in over 16s. https://www.nice.org.uk/guidance/ng89/chapter/Recommendations#risk-assessment

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Patient Temperature – Monitoring and Management

Hypothermia can have detrimental effects for patients as well as being incredibly uncomfortable, it's part of our role to ensure we take all appropriate measures to ensure they stay normothermic (>36°). There's even a NICE guideline! Here are some examples of how we do that:

Preoperative	Bair Hugger
	
Fluid Warmer - Ranger	**Level 1**
 	

Fluid warmer, bair hugger or both should be used if:

- giving more than 500ml of fluid to a patient.
- surgical time >30minutes
- Laparoscopic surgery
- Intrabdominal or pelvic surgery
- TURP/TURBT – due to large volume irrigation
- Children and elderly
- When blood products are used

NOTE: The level 1 is for major haemorrhage only

Suggested topics for SLEs

- CBD around the NICE guidelines for the prevention of perioperative hypothermia
- ACEX for appropriate intraoperative temperature monitoring and management of a patient
- Familiarise yourself will all the above devices

References
YG ODSOP 53: Peri-operative Hypothermia 2019
Also see NICE guidelines Hypothermia: prevention and management in adults having surgery 2016
https://www.nice.org.uk/guidance/cg65

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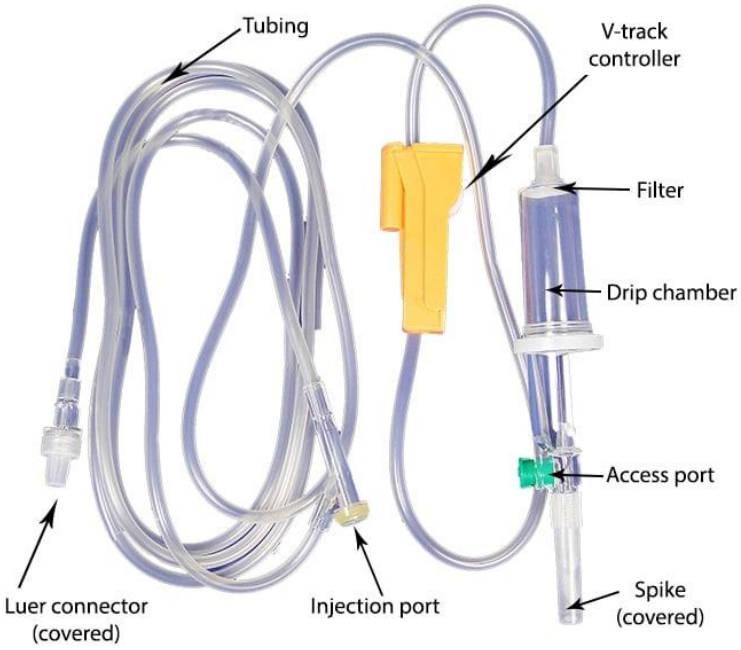
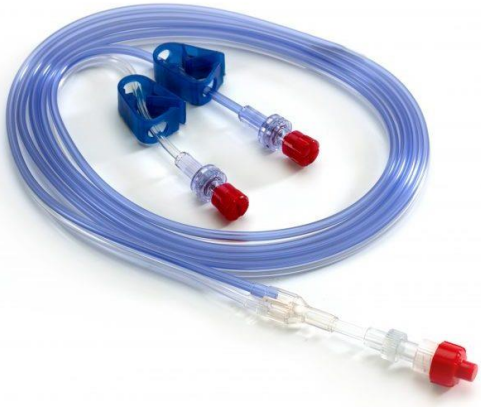
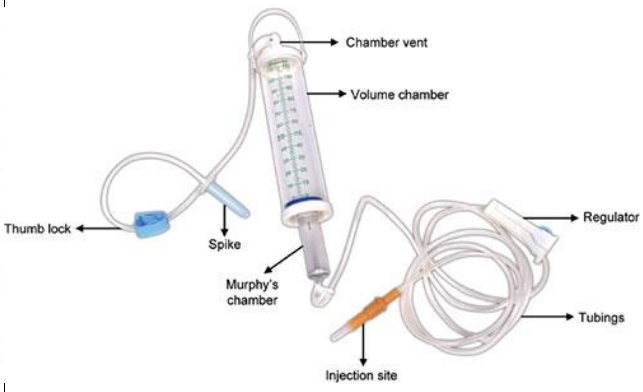
Giving Sets

Fluid Giving Set	Blood Giving Set
	
TIVA Giving Sets	**Pediatric Burette**
	

Suggested topics for SLEs

- DOPS on setting up an infusion line
- CBD around the different infusion devices available and when to use

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Infusion Pumps

Syringe Driver Pumps (Braun)	Volumetric Pump (Braun)
	
ITU version of above available with drug library and ability to bolus – look out for a gold label	

Suggested topics for SLEs

- DOPS in setting up both of the above
- ACEX in managing an infusion device for inotropes for a patient
- Attend your pump training so you know how to use these in an emergency

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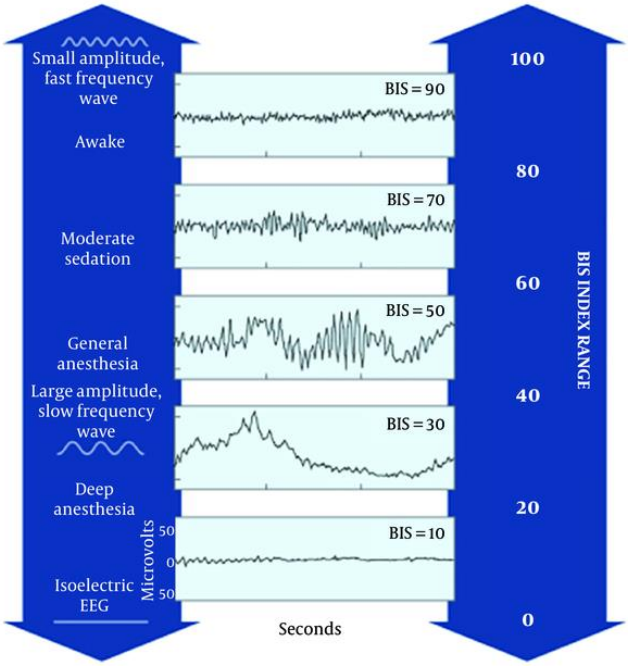
TIVA

Giving Set	TIVA Infusion Pumps
	 
BIS Monitoring	
	

Suggested topics for SLEs

- CBD around the indications of use, pros and cons
- CBD around the TIVA safety guidelines
- DOPS for setting up infusions for TIVA

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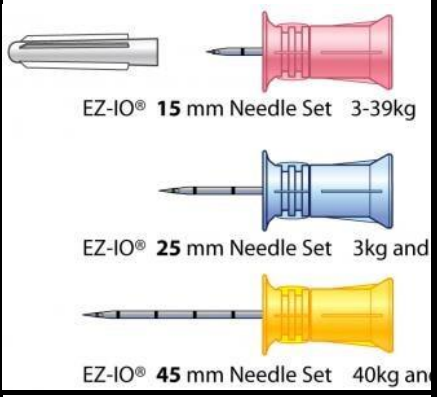
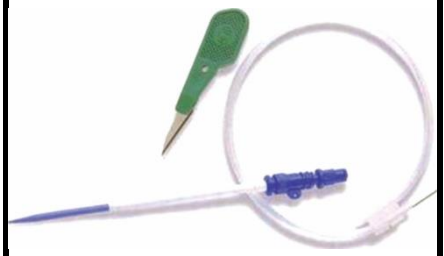
IV Access

Cannula	Central Venous Catheter	Intraosseous
		
Arterial Line – Vygon	**Arterial Line - Flowswitch**	**Rapid Infusion Catheter – RIC Line**
		

Suggested topics for SLEs

- Discuss the use of different equipment
- Discuss the difference and importance in choosing the appropriate gauge of cannula e.g. routine care vs resuscitation
- CBD/ACEX on identifying patients at high risk of requiring resuscitation during surgery and how we prepare for this anaesthetically.

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Anaesthetic Machine Check

Checklist for Anaesthetic Equipment 2012

AAGBI Safety Guideline

Checks at the start of every operating session
Do not use this equipment unless you have been trained

Check self-inflating bag available	
Perform manufacturer's (automatic) machine check	
Power supply	• Plugged in • Switched on • Back-up battery charged
Gas supplies and suction	• Gas and vacuum pipelines – 'tug test' • Cylinders filled and turned off • Flowmeters working (if applicable) • Hypoxic guard working • Oxygen flush working • Suction clean and working
Breathing system	• Whole system patent and leak free using 'two-bag' test • Vaporisers – fitted correctly, filled, leak free, plugged in (if necessary) • Soda lime - colour checked • Alternative systems (Bain, T-piece) – checked • Correct gas outlet selected
Ventilator	• Working and configured correctly
Scavenging	• Working and configured correctly
Monitors	• Working and configured correctly • Alarms limits and volumes set
Airway equipment	• Full range required, working, with spares
RECORD THIS CHECK IN THE PATIENT RECORD	

Don't Forget!	• Self-inflating bag • Common gas outlet • Difficult airway equipment • Resuscitation equipment • TIVA and/or other infusion equipment

This guideline is not a standard of medical care. The ultimate judgement with regard to a particular clinical procedure or treatment plan must be made by the clinician in the light of the clinical data presented and the diagnostic and treatment options available.

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CHECKS BEFORE EACH CASE

Breathing system	Whole system patent and leak free using 'two-bag' test Vaporisers – fitted correctly, filled, leak free, plugged in (if necessary) Alternative systems (Bain, T-piece) – checked Correct gas outlet selected
Ventilator	Working and configured correctly
Airway equipment	Full range required, working, with spares
Suction	Clean and working

THE TWO-BAG TEST

A two-bag test should be performed after the breathing system, vaporisers and ventilator have been checked individually

i. Attach the patient end of the breathing system (including angle piece and filter) to a test lung or bag.

ii. Set the fresh gas flow to 5 $l.min^{-1}$ and ventilate manually. Check the whole breathing system is patent and the unidirectional valves are moving. Check the function of the APL valve by squeezing both bags.

iii. Turn on the ventilator to ventilate the test lung. Turn off the fresh gas flow, or reduce to a minimum. Open and close each vaporiser in turn. There should be no loss of volume in the system.

This checklist is an abbreviated version of the publication by the Association of Anaesthetists of Great Britain and Ireland 'Checking Anaesthesia Equipment 2012'. It was originally published in *Anaesthesia*.
(Endorsed by the Chief Medical Officers)

If you wish to refer to this guideline, please use the following reference: Checklist for anaesthetic equipment 2012. *Anaesthesia* 2012; **66:** pages 662–63. http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2044.2012.07163.x/abstract

Suggested topics for SLEs

- DOPS for performing a machine check
- CBD around the importance of safety and preparation for failure including the consequences if the machine was to malfunction. Think about how you would manage this.

References

3. AAGBI Safety Guideline, 2012 - Checking Anaesthetic Equipment. https://doi.org/10.1111/j.1365-2044.2012.07163.x

Patient Monitoring

General Anaesthesia

- ECG, SPO2, NIBP and Capnography

Regional Anaesthesia

- ECG, SPO2, NIBP pre procedure and continued for 30 minutes after block completion

Procedural Sedation

- ECG, SPO2 and NIBP. Capnography to be used whenever there is loss of response to verbal contact

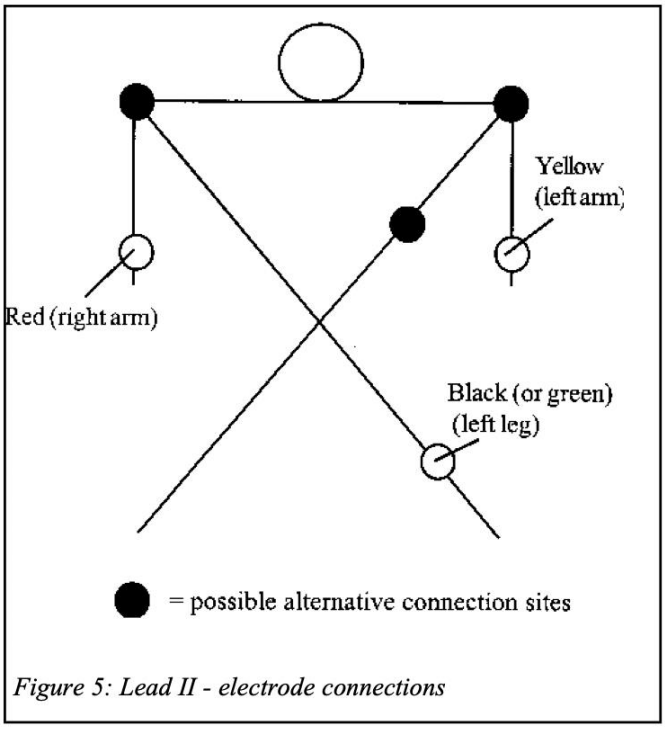
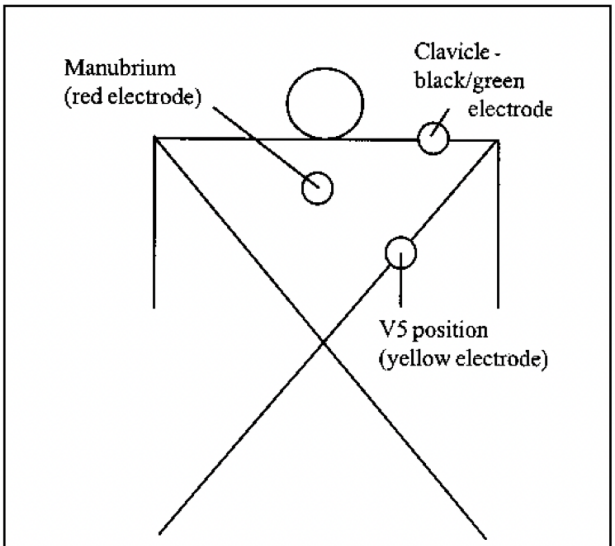
Suggested topics for SLEs

- CBD around the Association of Anaesthetists guidelines for monitoring standards
- DOPS for applying appropriate monitoring

Reference

1. Association of Anaesthetists, 2021. Recommended standards of monitoring during anaesthesia. https://doi.org/10.1111/anae.15501

ECG Monitoring in Theatre

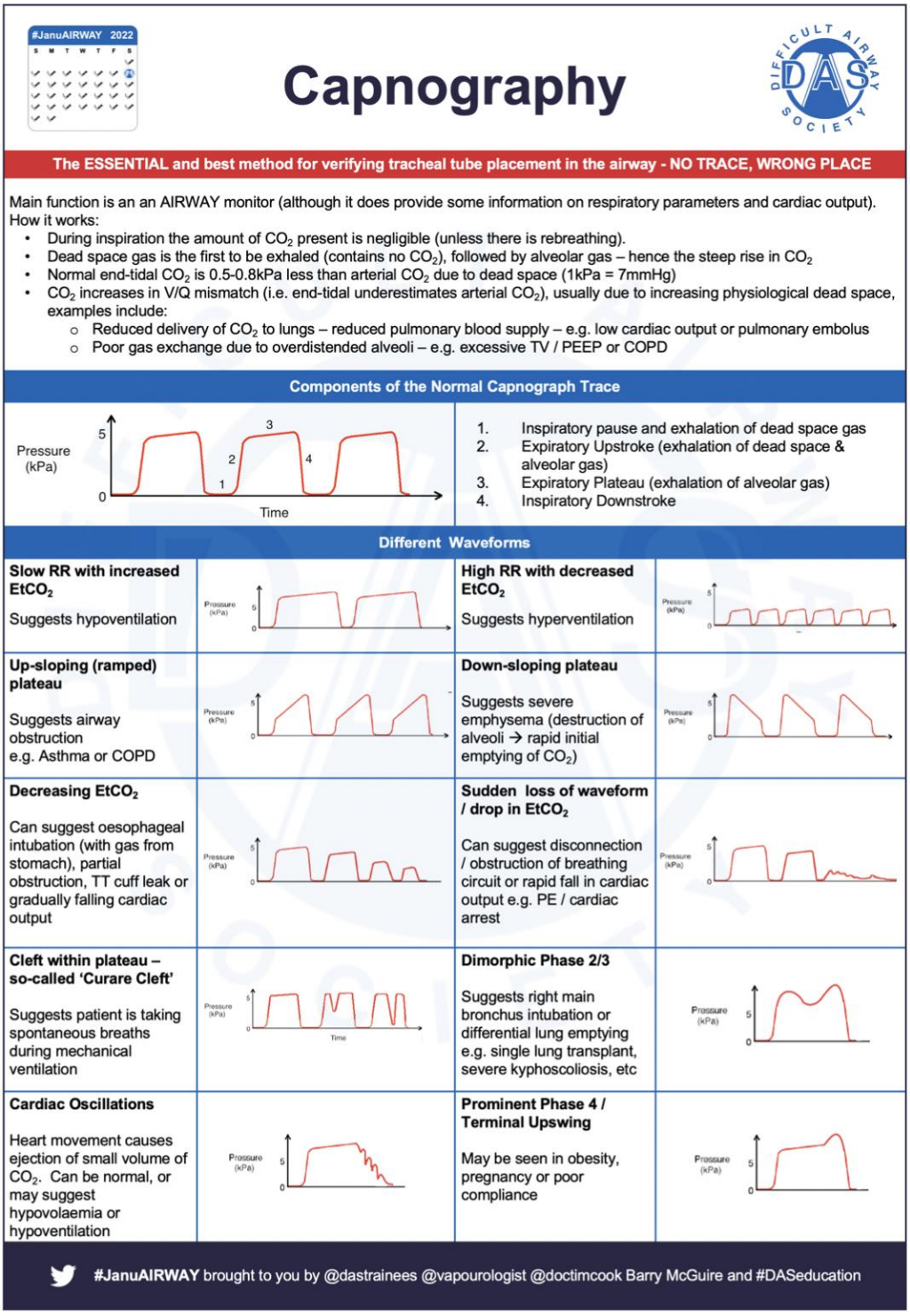
Lead II	CM V
 *Figure 5: Lead II - electrode connections*	 *Figure 6: CM5 - electrode connections*
Most useful for detecting cardiac arrhythmias	Most useful for detecting ischaemia

Suggested topics for SLEs

- DOPS for placing appropriate ECG leads appropriately
- CBD for management of arrhythmias under anaesthetic

References
Lee, J. Update in Anaesthesia: ECG Monitoring in Theatre . https://e-safe-anaesthesia.org/e_library/05/ECG_monitoring_in_theatre_Update_2000.pdf

Capnography

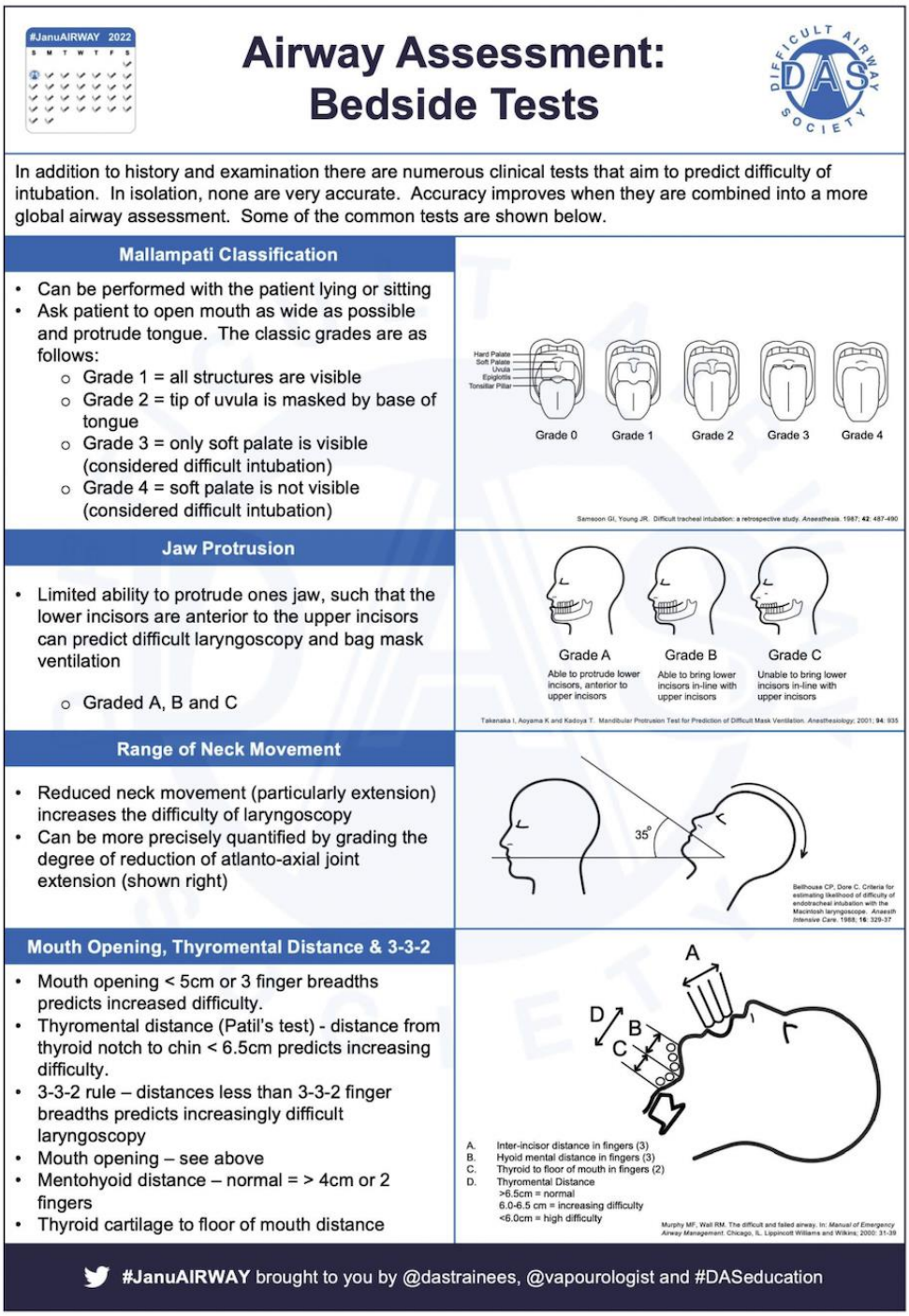


Suggested topics for SLEs

- DOPS on interpretating capnograph
- CBD around different capnograph waveforms and their clinical relevance

Reference
The DAS JanuAIRWAY 2022 Compilation - https://issuu.com/difficultairwaysociety/docs/_januairway_2022_the_compilat

Airway Assessment



Suggested topics for SLEs

- DOPS Airway assessment
- CBD around anaesthetic airway assessment and it's importance.
- ACEX for pre assessment and appropriate airway management

Reference
The DAS JanuAIRWAY 2022 Compilation - https://issuu.com/difficultairwaysociety/docs/_januairway_2022_the_compilation

Pre-Operative Assessment

The pre-operative assessment should be performed before the patient is in the anaesthetic room, it should help prepare the patient for theatre, is an opportunity to get to know your patient, their comorbidities and assess their risk for anaesthesia. This information will allow you to formulate a perioperative plan and consent your patient appropriately. Elective patients will have been seen in pre-operative assessment clinic, look for the booklet with yellow border and this will have lots of useful information.

- Confirm details: Name, DOB, Procedures and side if applicable
- Past medical history: focused history covering the systems e.g., CVS – Chest pain, angina, Resp – asthma – recent exacerbation, hospital admissions, GIT – reflux disease
- Past Surgical history and previous anaesthetics – postoperative vomiting, allergic reactions, malignant hyperpyrexia (MH), Suxamethonium apnoea. Look at previous anaesthetic charts – airway details and any significant events.
- Family history of any anaesthetic problems – Sux apnoea, MH
- Drug history and allergies and timing and doses of significant drugs. Which medicines have they taken and omitted.
- Frailty assessment – ranging from bed bound, house bound, self-caring to ultra-marathon runners.
- Airway assessment – any history of difficulties? Perform your assessment e.g. mouth opening, mallampati score, Jaw movement, Neck movement, document status of teeth, and look out for any other predictors of difficult airway
- Investigations – look for or perform relevant investigations such as FBC, G&S, ECG
- Look for Observations – Blood Pressure and Heart Rate, weight and height
- Risk scores e.g. PONV score, NELA score, CPET, Risk for complications
- You will also need to include analgesia plans and antiemetics based on your patients' individual needs and choices.
- Document your discussion about risks and benefits of different techniques suitable for your patient, offer the time to help answer any questions they have, formulae a plan communicate the plan with the team.

Anaesthetic plan

Mode of anaesthesia: regional/ neuraxial/ gas/ IV induction/ TIVA
Airway plan: LMA, ET Tube, Rapid Sequence Induction
Lines: IV access, A-line, CVC
Analgesia: regional, spinal, LA, Paracetamol+/- NSAIDS, opioids
Anti emetics: 1 agent, 2 agents
Post-op care: Day-case, ward, PACU, HDU, ITU

e.g A 63 year old female presents for Total Abdominal Hysterectomy for malignancy; the procedure will involve a laparotomy. She is an ex-smoker with good exercise tolerance and a BMI 35. The anaesthetic plan includes TIVA, with ETT, 2X IV access due to high risk of bleeding, you would like to ensure X-matched blood is available. For analgesia you agree on an awake spinal before anaesthetic, morphine PCA post op and regular simple analgesia. She scored 4 for PONV you plan to give two agents (dexamethasone and ondansetron) and are using TIVA to reduce her risk as much as possible. She had a bed booked in PACU post-op

Suggested topics for SLEs

- ACEX for pre-operative assessment
- ACEX for appropriate anaesthetic plan

References
AAGBI: Pre-operative Assessment and Patient Preparation – The Role of the Anaesthetist, 2010. http://dx.doi.org/10.21466/g.PAAPP-T.2010

Pre-operative Fasting Policies

Indications: reduce risk of regurgitation and aspiration of gastric content
This is in the elective setting – see RSI indications for emergency patients

Adults (6-2 rule)

6 hours fasting from food (including milk, fortisips, sweets carbonated)

2 hours from liquids NO MILK (water, squash non-pulp fruit juice, tea/coffee, carbohydrate preop drinks e.g., Forti juice, non-carbonated)

<2hours -Sip Until you send (max 50ml/hr)

During team brief, establish ***drink until time*** and communicate this to the ward staff. Inform staff If any delays in theatre

Paediatrics (6months+) (6-1 rule)

6 hours fasting from food and MILK including formula

1 hour fasting from liquids NO MILK (water, squash, non-carbonated, non-thickened

Neonates and babies <6months (6-3-1 rule)

6 hours fasting from formula milk

3 hours fasting from breast milk

1 hour fasting from clear liquid

Continue routine antacids, consider PPI if high risk of aspiration

Unplanned procedures

If a surgery unplanned and the patient has not fasted, discussion would need to take place between the surgeon and anaesthetist regarding the urgency of the surgery, can it wait for the 6 hour fasting period? Do you need to consider an RSI?

Suggested topics for SLEs

- A-CEX for preoperative assessment of fasting status / advice
- CBD based on the starvation policy or how do patients undergoing planned procedures compare to those undergoing unplanned procedures.

References
AAGBI, 2011: Pre-operative fasting in Adults and Children
Stephan Clements, 2019: YG Departmental Guidelines

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Induction Agents

IV or inhalational is usually chosen. A pre-med or adjunct or co-induction agent can be used for pharmacological synergism e.g., opioid or benzodiazepine

Agents	Dose	Presentation	Cautions	Notes
IV				
Propofol (common)	2-3mg/kg	1% 10mg/ml (2% exists!)	Soybean allergy	Pain on injection, hypotension Safe in porphyria and MH
Ketamine (common)	1-2mg/kg	10mg/ml Or 50mg/ml	Emergence delirium and hallucination	Dissociative anaesthesia
Thiopental (Obs/classic RSI)	3-5mg/kg	25mg/ml If you reconstitute 500mg with 20ml of H20	Looks like Abx!! ↓ CO Extravasation Intraarterial injection	Cannot be used in porphyria Caution with fixed CO, hepatic/renal dysfunction, neuromuscular disorders
Inhalational				
Sevoflurane	Often combined with nitrous to increase speed of onset. Titrated to effect		↓ BP with deep sedation	Commonly used for paediatric cases
Co-agents				
Midazolam	0-5-2mg	2mg/ml	Increases risk of delirium in elderly	Anterograde amnesia
Opioids				
Alfentanil	10mcg/kg	500mcg/ml	Obtunds CVS response to laryngoscopy	Bradycardia, wooden chest syndrome, ↓ RR
Fentanyl	1mcg/kg	50mcg/ml	Obtunds CVS response to laryngoscopy	Bradycardia, wooden chest syndrome, ↓ RR

Suggested topics for SLEs

- ACEX performing an IV induction / gas induction
- CBD around how to perform gas induction
- CBD around indications, pros and cons of IV vs gas induction

References

1. Scarth, E. & Smith, S. Drugs in Anaesthesia and Intensive Care – 5th Edition 2016. Oxford University Press.

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Rapid Sequence Induction

A rapid sequence induction is an IV induction technique for patients at risk of regurgitation but not thought to be a difficult airway. It provides immediate unresponsiveness, muscular relaxation with the use of cricoid pressure and without facemask ventilation. The aim is to intubate the trachea quickly and safely. NB patients with predicted difficult airways may need awake fibreoptic intubation.

Indications

1. Abdominal pathology e.g., obstruction, ileus
2. Reduced gastric emptying: Trauma, opiates, alcohol, vagotomy
3. Incompetent lower oesophageal sphincter e.g., Hiatus hernia /GORD
4. Reduced GCS (<8): lack of airway patency and hence own protection
5. Pregnancy >16/40 till 48hrs post-partum
6. Neurological or neuromuscular disease e.g., neuroprotection, spinal cord injury
7. Metabolic disturbance e.g., DKA, Sever AKI, sepsis
8. *Other:* humanitarian e.g., severe burns

Classic vs modified RSI

Classic: predetermined dose of thiopental and suxamethonium

Modified: any modification, this includes the use of propofol, rocuronium, facemask ventilation. Modified RSI will balance the increased risk of aspiration and intended benefit of the modification.

Examples of drugs that you may see used

Choice of induction agents	Choice on NMBs	Premedication
Propofol	Suxamethonium	Alfentanil
Ketamine	Rocuronium	Remifentanil
Thiopentone		Esmolol

The RSI

Pre induction considerations: Do you need an NG? Do you have adequate number of assistants? There should be a minimum of 3 people. Does the trolley tilt into Trendelenburg if regurgitation was to occur? Have you discussed your airway plan (A, B & C) and any potential interventions required with your ODP and helper?

- Attach monitoring and check etCO2
- Selection of alternative ET tubes and laryngoscopes including difficult airway equipment
- Optimise patient positioning – consider adjuncts if require e.g., Oxford HELP pillow
- Large bore cannula and fluids running
- Suction on and under pillow
- Preoxygenation with **100% O2** for **3-5min** aim for **etO2 >85%**
- Cricoid pressure (20-40N)
- Anti-pressor agent if using e.g. alfentanil
- Administer induction agent followed immediately by a neuromuscular blocker
- Intubate trachea
- Confirm tracheal intubation with etCO2

Suggested topics for SLEs

- ACEX for managing the emergency patient needing RSI or DOPS for performing an RSI
- Repeated assessment to show progress and confidence increases and less supervision required

References

1. BJA Education: Rapid Sequence Induction, Sinclair and Luxton 2005. https://academic.oup.com/bjaed/article/5/2/45/422107
2. Spoors and Kiff, 2010. Oxford Speciality Training: Training in Anaesthesia the Essential Curriculum

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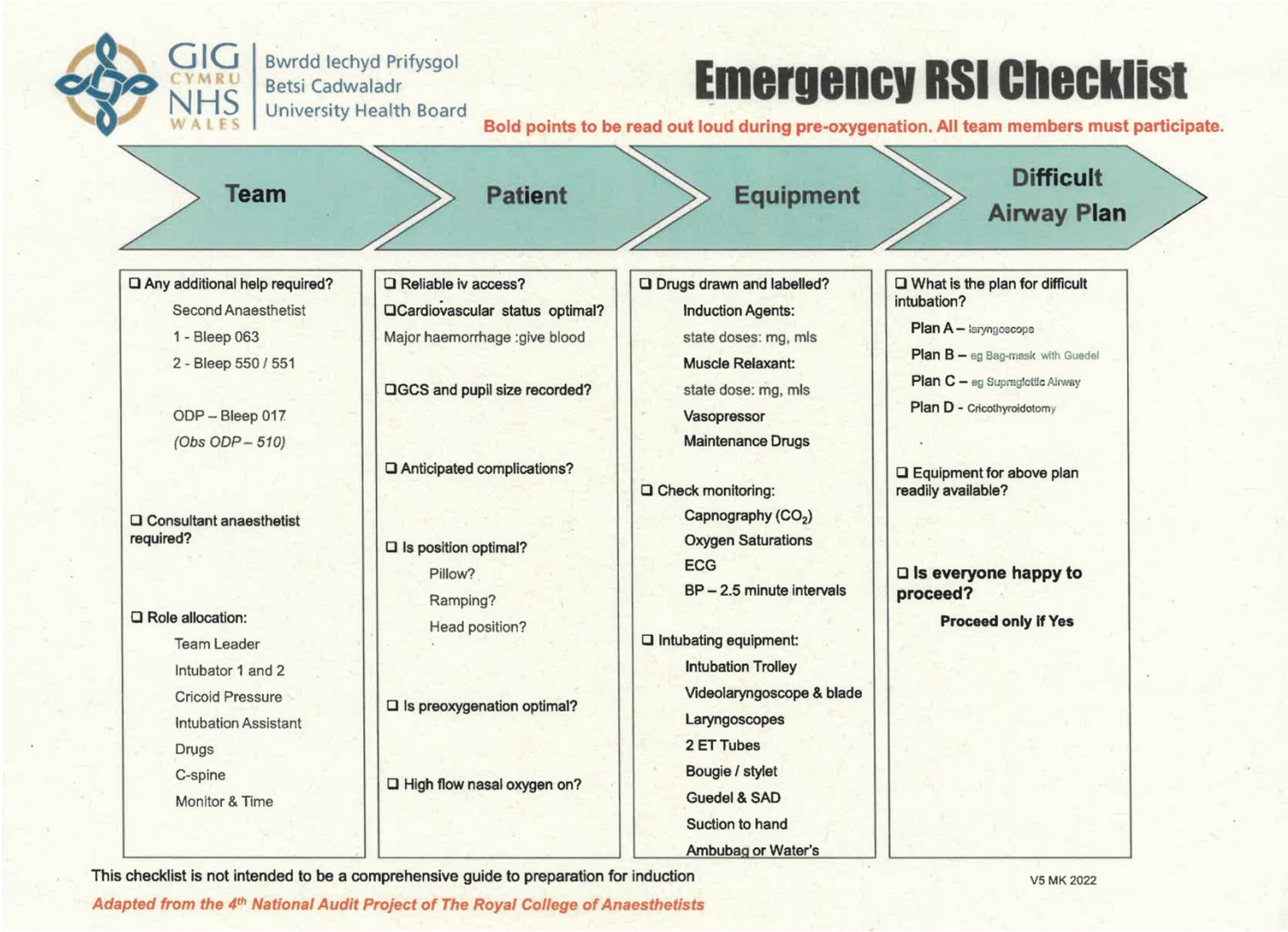
RSI Emergency Checklist *example*



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Emergency RSI Checklist

Bold points to be read out loud during pre-oxygenation. All team members must participate.

Team

- ❑ Any additional help required?
  - Second Anaesthetist
  - 1 - Bleep 063
  - 2 - Bleep 550 / 551
  - ODP – Bleep 017
  - *(Obs ODP – 510)*
- ❑ Consultant anaesthetist required?
- ❑ Role allocation:
  - Team Leader
  - Intubator 1 and 2
  - Cricoid Pressure
  - Intubation Assistant
  - Drugs
  - C-spine
  - Monitor & Time

Patient

- ❑ Reliable iv access?
- ❑Cardiovascular status optimal?
  - Major haemorrhage :give blood
- ❑GCS and pupil size recorded?
- ❑ Anticipated complications?
- ❑ Is position optimal?
  - Pillow?
  - Ramping?
  - Head position?
- ❑ Is preoxygenation optimal?
- ❑ High flow nasal oxygen on?

Equipment

- ❑ Drugs drawn and labelled?
  - Induction Agents:
  - state doses: mg, mls
  - Muscle Relaxant:
  - state dose: mg, mls
  - Vasopressor
  - Maintenance Drugs
- ❑ Check monitoring:
  - Capnography (CO_2)
  - Oxygen Saturations
  - ECG
  - BP – 2.5 minute intervals
- ❑ Intubating equipment:
  - Intubation Trolley
  - Videolaryngoscope & blade
  - Laryngoscopes
  - 2 ET Tubes
  - Bougie / stylet
  - Guedel & SAD
  - Suction to hand
  - Ambubag or Water's

Difficult Airway Plan

- ❑ What is the plan for difficult intubation?
  - Plan A – laryngoscope
  - Plan B – eg Bag-mask with Guedel
  - Plan C – eg Supraglottic Airway
  - Plan D - Cricothyroidotomy
- ❑ Equipment for above plan readily available?
- ❑ **Is everyone happy to proceed?**
  - **Proceed only if Yes**

This checklist is not intended to be a comprehensive guide to preparation for induction

V5 MK 2022

Adapted from the 4th National Audit Project of The Royal College of Anaesthetists

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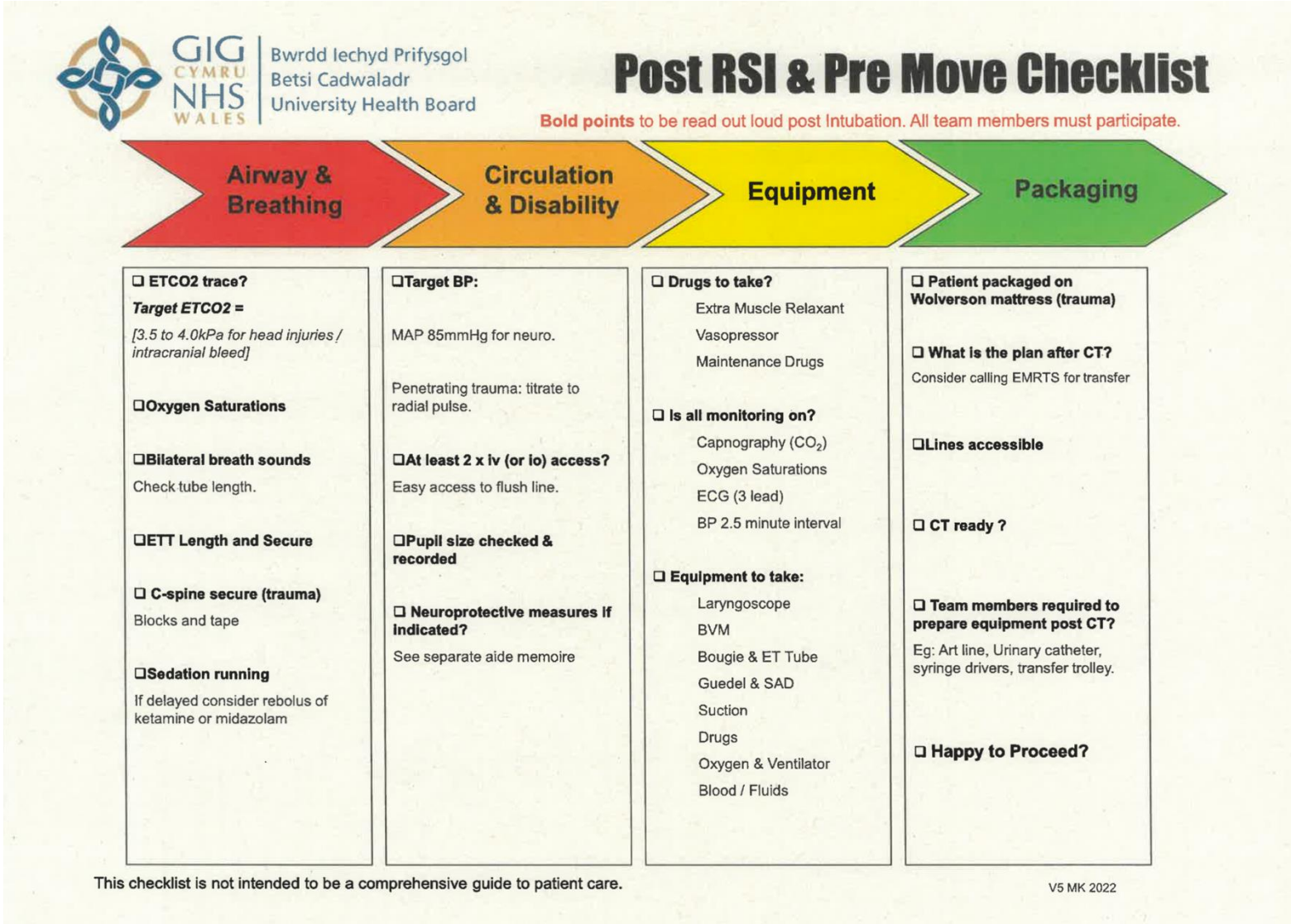
Post RSI and Transfer Checklist *example*



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Post RSI & Pre Move Checklist

Bold points to be read out loud post Intubation. All team members must participate.

Airway & Breathing

- ❑ **ETCO2 trace?**
- ***Target ETCO2 =***
- *[3.5 to 4.0kPa for head injuries / intracranial bleed]*
- ❑ **Oxygen Saturations**
- ❑ **Bilateral breath sounds**
  Check tube length.
- ❑ **ETT Length and Secure**
- ❑ **C-spine secure (trauma)**
  Blocks and tape
- ❑ **Sedation running**
  If delayed consider rebolus of ketamine or midazolam

Circulation & Disability

- ❑ **Target BP:**
- MAP 85mmHg for neuro.
- Penetrating trauma: titrate to radial pulse.
- ❑ **At least 2 x iv (or io) access?**
  Easy access to flush line.
- ❑ **Pupil size checked & recorded**
- ❑ **Neuroprotective measures if indicated?**
  See separate aide memoire

Equipment

- ❑ **Drugs to take?**
  - Extra Muscle Relaxant
  - Vasopressor
  - Maintenance Drugs
- ❑ **Is all monitoring on?**
  - Capnography (CO_2)
  - Oxygen Saturations
  - ECG (3 lead)
  - BP 2.5 minute interval
- ❑ **Equipment to take:**
  - Laryngoscope
  - BVM
  - Bougie & ET Tube
  - Guedel & SAD
  - Suction
  - Drugs
  - Oxygen & Ventilator
  - Blood / Fluids

Packaging

- ❑ **Patient packaged on Wolverson mattress (trauma)**
- ❑ **What is the plan after CT?**
  Consider calling EMRTS for transfer
- ❑ **Lines accessible**
- ❑ **CT ready ?**
- ❑ **Team members required to prepare equipment post CT?**
  Eg: Art line, Urinary catheter, syringe drivers, transfer trolley.
- ❑ **Happy to Proceed?**

This checklist is not intended to be a comprehensive guide to patient care.

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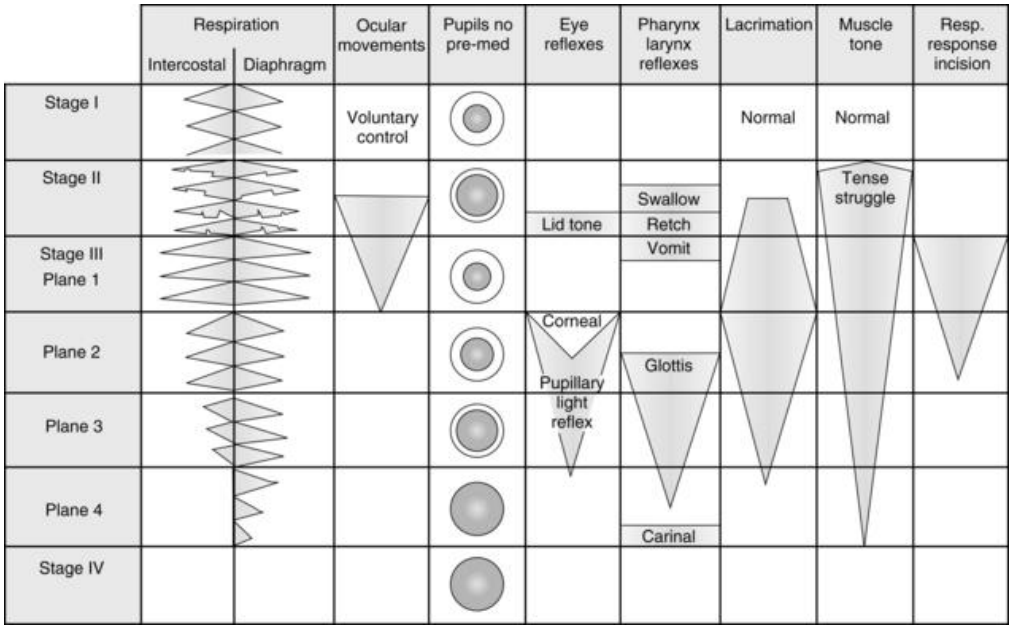
Stages of Anaesthesia

Guedel described four stages of anaesthesia in 1937. We are not dependent on these clinical signs due to advances in anaesthetic monitoring, however still useful to be aware of. Here are two diagrams showing a visual representation of the stages:

STAGE	RESPIRATION	PUPILS	EYE REFLEXES	URT & RESPIRATORY REFLEXES
1 Analgesia	Regular Small volume			
2 Excitement	Irregular		Eyelash absent	
3 Anaesthesia Plane I	Regular Large volume		Eyelid absent Conjunctival depressed	Pharyngeal & vomiting depressed
Plane II	Regular Large volume		Corneal depressed	
Plane III	Regular Becoming diaphragmatic Small volume			Laryngeal depressed
Plane IV	Irregular Diaphragmatic Small volume			Carinal depressed
4 Overdose	Apnoea			



Suggested topics for SLEs

- Look out for the signs of a patient clinically, if you want to create an SLE it would be included under induction of anaesthesia

References

1. Spoors and Kiff, 2010. Oxford Speciality Training: Training in Anaesthesia the Essential Curriculum : 3.2 Induction of Anaesthesia
2. *Drain, C. Inhalation Anaesthesia - Adapted from Gillespie NA: Signs of anesthesia, Anesth Analg 22:275, 1943.* *https://clinicalgate.com/inhalation-anesthesia/*
3. Smith and Aitkenheads Textbook of Anaesthesia 6E https://clinicalgate.com/the-practical-conduct-of-anaesthesia/

Airway Plan and Difficult Airway in Adults

Difficult airways can be predicted or unanticipated. Be mindful to take a good airway history and look at previous anaesthetic records, techniques used and any difficulties encountered.

Look out for risk factors of difficult airway high score on predication tools, obesity, short neck, small chin, limited mouth opening (fixed or temporary), airway trauma or burns, genetic syndromes, small joint disease e.g. diabetes mellites, neck problems e.g. RA, the list is long and a topic worth reading in further detail.

Take home points – have a high index of suspicion.

Note - different algorithms exist for paediatric patients and obstetric patients, these are not covered here and should be included in your further reading following your initial introduction into anaesthetics.

Try and practice working through an airway plan A, B, C, D as set out below and communicate this with your ODP, in order for this to become second nature and more familiar in the emergency setting.

Suggested topics for SLEs

- Discussion around the DAS algorithms
- ACEX for communicating plan A, B, C and D with your anaesthetic team for a patient you are performing an RSI for a patient

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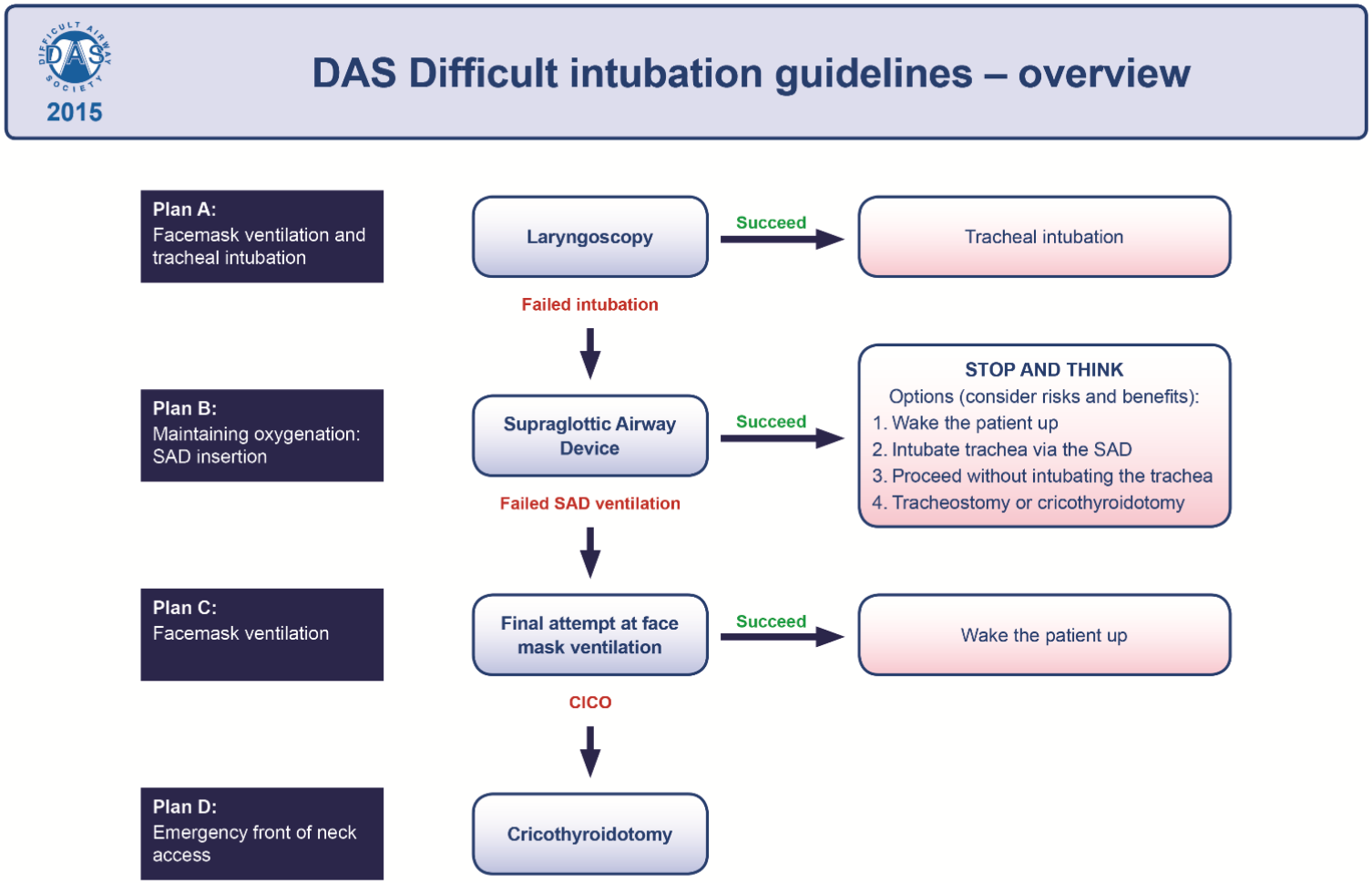
DAS Difficult Intubation Guidelines – Algorithms



This flowchart forms part of the DAS Guidelines for unanticipated difficult intubation in adults 2015 and should be used in conjunction with the text.

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Management of unanticipated difficult tracheal intubation in adults

2015

Plan A: Facemask ventilation and tracheal intubation

Optimise head and neck position
Preoxygenate
Adequate neuromuscular blockade
Direct / Video Laryngoscopy (maximum 3+1 attempts)
External laryngeal manipulation
Bougie
Remove cricoid pressure
Maintain oxygenation and anaesthesia

If in difficulty → call for help

Succeed → Confirm tracheal intubation with capnography

Declare failed intubation

Plan B: Maintaining oxygenation: SAD insertion

2nd generation device recommended
Change device or size (maximum 3 attempts)
Oxygenate and ventilate

Succeed →

STOP AND THINK

Options (consider risks and benefits):

1. Wake the patient up
2. Intubate trachea via the SAD
3. Proceed without intubating the trachea
4. Tracheostomy or cricothyroidotomy

Declare failed SAD ventilation

Plan C: Facemask ventilation

If facemask ventilation impossible, paralyse
Final attempt at facemask ventilation
Use 2 person technique and adjuncts

Succeed → Wake the patient up

Declare CICO

Plan D: Emergency front of neck access

Scalpel cricothyroidotomy

Post-operative care and follow up

- Formulate immediate airway management plan
- Monitor for complications
- Complete airway alert form
- Explain to the patient in person and in writing
- Send written report to GP and local database

This flowchart forms part of the DAS Guidelines for unanticipated difficult intubation in adults 2015 and should be used in conjunction with the text.

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Failed intubation, failed oxygenation in the paralysed, anaesthetised patient

CALL FOR HELP

Continue 100% O_2
Declare CICO

Plan D: Emergency front of neck access

Continue to give oxygen via upper airway
Ensure neuromuscular blockade
Position patient to extend neck

Scalpel cricothyroidotomy

Equipment: 1. Scalpel (number 10 blade)
2. Bougie
3. Tube (cuffed 6.0mm ID)

Laryngeal handshake to identify cricothyroid membrane

Palpable cricothyroid membrane
Transverse stab incision through cricothyroid membrane
Turn blade through 90° (sharp edge caudally)
Slide coude tip of bougie along blade into trachea
Railroad lubricated 6.0mm cuffed tracheal tube into trachea
Ventilate, inflate cuff and confirm position with capnography
Secure tube

Impalpable cricothyroid membrane
Make an 8-10cm vertical skin incision, caudad to cephalad
Use blunt dissection with fingers of both hands to separate tissues
Identify and stabilise the larynx
Proceed with technique for palpable cricothyroid membrane as above

Post-operative care and follow up
- Postpone surgery unless immediately life threatening
- Urgent surgical review of cricothyroidotomy site
- Document and follow up as in main flow chart

This flowchart forms part of the DAS Guidelines for unanticipated difficult intubation in adults 2015 and should be used in conjunction with the text.

References
1. Frerk, C. et al for Difficult Airway Society intubation guidelines working group. Difficult Airway Society 2015 guidelines for management of unanticipated difficult intubation in adults. *British Journal of Anaesthesia*, 115 (6): 827–848 (2015) doi:10.1093/bja/aev371

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Patient Safety in Theatre- WHO Checklist, Sign-in and Sign-out

National Patient Safety Agency (NPSA) advocate Five Steps to Safer Surgery. These five steps include: team brief, WHO surgical Safety checklists (sign in, time out and sign out) and a team debrief. To be effective all members of the theatre team should be present for all steps, this includes the anaesthetic team, surgical team and the theatre team.

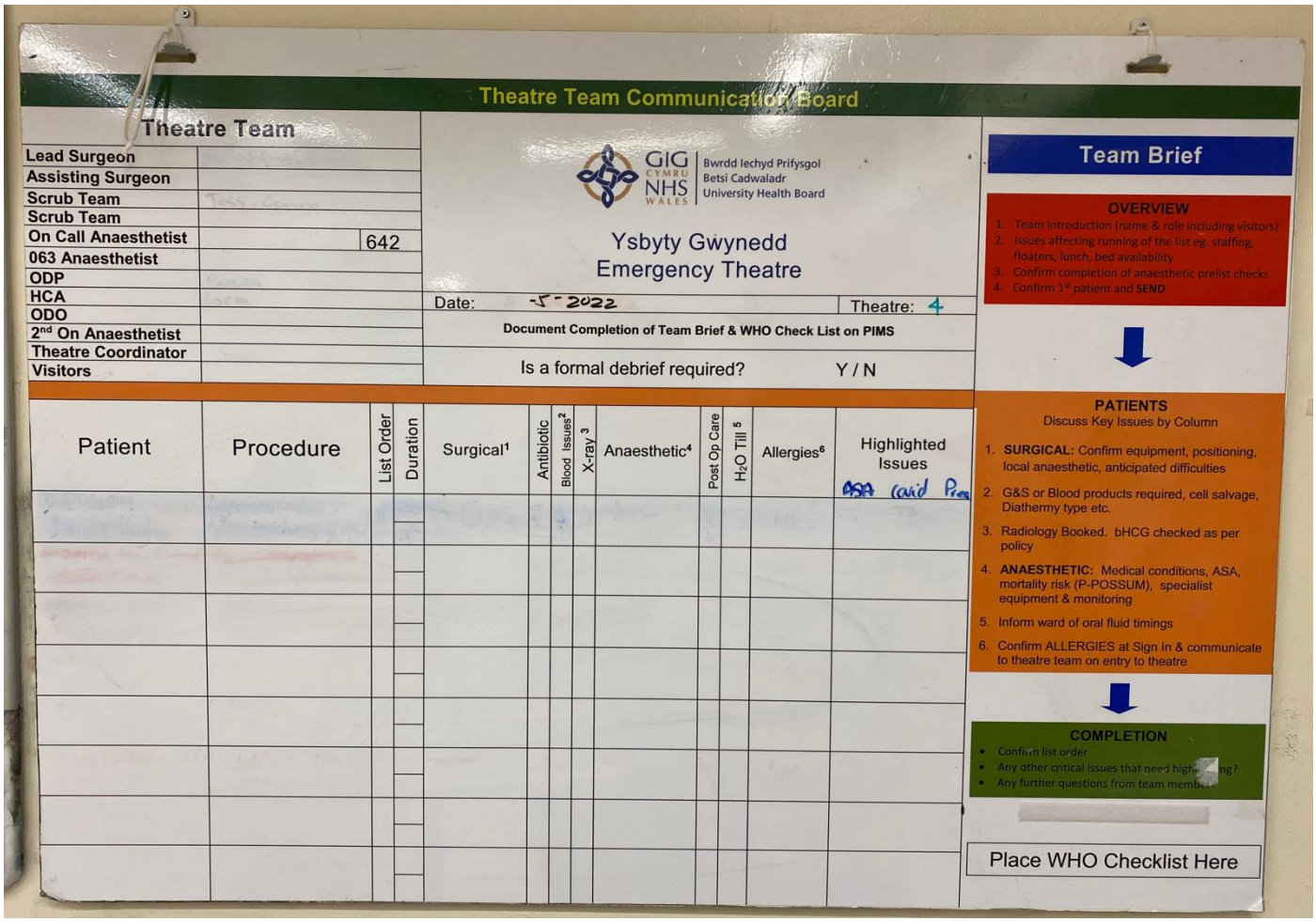
Timings

TEAM BRIEF: At least *10 mins before* the patient's start time i.e., *before* you send for the patient.
SIGN IN: *before* induction of anaesthesia

STOP BEFORE YOU BLOCK: performed by anaesthetist and ODP if a nerve block is performed – timing should be immediately before performing the block (i.e., needle insertion)

TIME OUT: *before* surgical incision / start of procedure
SIGN OUT: *before* the patient leaves theatre
DEBRIEF: at the *end of the list* if elective, at the end of every patient if on the emergency list (as your team will likely change between patients)

Communication board for team brief *example*



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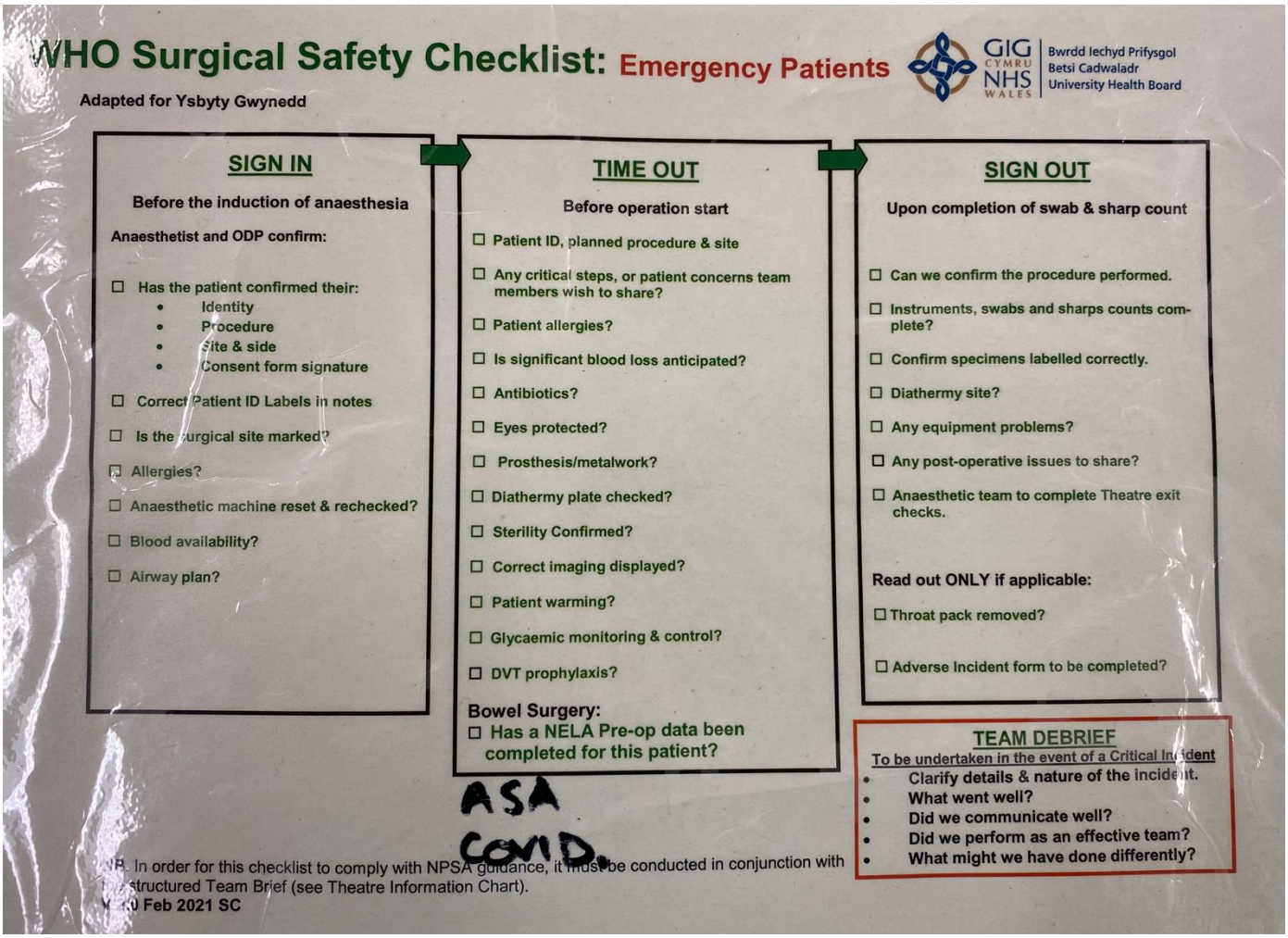
WHO Surgical Checklist *example*



WHO Surgical Safety Checklist: Emergency Patients

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Adapted for Ysbyty Gwynedd

SIGN IN

Before the induction of anaesthesia

Anaesthetist and ODP confirm:

- ☐ Has the patient confirmed their:
  - Identity
  - Procedure
  - Site & side
  - Consent form signature
- ☐ Correct Patient ID Labels in notes
- ☐ Is the surgical site marked?
- ☐ Allergies?
- ☐ Anaesthetic machine reset & rechecked?
- ☐ Blood availability?
- ☐ Airway plan?

TIME OUT

Before operation start

- ☐ Patient ID, planned procedure & site
- ☐ Any critical steps, or patient concerns team members wish to share?
- ☐ Patient allergies?
- ☐ Is significant blood loss anticipated?
- ☐ Antibiotics?
- ☐ Eyes protected?
- ☐ Prosthesis/metalwork?
- ☐ Diathermy plate checked?
- ☐ Sterility Confirmed?
- ☐ Correct imaging displayed?
- ☐ Patient warming?
- ☐ Glycaemic monitoring & control?
- ☐ DVT prophylaxis?

Bowel Surgery:
☐ Has a NELA Pre-op data been completed for this patient?

ASA
COVID.

SIGN OUT

Upon completion of swab & sharp count

- ☐ Can we confirm the procedure performed.
- ☐ Instruments, swabs and sharps counts complete?
- ☐ Confirm specimens labelled correctly.
- ☐ Diathermy site?
- ☐ Any equipment problems?
- ☐ Any post-operative issues to share?
- ☐ Anaesthetic team to complete Theatre exit checks.

Read out ONLY if applicable:

- ☐ Throat pack removed?
- ☐ Adverse Incident form to be completed?

TEAM DEBRIEF

To be undertaken in the event of a Critical Incident

- Clarify details & nature of the incident.
- What went well?
- Did we communicate well?
- Did we perform as an effective team?
- What might we have done differently?

NB. In order for this checklist to comply with NPSA guidance, it must be conducted in conjunction with a structured Team Brief (see Theatre Information Chart).

V 3.0 Feb 2021 SC

Suggested topics for SLEs

- DOPS performing elements of the above steps
- CBD around the WHO checklist and how it impacts patient safety

References

YG Theatres LocSSIP 69: Five Steps to Safter Surgery and the WHO Surgical Safety Checklist

Patient Positioning for Theatre

When positioning a patient, you must consider surgical need and preference for access, patient safety and reducing the risk of injury e.g. burns from diathermy, nerve injury. You will see physiology in action as you change the patient's position, some frailer patients may not be able to withstand extreme positioning.

When positioning always check:

A	Check that Endotracheal Tube has not dislodged, kinked or migrated in or out. Check for face/airway swelling towards the end if head down for a prolonged time. Head support is very important and hyperextension of C-spine can cause long term damage to patients. Check End Tidal CO2.
B	Check tidal volume and ventilation are adequate. Check gas flow and volatile if used. Apply PEEP to prevent atelectasis. Check SpO2.
C	Check IV cannula is working and tubing is not dislodged or kinked. Position the arms so that cannula or tubing for drip is not obstructed by surgical staff or equipment. A second cannula on the other arm can give an alternative access. Check Blood pressure is cycling at selected time intervals.
D/E	Check pressure points and skin. Keep patient warm. Check that there are no overextension or over-abduction of joints. Make sure the patient has thrombosis prophylaxis using stockings or compression devices.

Position	Problem
Supine Patient is on their back, arms flat by sides (wrap or use arm supports) Abduction <90° forearms pronated, or resting on the chest/abdomen *Used in*: most surgeries	- Corneal injury - Avoid hyperextension of knees - Pressure points on heels, sacrum, greater trochanter of femur
Lithotomy/Lloyd-Davies *Used in*: gynae, colorectal, urology. The difference between the two is the angle of flexion at the hip.  	- arms by side can cause damage to finger/pressure areas - Sciatic/obturator nerve stretching and femoral nerve compression if hips flexed >90° - Common peroneal and saphenous nerve injury from leg supports - Elevate both legs simultaneously to prevent lower back damage - Calf compression – DVT / Compartment syndrome - Avoid pressure to sacrum/contact with table
Lateral decubitus Patient on side	- ENSURE CORRECT SIDE FOR SURGERY - Good head support

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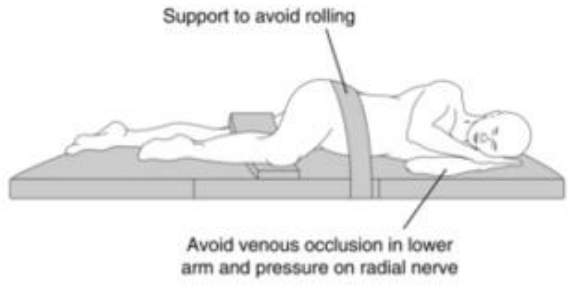
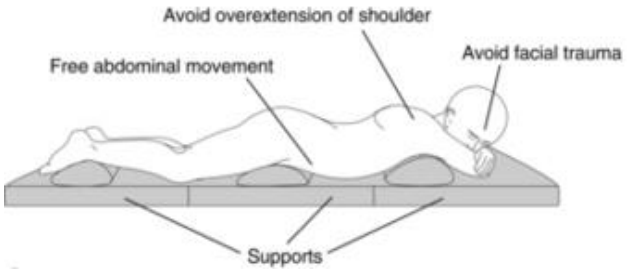
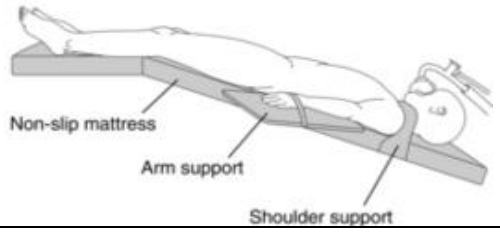
Used in: hip, renal, thoracic surgery  	- Check pressure points - Asymmetrical lung ventilation - Prevent over rotation of spine (both directions) - Corneal abrasion e.g. from canula - Common peroneal and saphenous injury - Padding between legs (if not hip surgery)
Prone *Used in:* calcaneal, renal, varicose veins, spinal surgeries  	- Eyes – direct pressure on eyes will increase intra-ocular pressure and cause temporary or permanent impairment. - Neck – hyper-extension/flexion – aim neutral, use head support with mirror - Breasts and genitalia – ensure no compression - Abdominal compartment syndrome: pillows or padded support will mitigate pressure effect. - Ankle, knee and elbow joints must be supported to prevent nerve and vascular damage - Cervical, brachial, lumbar and sacral plexus: extension, abduction, rotation and stretching can cause damage.
Trendelenburgh *Used in*: laparoscopic surgeries  	- Displacement of ET Tube - Ventilatory issues due to decreased functional residual capacity and compliance. Increased airway pressure due to diaphragmatic compression - Oedema of head neck and larynx. - Risk of aspiration if not intubated

Suggested topics for SLEs

- Watch the TV next time you position a patient head down (Trendelenburg), how do they vary? Does it change during the procedure? Does the patient handle the extreme positioning?
- CBD changes in physiology that occur with xx position
- ACEX – did you have to intervene clinically to stabilise a patients physiology?
- DOPS – Position a patient, perform the checks with the ODP

References

1. Spoors and Kiff, 2010. Oxford Speciality Training: Training in Anaesthesia the Essential Curriculum – 4.2 Patient Positioning. https://academic.oup.com/bjaed/article/8/6/214/405940
2. Smith and Aitkenheads Textbook of Anaesthesia 6E https://clinicalgate.com/the-practical-conduct-of-anaesthesia/

Basic Ventilation Settings on an Anaesthetic Machine

<table>
<tr><th colspan="2">Ventilation Setting</th></tr>
<tr><td colspan="2"> 
</td></tr>
<tr><td>VC-AF (Volume Control – Autoflow)</td><td>VC (Volume Control)</td></tr>
<tr><td>Dial up a volume – mode allows spontaneous breathing at any time in resp cycle</td><td>Dial up a volume – variable pressure</td></tr>
<tr><td>PC (Pressure Control)</td><td>PSV (Pressure support Ventilation)</td></tr>
<tr><td>Dial up a pressure – variable volume</td><td>Assists patient triggered breaths with pressure – variable volume</td></tr>
</table>

Suggested topics for SLEs

- CBD around the different ventilation modes available
- CBD around the advantages and disadvantages of different modes and their application to different clinical cases
- ACEX setting up and managing ventilation for a patient

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Safe Extubation

Respiratory problems are three times more common during extubation vs intubation. NAP 4 reporting airway obstruction as the commonest cause and highest risk being aspiration at beginning and end of anaesthesia. Prepare and beware!

What does fully conscious mean? When is the patient ready to extubate?

- Have appropriate assistance and be prepared to reintubate if necessary
- Is it appropriate to extubate, do you need to wait?
- Initiate 100% O2
- Fully reversed Neuro muscular blockade is required prior to extubating.
- Suction – does this need to be under direct vision?
- Terminate maintenance anaesthesia
- Continue IPPV
- Optimal positioning – sitting up? Left lateral and head down?
- Are there any special considerations for you patients?
- Can they follow commands – 'can you open your eyes?' 'Can you squeeze my finger?' Can they head hold >5secs?
- Are they breathing spontaneously and are TV adequate?
- Extubate during end inspiration (glottis fully open) to avoid airway trauma

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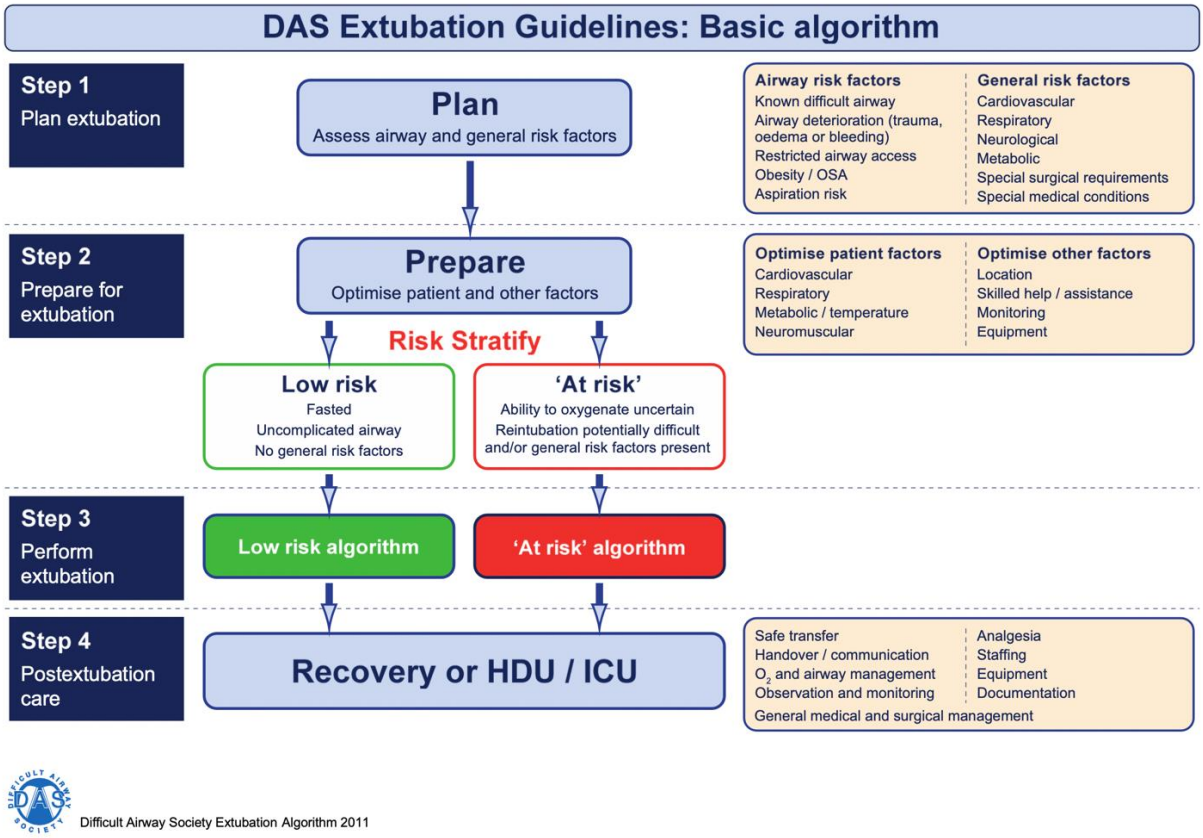
Special Considerations

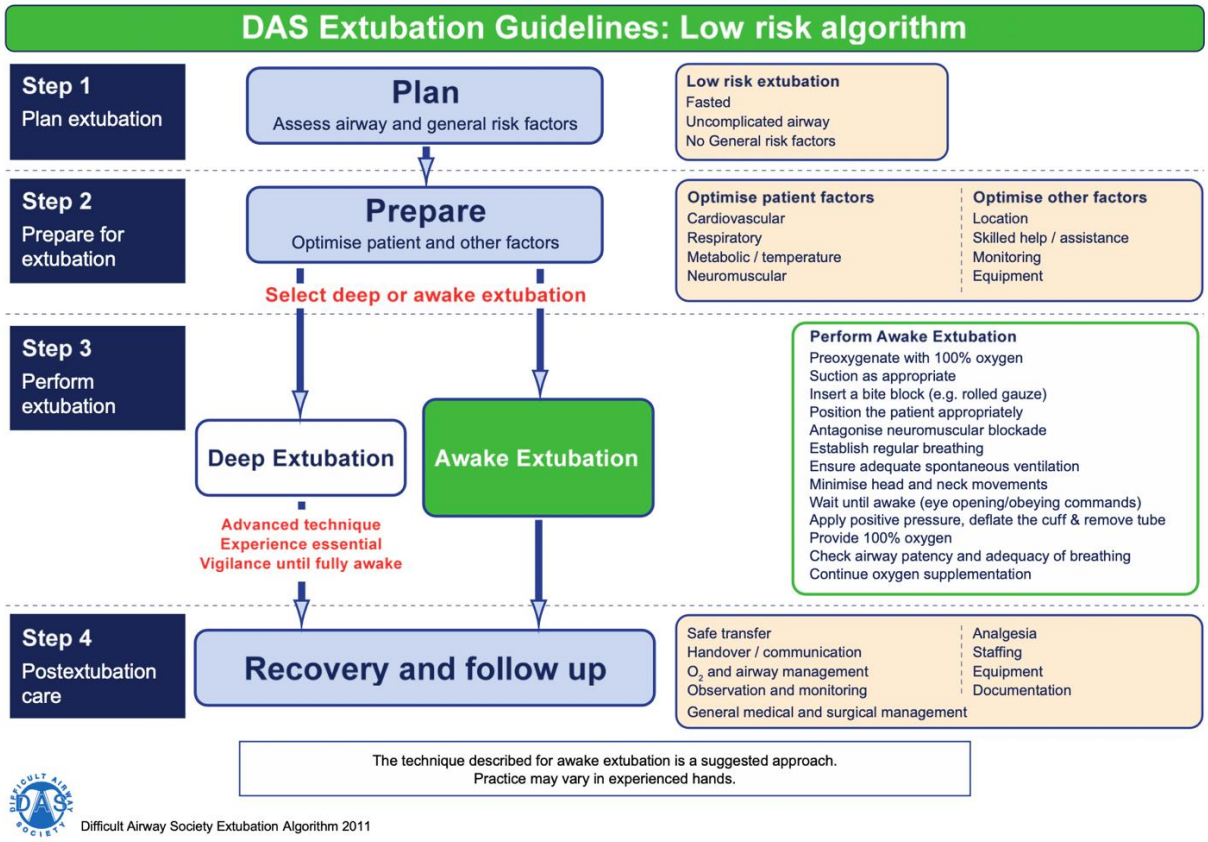
Difficult intubation	Difficult airway equipment should be available and senior assistance
Obese patients	Take extra care for positioning, extubate in the upright position. If OSA present, you may need to start CPAP. Use normal CPAP machine post extubation if regime known, consider higher level of care postop.
Irritable airways	Pre-existing airway disease e.g., COPD, smokers, LRTI, are associated with increased problems on Extubation such as coughing, bronchospasm and laryngospasm. Look out for these and remember PEEP!
Neurological and Muscular Conditions	Ensure complete reversal of NMB if used, airway reflexes may be depressed, pay attention to Tidal Volume and breathing patterns, assistance may be required.
Prolonged surgery	Risk of airway collapse and atelectasis, prolonged effects of maintenance agent, airway swelling may be present if head down position was prolonged – check for cuff leak
Deep Extubation	For information during you novice period, a skill to master later. It is a technique used mainly to avoid coughing such as post neurosurgery but can been seen in ENT.
Biting the ETT	Do you have a biter? Consider a bite block, is it possible to insert a Guedel, apply PEEP and consider deflating the pilot balloon so air can leak around the obstructed tube.

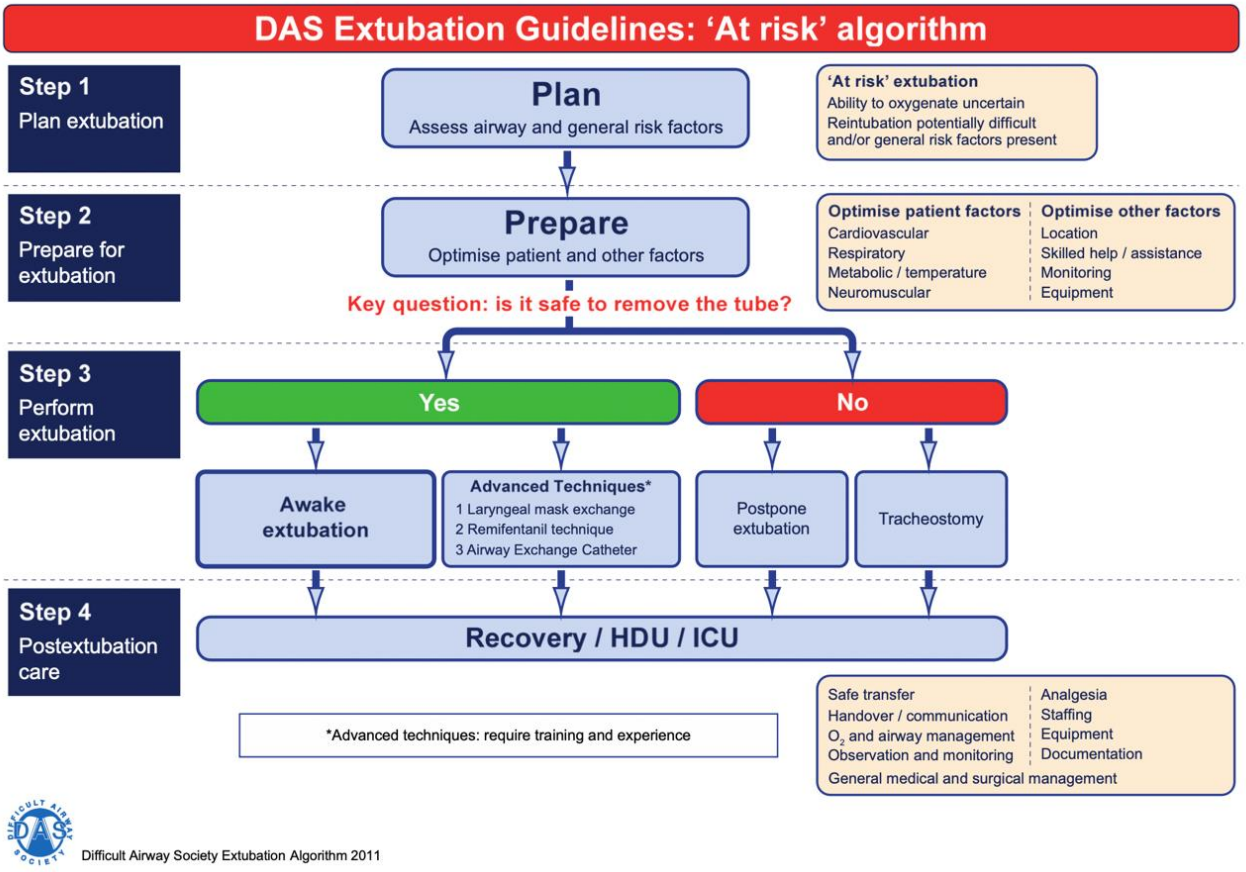
Suggested topics for SLEs

- Consider discussion around appropriate extubation plans for your patient
- Perform extubations in a variety of patients
- Reflect on management of complications

DAS Extubation Guidelines







References

3. Spoors and Kiff, 2010. Oxford Speciality Training: Training in Anaesthesia the Essential Curriculum – 5.1 The Recovery Room. https://academic.oup.com/bjaed/article/8/6/214/405940
4. Difficult Airway Society - Extubation Guidelines, 2011. https://das.uk.com/content/das-extubation-guidelines
5. Karmarkar, S. and Varshney, S. Tracheal extubation, *Continuing Education in Anaesthesia Critical Care & Pain*, Volume 8, Issue 6, December 2008, Pages 214–220, https://doi.org/10.1093/bjaceaccp/mkn036
6. Benham-Hermetz, J. and Mitchell, V. BJA Education - 24.08.21. Safe tracheal Extubation after general anaesthesia. https://doi.org/10.1016/j.bjae.2021.07.003

Safe Transfer

Transfer to patients can be IntRA Hospital (within the hospital) or intER Hospital (between hospitals). Aim to complete the All Wales Transfer Course to learn more in depth detail about how to safely transfer patient between different areas. Here we will focus on transfer from theatre to the chosen recovery area (theatre recovery, PACU, HDU, ITU) as this is the commonest transfer you will initially encounter as a novice.

A	- LMA or adjunct - Extubated - Remains intubated - Consider best position of patient for transfer
B	- Adequate Tidal Volume and NMB reversed (TOF >0.9) - Ventilator settings as desired. Oxygen connected to airway device and SWITCHED ON. Adequate O2 supply (calculate for long transfers)
C	- Check Observations before starting, are you happy? Do you need to continue vasopressors/inotropes or stabilise your patient before transfer? - Continue or disconnect fluid? - FLUSH the cannula - Untangle your lines and keep an eye on cannulas, arterial lines and Central venous catheters, you don't want them to be pulled out during transfer, by the team or the patient! - Keep monitoring on for transfer and TURN MONITOR SO YOU CAN SEE IT Minimum monitoring standards as per AAGBI including ECG, NIBP, Sp02, etCO2 (if airway present)
D & E	- talk and reassure your patient if they are emerging from anaesthesia - Keep them warm (being cold is as miserable as PONV!) and maintain their dignity - Have a glycaemic control plan if diabetic e.g., next BM, continue or stop sliding scale, food and drink - Do you need cot sides e.g., paediatric patients?
Equipment	This will depend how critical your patient is, see table below For paediatric patients you may also want to carry an Ayre T Piece

Ensure you perform and adequate handover to accompany your fabulous transfer!

Suggested topics for SLEs

- ACEX for managing the transfer of patient from theatre to a recovery area
- DOPS for trouble shooting a problem during transfer
- CBD around factors that may effect your patient during transfer or extra preparation you may need to consider to keep your patient safe

Table 1: Patient level of care (0-3), recommended competencies required for transfer and essential equipment required. Taken from Welsh Guideline for the Transfer of the Critically Ill Patient.

Patient	Accompanying personnel (minimum)	Skills required	Essential equipment
Level 0	Porter or HCA	BLS	
Level 0.5 (Elderly/confused)	Porter and HCA	BLS	
Level 1	Suitably experienced nurse/HCA and porter, appropriate to the needs of the patient	BLS and gas cylinder training. Appropriate competency in; • specific drug delivery • recognition of deterioration (ILS) • suction and tracheostomy care	Oxygen, suction (if trachy), portable IV stand, battery operated infusors, pulse oximetry
Level 2	Nurse and porter	All of the above, plus; • two years critical care experience • use of airway adjuncts • use of bag and mask • use of defibrillator • care of invasive monitoring	All of the above, plus; ECG and BP monitors, immediate access to defibrillator
Level 3	Doctor/ACCP, nurse or ODP and porter	Competency of the supervising doctor/ ACCP or the transferring doctor/ ACCP must be at or above the minimum standard (see appendix 4)	Full ICU portable monitoring, ventilator and transfer equipment up to minimal monitoring standards

References
1. Welsh Government, Farley-Hills, E and O-Keeffee. Welsh Guideline for the Transfer of the Critically Ill Patient. https://collaborative.nhs.wales/networks/critical-care/documents/guidelines-for-the-transfer-of-the-critically-ill-adult/
2. AAGBI. Guidelines – Recommendations for standards of monitoring during anaesthesia and recovery 2021. https://doi.org/10.1111/anae.15501

Safe Handover

A patient going to theatre will be care for by multiple teams, clear accurate handover of care is vital to reduce error and promote a high standard of care. You may find that you assess a patient pre-operatively and handover the care to another anaesthetic colleague at the end of a shift, you may handover the care of a patient intra-operatively to go for a coffee break or you will handover the care of your patient to the recovery nurse post-operatively.

Environment

One person should speak at a time, check team members can hear, stop all non-essential non-handover activities.

Patient details (name, age, relevant past medical and social history, medication history and allergies)
Surgical details (Procedure type, any complications, estimated blood loss)
Antibiotics given

Anaesthetic details

Type of anaesthesia (GA/Neuraxial/TIVA), any difficulty during induction (Difficult access or airway)
Analgesia given
Antiemetics given
Fluids and blood products given
Any other drugs given or interventions performed

Post operative plan and considerations

Make a plan – document on the anaesthetic chart and verbally communicate plan to incoming team
Immediate post operative plans

- Oxygen and airway plan
- Monitoring required e.g. A-line plan, intrathecal diamorphine observations
- Analgesia, antiemetics and fluids
- Set acceptable physiological parameters

Ongoing care required e.g., CXR needed for Central venous catheter, blood tests, needs clinical review at X time)
General medical and surgical management

Give the opportunity to ask questions and check understanding before terminating the handover. Leave instructions on how to be contacted if required.

Suggested topics for SLEs

- ACEX for management and handover of the patient in recovery / ITU
- DOPS using the handover tool in recovery

References
Departmental Guidelines, Clements, S. 2019 - Handover of Patient Care
AAGBI, 2013. Immediate post-anaesthesia recovery. https://onlinelibrary.wiley.com/doi/full/10.1111/anae.12146

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Analgesia

Analgesia is a continuous progress, even the anaesthetised patient will have a physiological response to pain, we aim to dampen down the inflammatory response before and during surgery. Think pre-op, intra-op and post-op (recovery and ward).

Pre-op

Premedication *e.g.* Pregabalin
Anaesthetic Room
*Neuraxial (*Spinal, Epidural*,* CSE)
Regional blocks

Intra-operative

Paracetamol
NSAIDS (caution with age, eGFR, peptic ulcer disease)
Opioids IV e.g. morphine, fentanyl, remifentanil
*Local Anaesthetic (*Surgical infiltration, Rectus Sheath Catheter infusion: 8ml/hr 0.125% levobupivacaine via elastomeric pump (instructions on guidelines website)

Post-operative

Recovery
Opioid (IV e.g. fentanyl or morphine boluses, PCA)

Ward
Weak opioids e.g. codeine, dihydrocodeine, tramadol
Strong opioids e.g. Oral morphine solution (NB PO bioavailability ~1/3 i.e. 10mg PO ~3mg IV) or oxycodone e.g. Longtec 5-10mg BD and shortec 5-10mg 2hourly PRN

Other agents

Ketamine *infusion*
Lidocaine *infusion/bolus*
Clonidine *bolus*
Magnesium sulphate (20mmol/5g) *infusion* titrate to BP/HR

Special Considerations – *Check the departmental website for recipes

Day Case
*Laparotomy**
*Major Gynaecology Surgery**
*Colorectal surgery **
Orthopaedics: daycase arthroscopy, daycase* and inpatient* arthroplasty*
Chronic pain/pre-existing analgesia: Continue regular opioid e.g. buprenorphine and fentanyl patches, note time last changed

Suggested topics for SLEs

- Discuss appropriate analgesia plans for a variety of patients
- ACEX for pain management (all or pick pre/intra/postop)
- DOPS for management of post op management of rescue analgesia

Remember the acute pain team are your friends!

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Post Operative Nausea and Vomiting in Adults

Post Operative Nausea and Vomiting (PONV) affects 1/3 patients and can make patients feel miserable following surgery. Risk scores exist to try and stratify risk and guide prophylactic therapy.

Apfel Score

Risk Factor	Points
Female gender	1
Non-smoker	1
Hx PONV or motion sickness	1
Postoperative Opioids	1

Surgical risk factors include specific surgeries e.g. gynaecological, ophthalmological (especially strabismus surgery), otological and thyroid surgery.

Apfel Score	Risk estimation	Recommended Intervention
0	10%	None
1	20	1 or 2 antiemetics interventions
2	40%	1 or 2 antiemetics interventions
3	60%	3 or more antiemetic interventions
4	80%	3 or more antiemetic interventions

Intervention	Drug Name	Mode	Dose (mg)	Timing of administration
Primary	Dexamethasone	IV	4-8	Induction
	Droperidol	IV	0.625-1.25	End of surgery
	Ondansetron	IV	4	Induction
	Palonosetron	IV	0.075	Induction
	Aprepitant	PO	40	Before Induction
Secondary	Dimenhydrinate	IV	50	Induction
	Scopolamine	TD	1	Night before
	Metoclopramide	IV	25-50	Induction

TD = Transdermal

Suggested topics for SLEs

- Discussion around choice of antiemetics for your patient
- ACEX for PONV assessment and appropriate management
- Discussions around strategies to reduced PONV in high risk patients e.g. TIVA

References:
1. BJA education Nausea and Vomiting After Surgery , Pierre & Whelan 2013. https://academic.oup.com/bjaed/article/13/1/28/281153

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Neuromuscular Blocking Agents and their Reversal

NMB = Neuromuscular blocker
ND-NMBs= non depolarising neuromuscular blockers

Type of NMBs	Examples	Intubation Dose	Top up dose	Preparation	Onset
Depolarising	Suxamethonium	1-2mg/kg or 4mg/kg IM	Not recommended	50mg/ml Store at 4°	30s
Non-depolarising	Atracurium	0.5mg/kg	Approx. half intubating dose	10mg/ml 2-8°	3-5mins
	Rocuronium	0.6mg/kg routine 1.2mg/kg RSI	Approx. half (routine) intubating dose	10mg/ml 2-8°	1-2mins Dose dependent
	Vecuronium	0.1mg/kg	Approx. half intubating dose	2mg/ml needs reconstituting	3-4mins

Reversal Agents

Neostigmine is anticholinesterase inhibitor, it inhibits anticholinesterase increasing the concentration of acetylcholine in the synaptic cleft to compete and dislodge the ND-NMBs. It can be used for all ND-NMBs. Neostigmine does come 'plain' but we commonly use a 2.5mg neostigmine/500mcg glycopyrrolate mixed solution to contract unpleasant side effects. Peak time to effect 20 minutes duration of action

Sugammadex is a modified gamma cyclodextrin which encapsulates free molecules of rocuronium and vecuronium. It comes in 200mg/ml ampoules. Can only be used for ROCURONIUM and VECURONIUM. Depending on dose 4-24hrs is recommended before a repeated dose of affected NMB. If your patient is on oral contraceptive pill you need to give advice for extra protection*

*see departmental guideline

This is a suggested dosing guide for ***neostigmine*** according to patients depth of block:

Neostigmine Dosing Guide			
Type of monitoring		Neostigmine dose	
			70 kg patient
No twitch	No twitch	WAIT	WAIT
1 twitch	1 twitch	WAIT	WAIT
2–3 twitches	2–2 twitches	~50 μg.kg^{-1}	3 to 4 mg
4 twitches with fade	TOF ratio (<0.4)	~40 μg.kg^{-1}	2 to 3 mg
4 twitches without fade	TOF ratio (0.4–0.9)	15 to 25 μg.kg^{-1}	1 to 2 mg
	TOF ratio (>0.9)	NONE	NONE
Risk factors for residual postoperative paralysis			
High total dose of neuromuscular blockade (>1.5 mg.kg^{-1} rocuronium; >0.4 mg.kg^{-1} cisatracurium)			
High-dose neostigmine reversal (>60 μg.kg^{-1})			
Always dose neuromuscular blockers and reversal according to monitoring and clinical condition.			

This is a suggested dosing guide for ***sugammadex*** according to urgency and depth of block:

Urgency	Dose	Time for reversal	
Routine reversal	2mg/kg	2-3 mins	TOF≥2
	4mg/kg		TOF 0 + PTC≥1-2
Immediate	16mg/kg	90 seconds	Any depth

Suggested topics for SLEs

- CBD - Discuss the use of an appropriate reversal agent for your case
- ACEX - Managed the reversal of NMB for a patient

References

1. Rudolph, M etal. Implementation of a new strategy to improve the peri-operative management of neuromuscular blockade and its effects on postoperative pulmonary complications. Anaesthesia, 2018 73(9)p 1067-1078. https://doi.org/10.1111/anae.14326
2. Buckinghamshire Healthcare NHS Trust: Sugammadex for reversal of neuromuscular blockade in Theatre. http://www.bucksformulary.nhs.uk/docs/Guideline_151FM.pdf
3. Scarth, E. & Smith, S. Drugs in Anaesthesia and Intensive Care – 5th Edition 2016. Oxford University Press.

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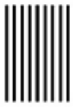
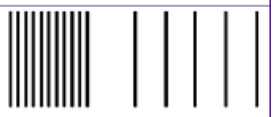
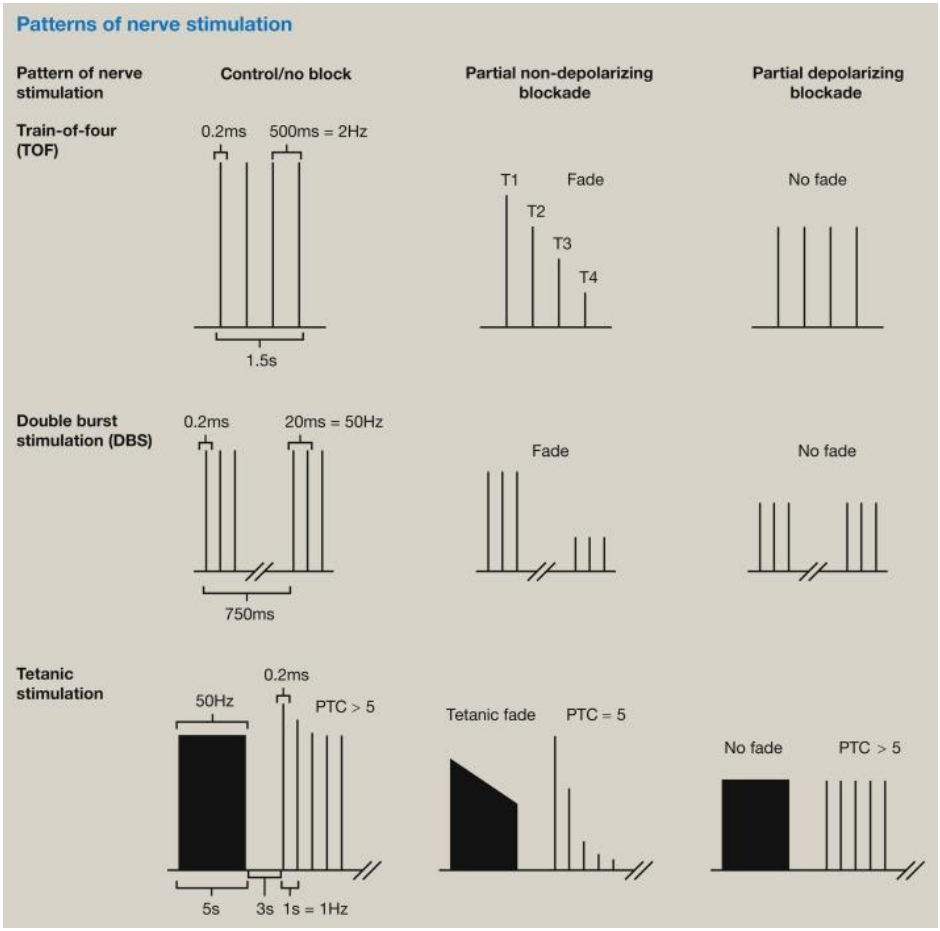
Neuromuscular Blockade – The Tests

Monitoring is required for all patients receiving an NMB, these are the common tests used:

Monitoring Test	Definition	Comments	Stimulation Characteristics
Single twitch	A single supramaximal electrical stimulus ranging from 0.1-1.0 Hz	Requires baseline before drug administration; generally used as a qualitative rather than quantitative assessment	
Train-of-four	A series of four twitches at 2 Hz every ½ second for 2 sec	Reflects blockade from 70%-100%; useful during onset, maintenance, and emergence Train-of-four ratio is determined by comparing T_1-T_4	
Double-burst simulation	Two short bursts of 50 Hz tetanus separated by 0.75 sec	Similar to train-of-four; useful during onset, maintenance, and emergence; may be easier to detect fade than with train-of-four; tactile evaluation	
Tetanus	Generally consists of rapid delivery of a 30-, 50-, or 100-Hz stimulus for 5 sec	Should be used sparingly for deep block assessment; painful	
Posttetanic count	50-Hz tetanus for 5 sec, a 3-sec pause, then single twitches of 1 Hz	Used only when train-of-four and double-burst stimulation is absent; count of less than eight indicates deep block, and prolonged recovery is likely	

This is a graphical representation of the difference between non-depolarising and depolarising blockade:



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Train Of Four (TOF)

Used for: Non depolarising blockade (ratio would not change with depolarising)
Two electrodes are required: **distal = black**, **proximal =red**

Qualitative

e.g. simuplex/innervator
The "old fashioned twitcher" with black and red cables and crocodile clips
Place electrodes and dial up 60mA
You visually look for four twitch and you compare their strength visually. Does the last look as strong as the first?

Quantitative

e.g. The Drager twitcher
Gives you a numbered % to be accurate start the measurement baseline prior to NMB delivery and make sure hand is unobstructed during surgery e.g. best results with arm out arm board thumb not restricted, poor results if any with arms padded by the side

How paralysed is your patient?

TOF twitches	% Receptor blockade
0	100
1	90
2	80
3	75
4	<70

Post Tetanic Count

Used for: assessing deep block i.e. when there are no twitches (after making sure there is no loss of connection, electrodes are placed correctly and the cables are connected!)
A tetanic stimulus is applied you then perform a post tetanic count of twitches. Note PTC 9 = TOF 1

Suggested topics for SLEs

- CBD around the different types of tests, their interpretation and their limitations
- ACEX for assessing a patients NMB depth and appropriate ongoing management e.g. a patient shows signs of spontaneous breathing, assessing the ongoing surgery and how you managed this situation

References
1. *McGrath, C and Hunter, J. Continuing Education in Anaesthesia Critical Care & Pain*, Volume 6, Issue 4, August 2006, Page 164, https://doi.org/10.1093/bjaceaccp/mkl032
2. Nagelhout, J. Anaesthesia Key Chapter 12: Neuromuscular Blocking Agents, Reversal Agents, and their Monitoring. https://aneskey.com/neuromuscular-blocking-agents-reversal-agents-and-their-monitoring/
3. Kennedy, H & Wilson, M. Monitoring techniques: neuromuscular blockade and depth of anaesthesia. Anaesthesia and Intensive Care Medicine. 21(7)p373-378, July 2020 https://doi.org/10.1016/j.mpaic.2020.04.002

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Local Anaesthetic Drugs

We commonly use local anaesthetics in theatre. It may be topical for paediatric cannulation, LA to skin, neuraxial administration, regional blocks or by the surgeons into the wound at the end of surgery. It is an important consideration along with multimodal analgesia.

Common examples

Name	Presentation	Dose	t 1/2	Comments
Lidocaine	1% or 2%	3mg/kg	1 hr	
	With adrenaline	7mg/kg	2 hrs	
Bupivacaine				
	Levobupivacaine 0.25%	2mg/kg	2-4 hrs	
	Levobupivacaine 0.5%	2mg/kg	2-4 hrs	
Neuroaxial only	*'Heavy' Marcaine*	Will depend on height of block required	Depends on amount given	
EMLA	5% cream Lignocaine/prilocaine	'a thick layer' under occlusive dressing	5 hours	Apply for 1-5 hrs before procedure
Ametop	4% amethocaine	Up to 5 tubes (adults) 1-5 tubes (paeds- age dependent)	4-6 hrs	Apply for 30-40mins before procedure

Suggested topics for SLEs

- CBD - Discuss the appropriate choice of LA for your patient
- ACEX – Using LA as part of your analgesia regime for a patient
- CBD – how to manage LA toxicity

References
1. BNF https://bnf.nice.org.uk

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Emergency Drugs

Whilst prepping your theatre for the day you should prepare a tray of 'emergency drugs', these are drugs to counteract the physiological changes of our anaesthetic drugs and potential surgical stimulus creates. Agents to increase blood pressure and to treat bradycardia. Commonly this would include the following:

Drug Name	Indication	Dose	Presentation	Preparation
Suxamethonium	Laryngospasm	25-50mcg	50mg/ml	100mg in 2ml syringe * *fridge*
Atropine	Bradycardia	20mcg/kg	Prefilled 1mg/5ml (0.2mg/ml or 200mcg/ml) or 600mcg/1ml vials	Prefilled 600mcg dilute to 6ml with NaCl0.9%
Glycopyrronium	Bradycardia	200mcg bolus	0.2mg/ml	Normally 3ml vials draw up neat
Metaraminol	Hypotension	0.5 mg bolus	10mg/ml	Prefilled or dilute 10mg with 19ml NaCl0.9% (20ml syringe)
Ephedrine	Hypotension	3mg bolus	30mg/ml	Prefilled or dilute 30mg with 9ml NaCl0.9%

*typically, may need higher dose for larger patients e.g. 200mg, or IM dose would be 4mg/kg.

Other useful emergency drugs that should be available when required:

Drug Name	Indication	Dose	Presentation	Preparation
Adrenaline	Anaphylaxis	50-100mcg boluses IV titrated to effect	0.5-1ml of 1:10,000	Will depend on strength
	Cardiac Arrest	1 mg	10ml of 1: 10,000	Prefilled syringe (Cardiac arrest box)
Intralipid 20%	LA toxicity	Initial dose 1.5ml/kg IV over 1 min	100ml bag of 20% solution	
Dantrolene	Malignant hyperthermia	2.5mg/kg	20mg vial of orange powder	Reconstitute 20mg vials with 60ml water for injection
Calcium chloride 10%	Hyperkalaemia Major Haemorrhage	10ml	10ml = Ca^{2+} 6.8mmol	Prefilled
If unavailable 10% Calcium GLUCONATE		30ml	10ml = 2.2mmol Ca^{2+}	
Amiodarone	VT/pVT	300mg/150mg bolus	300mg/10ml	Prefilled syringe
	Other suitable tachycardias	300mg IV 10-60mins Then 900mg/24hrs	Either 150mg/3ml or 300mg/10ml	Needs diluting with dextrose – see MEDUSA

References
1. BNF https://bnf.nice.org.uk
2. Medusa Injectable Medicines Guide https://medusa.wales.nhs.uk/HomeND.asp
3. RCOA Basic Anaesthetic Drugs https://rcoa.ac.uk/sites/default/files/documents/2019-11/ANAESTHETIC_DRUG_CRIB_SHEET-8.pdf

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Drugs Summary Chart – RCOA Basic Anaesthetic Drugs

https://rcoa.ac.uk/sites/default/files/documents/2019-11/ANAESTHETIC_DRUG_CRIB_SHEET-8.pdf

Basic Anaesthetic Drugs

Doses are for an average adult. They are provided as a guide to the usual range of doses for fit ASA1/2 adult patients only.

You should discuss these doses with your trainers and adjust the document as required according to local practice.

***= Titrate to effect.**

Induction Agents	Dose	Presentation
Propofol	2–3 mg/kg	10 mg/ml
Thiopental	3–5 mg/kg	25 mg/ml – Beware of antibiotics in 20 ml syringe

Opioids	Dose	Presentation
Fentanyl*	1 mcg/kg	50 mcg/ml
Alfentanil*	10 mcg/kg	500 mcg/ml
Morphine*	0.1 mg/kg	10 mg/ml

Muscle Relaxants	Dose (Intubation)	Top ups	Presentation
Atracurium	0.5 mg/kg	Approximately half intubating dose	10 mg/ml (stored in fridge)
Vecuronium	0.1 mg/kg		2 mg/ml
Rocuronium	0.6 mg/kg		10 mg/ml (stored in fridge)
Suxamethonium	1–1.5 mg/kg		50 mg/ml (stored in fridge)

Reversal for muscle relaxants	Neostigmine 2.5 mg + Glycopyrronium 500 mcg

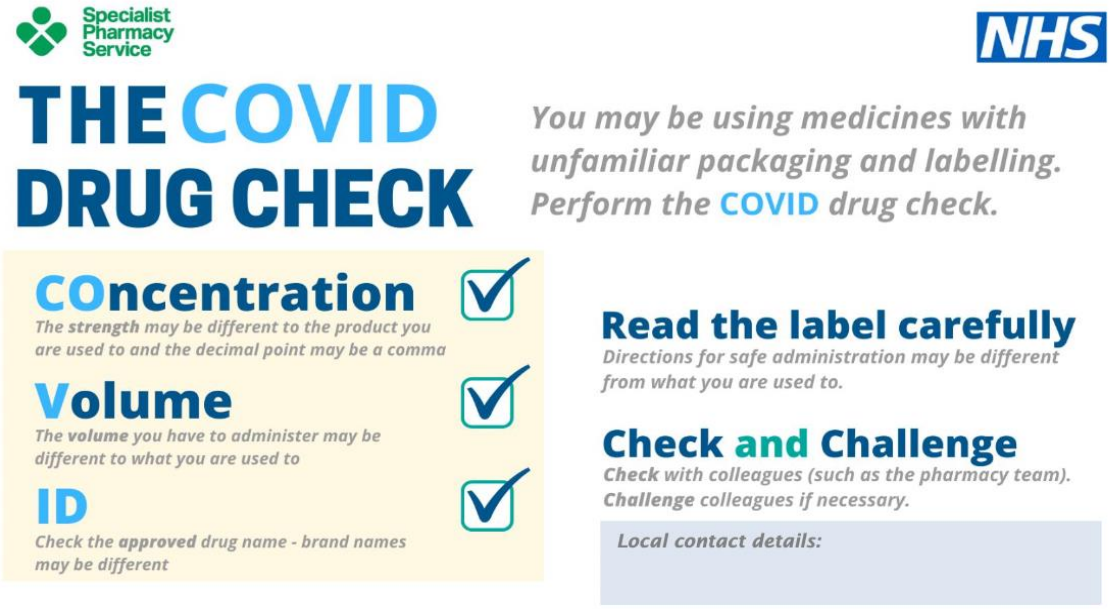
Local Anaesthetics	Toxic Dose	Formulation/Max Dose
Bupivacaine	2 mg/kg	0.25% = 2.5 mg/ml (Max dose 0.8 ml/kg) 0.5% = 5 mg/ml (Max dose 0.4 ml/kg)
Lidocaine	3 mg/kg without adrenaline 6 mg/kg with adrenaline	1% = 10 mg/ml 2% = 20 mg/ml

Common Emergency Drugs	Use	Dose	Presentation
Suxamethonium	Laryngospasm	25–50 mg	50 mg/ml (fridge)
Atropine*	Bradycardia	20 mcg/kg	1 mg/ml
Glycopyrronium*	Bradycardia	200 mcg bolus	200 mcg/ml
Ephedrine*	Hypotension	3 mg bolus	30 mg diluted into 10 ml saline
Metaraminol*	Hypotension	0.5 mg bolus	10 mg diluted into 20 ml saline

Adrenaline*	Suspected anaphylaxis	50–100 mcg boluses titrated to effect 0.5–1 ml of 1:10,000

Other Emergency Drugs	
Intralipid 20%	Local anaesthetic toxicity – initial dose 1.5 ml/kg IV over 1 min
Dantrolene	Malignant Hyperthermia – initial dose 2.5 mg/kg IV (9 vials for 70 kg Px)

Drug Conversion and Concentration



This conversion table has been produced to facilitate dosage calculations by giving % strength equivalences as mg/mL, mg/10mL, and mg/20 mL and mg/100 mL:

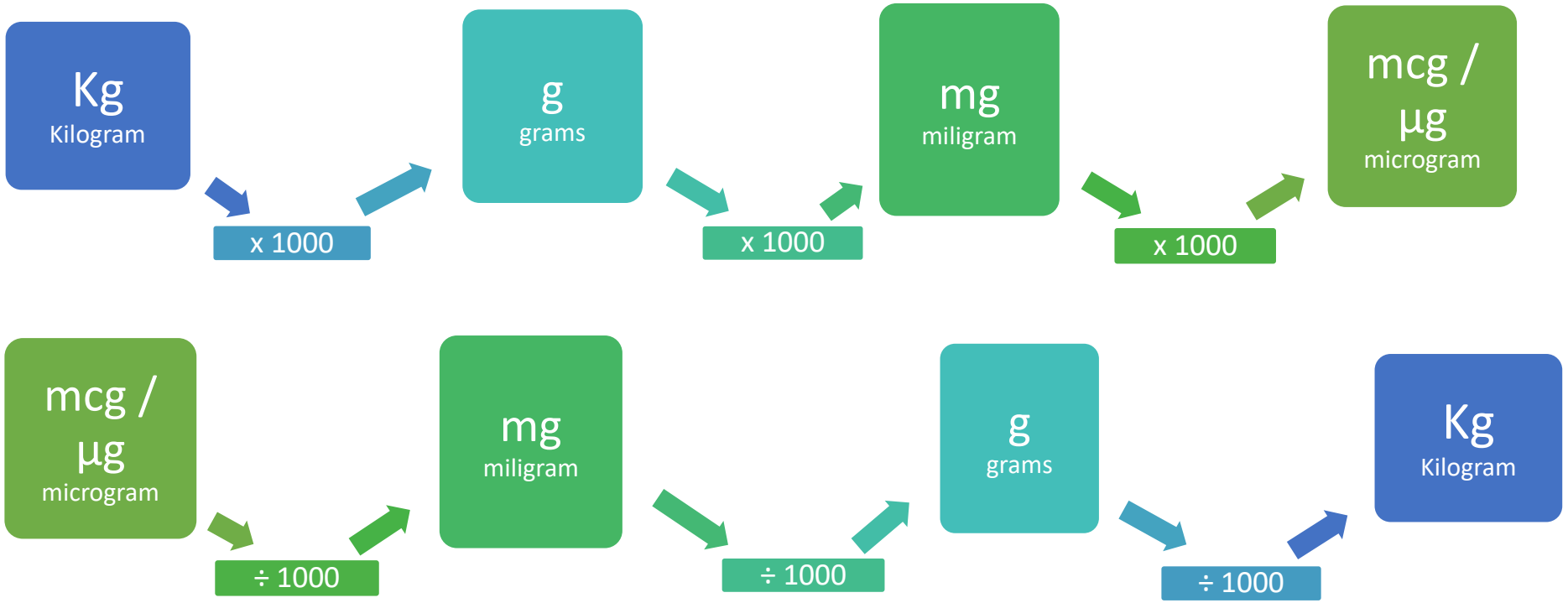
Conversion Table				
Percentage	**mg/mL**	**mg/10mL**	**mg/20mL**	**mg/100mL**
0.1%	1mg/mL	10mg/10mL	20mg/20mL	100mg/100mL
0.5%	5mg/mL	50mg/10mL	100mg/20mL	500mg/100mL
1%	10mg/mL	100mg/10mL	200mg/20mL	1g/100mL
2%	20mg/mL	200mg/10mL	400mg/20mL	2g/100mL
2.5%	25mg/mL	250mg/10mL	500mg/20mL	2.5g/100mL
5%	50mg/mL	500mg/10mL	1g/20mL	5g/100mL
10%	100mg/mL	1g/10mL	2g/20mL	10g/100mL
12.5%	125mg/mL	1.25g/10mL	2.5g/20mL	12.5g/100mL
20%	200mg/mL	2g/10mL	4g/20mL	20g/100mL
25%	250mg/mL	2.5g/10mL	5g/20mL	25g/100mL
50%	500mg/mL	5g/10mL	10g/20mL	50g/100mL

NB. Strengths are not expressed in mmoL in the above table because mmoL is drug specific. For example 1% strength = 10mg/mL for any drug, but the number of mmoL will be different for each drug.

References

1. Specialist Pharmacy Service The COVID Drug Check: https://www.sps.nhs.uk/wp-content/uploads/2020/04/COVID_medicine_percentage_strength_to_mg_per_mL_check_table.pdf

Drug Conversion and Concentration



References
1. USW Study Skills: Units of Measurement for Drug Calculations https://studyskills.southwales.ac.uk/maths/mathematics-learning-resources/maths-topic-locator-numbers/units-measurement-drug-calculations/

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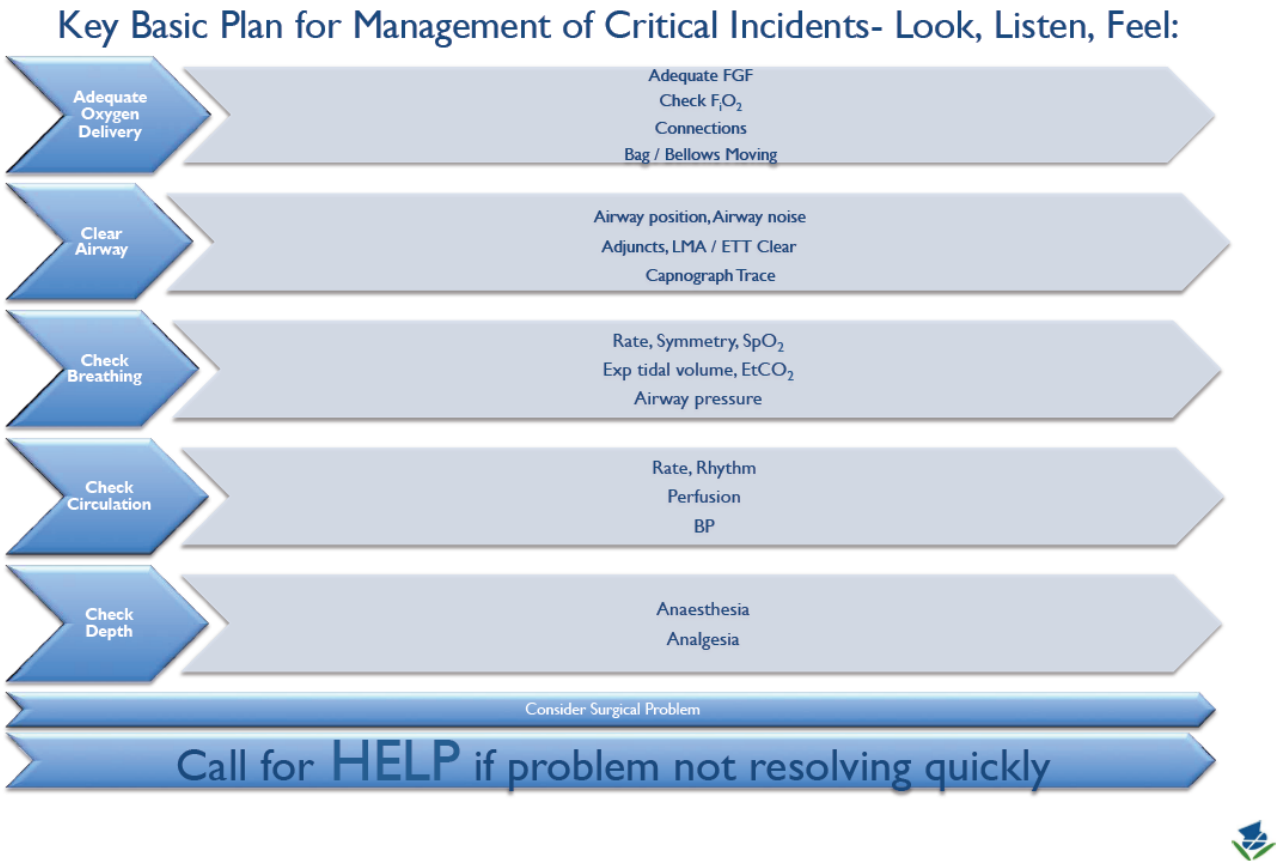
Basic Plan for Management of Critical Incidents

A number of critical incidents can occur whilst a patient is under anaesthesia. It is important to develop an approach to identifying the cause of the problem and steps to ensure oxygenation and anaesthesia are maintained.



Suggested topics for SLEs

- CBD on common critical incidents under anaesthesia
- Reflection on all critical incidence you encounter (required for logbook)
- Attend an Anaesthetic Critical Incident Simulated Course e.g. ACID

Reference

1. Scottish Clinical Simulation Course: ACID: Anaesthetic Critical Incident Drills Simulation Course – run by local facilitators