Advanced Airway Management Guidelines
Emergency Department, Royal Infirmary of Edinburgh

"In the critically ill, patient factors may preclude standard airway assessment. Urgency and reduced physiological reserve contribute dramatically to increased risks of profound peri intubation hypoxaemia, hypotension, arrhythmia, cardiac arrest, and death. Delays during tracheal intubation and multiple attempts at laryngoscopy are associated with increased complications, again including cardiac arrest and death." (1)

Overview

This policy is designed to help us:

- Deliver safe, patient focused care at all times
- Involve anaesthesia / critical care early in the patient's resuscitation
- Maintain the RSI experience of emergency physicians (EP) (as per RCOA and RCEM guidance)

This policy is not designed as a detailed guide for the management of tracheal intubation in critically ill adults (please see the references). While much of this document focuses on the practicalities of maintaining and protecting the patient's airway; equally important is the surrounding decision making (timely identification of those who may need interventions, early escalation / referral, planning and informing the clinical team etc). Communication is the bedrock of successful airway management in the Emergency Department (ED).

The collaborative approach to airway management in the ED at the RIE has a long history, the airway registry alone goes back 20 years. Over this period we have found that close liaison between specialties has improved the delivery of emergency airway care. Within two large departments there is an inevitable mix of experience, expertise and comfort with regard to the management of tracheal intubations in the critically ill. Frequently anaesthetic trainees may find themselves supporting more senior ED staff – all parties should be aware that his may be challenging for either / both parties. Teams must form quickly to identify the most appropriate, patient centred course of action.

The ubiquitous term RSI (rapid sequence induction / intubation) is used in this document to mean any drug assisted emergent asleep endotracheal intubation. Traditionally an RSI has included predetermined doses of drugs administered in short succession followed by a period of cricoid pressure and apnoea. Certain circumstances may require a more tailored or delayed approach to allow safe induction (e.g. to optimise oxygenation or cardiovascular status). Regardless of technique oxygen delivery must be prioritised.

Decision-making around RSI

The indications for RSI are well described. In most instances aggressive and timely management of medical emergencies is appropriate, however maximal therapy may not always be in the best interests of the patient. Discussions on whether to limit care are complicated and should be based either on the wishes of the individual, or when the consultant responsible for a patient's care believes that specific interventions are not of clinical benefit. These discussions and the decision-making process around them are at their most difficult in the emergency setting. Early involvement of senior clinicians from ED, anaesthetics and ITU will increase the time and capacity available to formulate an appropriate escalation plan. Plans and limits should be carefully documented on Trak and conveyed where appropriate to the patient and family.

Roles

- It is the responsibility of the ED team leader to ensure that the right skill mix is present prior to embarking on RSI.
- If RSI is anticipated contact the senior emergency anaesthetist (Bleep 2200). This will usually be a consultant apart from Friday, Saturday and Sunday nights. If the 2200 bleep holder is unavailable to attend they may nominate another anaesthetist. An airway emergency can be declared via 2222.
- If clinical judgment demands RSI prior to anaesthetic review, the EP (ST4+) will proceed only if they have suitable assistance, skills and experience.
- When the anaesthetist arrives, they should discuss the management plan with the senior EP; this should include an agreed airway management plan (including role allocation and drug choice).
- After an airway plan is agreed the anaesthetist will generally remain in reserve (intubator 2) while the EP (ST4+) proceeds with RSI.
- If difficulty is anticipated by either of the intubators or team leader, a change of operator may be appropriate.
- In cases of major trauma, or if the anaesthetist determines they should manage the airway for any other reason, this should be communicated to the ED team leader prior to starting the pre-induction checklist.
- The pre-induction checklist should be completed for every RSI, it is designed as a "challenge and response" checklist. Part 1 is designed to be completed by the intubator and assistant, part 2 should be completed by the team leader and include all members of the team. If interrupted the checklist section that was interrupted should be re-started.

Team work / non-technical

- Communication is key to successful management of stressful and difficult situations.
- While urgent, few RSIs are required immediately.
- There will be a range of experience in the team, this should be utilised to deliver safe, patient focused care.
- Stay calm, optimise what you can and have a structured plan for management if unsuccessful.

Assistance

- Resuscitation room nurses are competent in providing cricoid pressure and many are experienced in assisting with intubation. Operating Department Practitioners should routinely attend ED RSI if available. They may either act to support competent nursing staff or take a more active role in cases of anticipated or encountered difficulty.

Difficult airways

If difficulty is anticipated there are several potential courses of action;

- Maintain oxygenation and ventilation via other means (e.g. basic manoeuvres / adjuncts)
- Call for additional anaesthetist / ODP / EP / surgical help
- Summon the difficult airway trolley from theatres
- Move the patient to an operating theatre (consider the risks of transfer)

If an unanticipated difficult airway is encountered, the Difficult Airway Society (DAS) algorithm (on the front of the airway trolley) should be the default approach to management.

- **Positioning** should be optimised for all patients. 'Oxford HELP' wedges (resus cupboard) and head rests (airway trolley) are available and should be used to achieve optimal head and neck positioning when the neck is not at risk. The ramped position has been shown not only to improve laryngeal exposure, but will increase FRC and extend safe apnoea time.

- **McGrath video laryngoscopes** are available in every airway trolley in the ED for use by individuals who are trained and comfortable to do so. If required the McGrath will accompany the patient to their final destination and then immediately returned to the ED for cleaning Return and cleaning of the McGrath after use is the responsibility of the operator.

- Consider routine use of a gum elastic bougie.

- **Gentle ventilation prior to intubation is safe**. Patients receiving bag-mask ventilation had higher oxygen saturations and a lower incidence of severe hypoxemia than those receiving no ventilation (2). Consider early use of OPA to limit gastric insufflation.

- **NODESAT "nasal oxygen during efforts to secure a tube"**: simple nasal cannulae with 10l/min O2 can be administered beneath the facemask during preoxygenation and remain in place during BMV and laryngoscopy. Even low flow nasal O2 has been shown to extend safe apnoea time and does not require specialist equipment. (3)

- **High Flow Nasal Oxygen (HFNO)** can be delivered using the ED's V60 ventilator. Alternatively the Optiflow can be borrowed from theatres.

- In the event of difficult view at laryngoscopy consider early release, adjustment (BURP) and removal of cricoid pressure: this can often transform a difficult view into an easy one.

- Post-intubation checks should include careful cuff inflation and careful securing of the ETT.

- **Front of neck access (FONA)** In the event of a failed airway requiring FONA there is a VBM ScalpelCric kit available in drawer D of the airway trolley. The 'ED surgical airway kit' containing a

tracheal hook is also available in the bottom drawer of the airway trolley. Operators should use whichever method they are trained in and feel most comfortable with.

Paperwork

- Airway management and transfers must be documented to theatre standard (anaesthetic forms are available in the ED).
- An electronic RSI audit form must be completed on Trak, this remains the responsibility of the intubating doctor. (EPR / Clinical Audit and QI / New / Emergency Department Intubation Registry)
- Unusual events or problems must be documented and where appropriate, a Datix form completed.

Suction Above Cuff Endotracheal Tube (SACETT)

- Reduce the risk of ventilator associated pneumonia and should be used for all patients being intubated in the ED. A size 8.0 tube is preferable but consider a size 7.0 for smaller adults.

Capnography

- Use of waveform capnography is mandatory for all endotracheal intubations.
- Remember "No trace wrong place": even in low cardiac output states and cardiac arrest, there will still be an attenuated capnography trace.

Critical / onward care

- Airway support will usually be provided by the on-call anaesthetist. Onward care for patients post RSI is usually provided by critical care. Early liaison will assist both with clinical management in the ED and expedite discharge from the ED.
- Not all intensivists are anaesthetists. Be aware that they may not have the airway skills to act in a supervisory role.

Responsibility for patient

- Emergency Medicine are in overall charge of patient care in the ED. Generally, responsibility will pass from them to Anaesthesia/Critical Care at the point of transfer.
- If a patient requires emergent surgery the ED team leader should discuss with the receiving specialty and relevant CEPOD anaesthetist (note this may not always be the attending anaesthetist).
- Multiple handovers can lead to loss of information. SBAR (Situation Background Assessment Recommendation) may be a useful format to guide hand over / updates between clinical teams.

Personal Protective Equipment (PPE)

- RSI is an aerosol generating procedure (AGP) and will likely require airborne PPE (FFP3 mask, gown, and visor) for the foreseeable future.
- AGPs can be performed in Resus 2, Resus 4, the Anaesthetic Room and the Isolation Room. The location will be determined by the team lead.
- Resus 4 will generally be reserved for patients with suspected COVID-19. This room must be allowed to lie fallow for 40 minutes post AGP prior to cleaning.
- Airborne PPE is not required for oral suctioning. Wear apron, gloves, surgical face mask and visor.

Dentures

Patient's dentures are frequently misplaced in the ED. Please ensure dentures are removed, placed in a labelled denture pot and kept with the patient. Please record their location in the notes.

Airway trolley/equipment

In order to avoid contamination, airway equipment should not be opened prior to use. Avoid placing any loose parts such as IV giving set caps, transparent backing of ECG stickers etc on top of the airway trolley as this poses a risk of foreign body aspiration. Tubing from portable ventilators should be covered with the manufacturers cap when not in use.

Special circumstances

Trauma

- Oxygenation and airway maintenance remains the priority.
- If the cervical spine is not 'cleared': remove the collar prior to RSI. Apply manual in-line stabilisation (MILS) and aim to minimise movement. Laryngeal view is likely to be at least one grade worse owing to suboptimal positioning, consider reverse trendelenburg position. When intubation is complete cervical spine immobilisation should be carefully re-applied. Head blocks may be used as an alternative to a cervical collar in deeply sedated or paralysed patients with a significant brain injury, see RIE Major Trauma Centre Clinical Guidelines for further information on immobilisation and cervical spine clearance.
- Some patients with facial injuries may be better managed sitting up to allow airway maintenance and postural drainage.
- RSI may precipitate cardiovascular compromise (induction agents and positive airway pressure); consider adequacy of volume resuscitation, timing / location of intervention and doses of induction agents. Refer to the "anaesthesia for damage control resuscitation" SOP.

Pregnancy

- Please inform the obstetric anaesthetics trainee (bleep 2204) and consultant (via switch) in addition to the on-call anaesthetist (bleep 2200)

Obesity

- Anticipate difficulty and rapid desaturation. Ramp, consider using Oxford HELP pillows. Induction doses should be based on ideal weight; height in centimetres, minus 100 (men) or 105 (women); with maintenance infusions based on adjusted body weight (ideal weight + 40% of excess). Use of BIS may aid assessment of anaesthetic depth. This recommendation has been adapted from the guidance at sobauk.co.uk.

Laryngectomy / tracheostomy

- See national tracheostomy safety project guidelines (tracheostomy.org.uk), also found on the in the bottom draw of the ED airway trolleys.

Double lumen tubes (DLTs)

- These specialist endotracheal tubes allow lung isolation; their use may be infrequently indicated following bronchial injury. DLTs are stocked in CEPOD and require additional equipment to insert. Depending on the situation a cardiothoracic anaesthetist may also be called to assist the attending anaesthetist.

<u>RSI Agent Guidance</u>

- All induction agents can cause severe hypotension so take note of cardiovascular status, age and conscious level. The induction doses stated in the 'Rapid Sequence Induction Agent Guidance' below should be tailored to the patient and scenario. Propofol, unless in expert hands is often a poor first choice in critically ill patients.

- Relaxant choice: Rocuronium is almost always an excellent choice. Waking the patient up is unlikely to be appropriate in case of failed intubation in ED. In the rare event of needing to reverse muscle relaxation Sugammadex is stored in Resus 2

- For major trauma patients refer to the "Anaesthesia for Damage Control Resuscitation" SOP.

Rapid Sequence Induction Agent Guidance

Emergency Department, Royal Infirmary of Edinburgh
Collaboration between Emergency Medicine, Anaesthetics and Critical Care

- All induction agents can cause severe hypotension so take note of cardiovascular status, age and conscious level; the full dose of induction agent may not be appropriate. Induction doses are a guide and should be tailored to the patient and scenario.

First Choice	➢ **Ketamine 1-2mg/kg** ➢ **Rocuronium 1mg/kg**

- In the rare event of needing to immediately reverse muscle relaxation, use **Sugammadex 16 mg/kg**

Special circumstances	
Concerned about raised ICP	➢ Consider adding Fentanyl 1-2 micrograms/kg
Concerned about raised ICP with systemic hypertension	➢ Thiopentone 2-5mg/kg ➢ Fentanyl 1-2 micrograms/kg ➢ Rocuronium 1mg/kg
Significant tachycardia or severe cardiac disease with hypotension	➢ Etomidate 0.1-0.3mg/kg ➢ Fentanyl 1-2 micrograms/kg ➢ Rocuronium 1mg/kg
Status epilepticus	➢ Thiopentone 2-5mg/kg + Rocuronium 1mg/kg
Major trauma including isolated head injuries	➢ See separate guideline – Anaesthesia for damage control resuscitation

PLEASE NOTE: Propofol, unless in expert hands, is often a poor 1st choice in critically ill patients due to its narrow therapeutic index.

Bariatric patients

Induction doses should be based on ideal weight; height in centimetres, minus 100 (men) or 105 (women); with maintenance infusions based on adjusted body weight (ideal weight + 40% of excess).

Adapted from guidance at SOBAUK.co.uk

Rapid Sequence Induction Agent Guidance		Version 3	Page 1 of 1
Updated: June 2021	Review: June 2023	Authors: N Di Rollo, L Peacock, K Carey, S Bourn. Adapted from original guidance by M Geddes, G Price, S Moultrie, C Walker	

ANAESTHESIA FOR DAMAGE CONTROL RESUSCITATION

INDUCTION & MAINTENANCE OF ANAESTHESIA

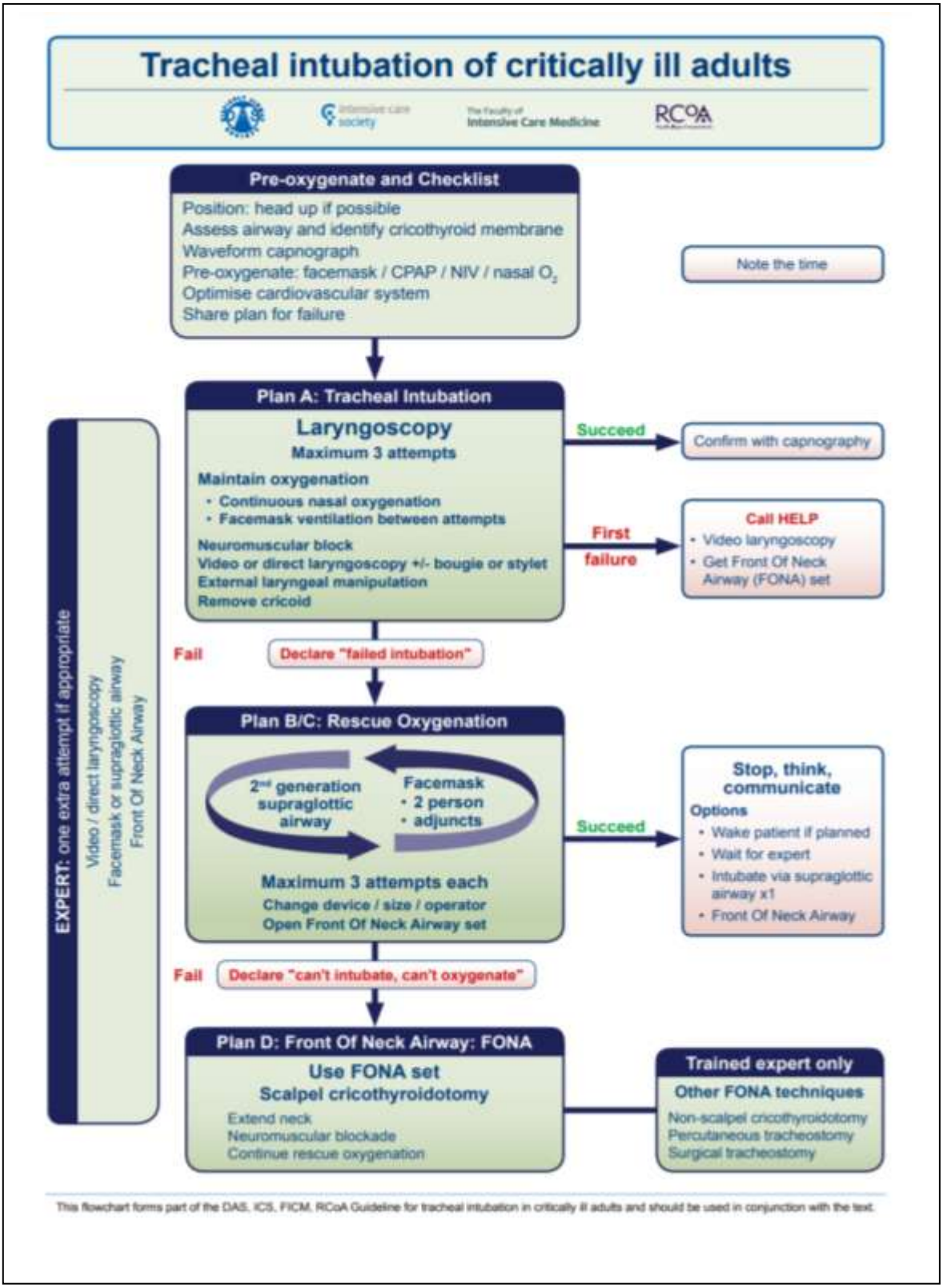
- Pre-oxygenate
  - Consider OPA + 2 x NPA to optimise
- Manual In-Line Cervical Spine
- Consider Reverse Trendelenburg position
- Anticipate Hypotension on Induction
  - Ensure Rapid Infuser connected, functional and loaded with blood and products.
- Reduce drug doses and volatile concentration
  - (aim 0.3-0.5 MAC until haemodynamically adequate)
- Antibiotics

Aim to deliver 300-500µg fentanyl slowly over first half an hour.

DRUGS TO DRAW UP

DRUG	DOSE	CONC.	SYRINGE	INDUCTION DOSE
Ketamine	200mg	10mg/ml	20ml	0.5 – 2 mg/kg
Rocuronium	100mg	10mg/ml	10ml	1.2mg/kg
Fentanyl	500µg	50µg/ml	10ml	1-3µg/kg

Extract from full guideline B. Schyma, Version 1.3, 01/10/2020


Tracheal intubation of critically ill adults
Intensive Care Society
The Faculty of Intensive Care Medicine
RCoA
Pre-oxygenate and Checklist
Position: head up if possible
Assess airway and identify cricothyroid membrane
Waveform capnograph
Pre-oxygenate: facemask / CPAP / NIV / nasal O2
Optimise cardiovascular system
Share plan for failure
Note the time
Plan A: Tracheal Intubation
Laryngoscopy
Maximum 3 attempts
Maintain oxygenation
• Continuous nasal oxygenation
• Facemask ventilation between attempts
Neuromuscular block
Video or direct laryngoscopy +/- bougie or stylet
External laryngeal manipulation
Remove cricoid
Succeed
Confirm with capnography
First failure
Call HELP
• Video laryngoscopy
• Get Front Of Neck Airway (FONA) set
Fail
Declare "failed intubation"
EXPERT: one extra attempt if appropriate
Video / direct laryngoscopy
Facemask or supraglottic airway
Front Of Neck Airway
Plan B/C: Rescue Oxygenation
2nd generation supraglottic airway
Facemask
• 2 person
• adjuncts
Maximum 3 attempts each
Change device / size / operator
Open Front Of Neck Airway set
Succeed
Stop, think, communicate
Options
• Wake patient if planned
• Wait for expert
• Intubate via supraglottic airway x1
• Front Of Neck Airway
Fail
Declare "can't intubate, can't oxygenate"
Plan D: Front Of Neck Airway: FONA
Use FONA set
Scalpel cricothyroidotomy
Extend neck
Neuromuscular blockade
Continue rescue oxygenation
Trained expert only
Other FONA techniques
Non-scalpel cricothyroidotomy
Percutaneous tracheostomy
Surgical tracheostomy
This flowchart forms part of the DAS, ICS, FICM, RCoA Guideline for tracheal intubation in critically ill adults and should be used in conjunction with the text.

Can't Intubate, Can't Oxygenate (CICO) in critically ill adults

Intensive Care Society

The Faculty of Intensive Care Medicine

RCoA

CALL FOR HELP

Declare "Can't Intubate, Can't Oxygenate"

Plan D: Front Of Neck Airway: FONA

Extend neck
Ensure neuromuscular blockade
Continue rescue oxygenation
Exclude oxygen failure and blocked circuit

Scalpel cricothyroidotomy

Equipment: 1. Scalpel (wide blade e.g. number 10 or 20)
2. Bougie (≤ 14 French gauge)
3. Tube (cuffed 5.0-6.0mm ID)

Laryngeal handshake to identify cricothyroid membrane

Palpable cricothyroid membrane
- Transverse stab incision through cricothyroid membrane
- Turn blade through 90° (sharp edge towards the feet)
- Slide Coudé tip of bougie along blade into trachea
- Railroad lubricated cuffed tube into trachea
- Inflate cuff, ventilate and confirm position with capnography
- Secure tube

Impalpable cricothyroid membrane
- Make a large midline vertical incision
- Blunt dissection with fingers to separate tissues
- Identify and stabilise the larynx
- Proceed with technique for palpable cricothyroid membrane as above

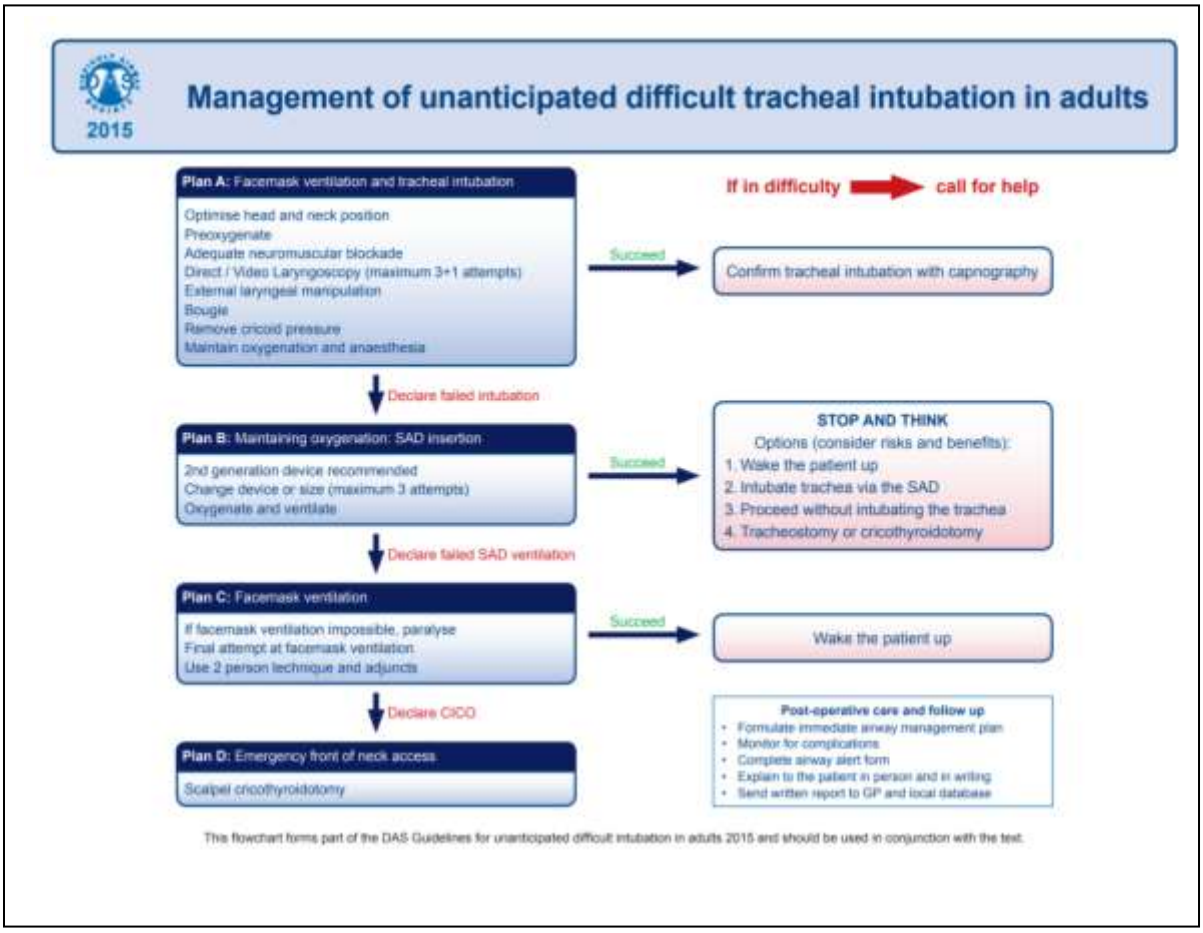
Trained expert only

Other FONA techniques

Non-scalpel cricothyroidotomy
Percutaneous tracheostomy
Surgical tracheostomy

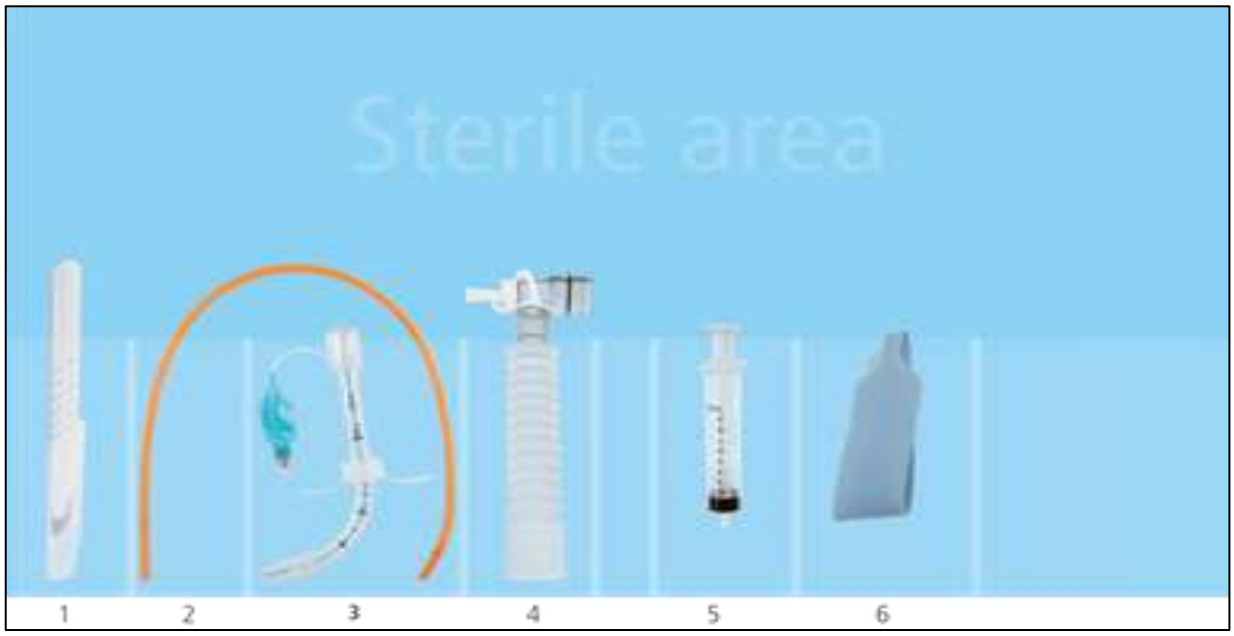
Post-FONA care and follow up
- Tracheal suction
- Recruitment manoeuvre (if haemodynamically stable)
- Chest X-ray
- Monitor for complications
- Surgical review of FONA site
- Agree airway plan with senior clinicians
- Document and complete airway alert

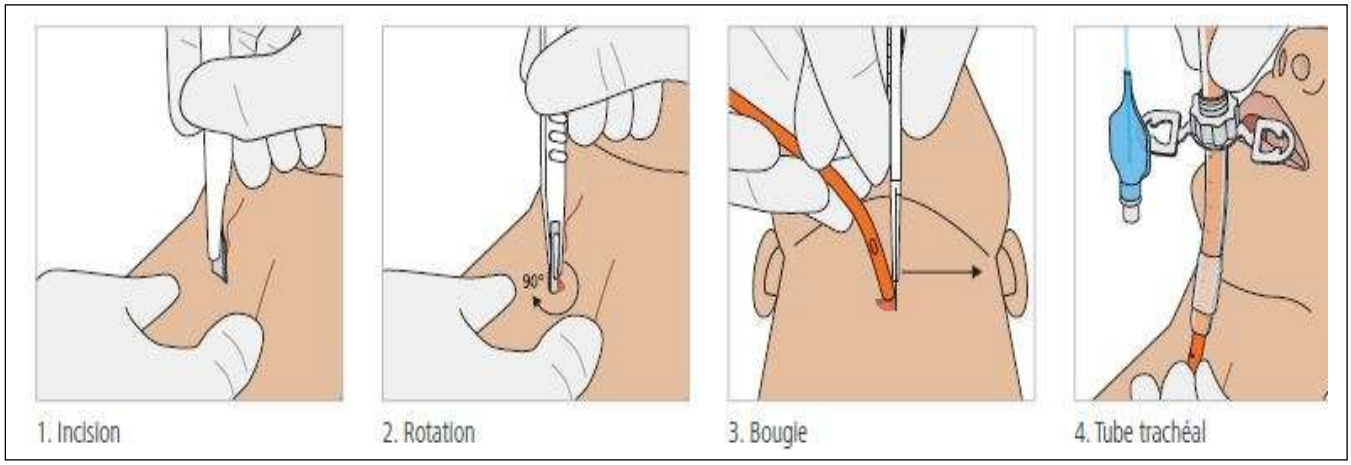
This flowchart forms part of the DAS, ICS, FICM, RCoA Guideline for tracheal intubation in critically ill adults and should be used in conjunction with the text.


2015
Management of unanticipated difficult tracheal intubation in adults
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.

VBM ScalpelCric surgical airway kit

- Stored in drawer D of the airway trolley





References

(1) Higgs A, McGrath BA, Goddard C, Rangasami J, Suntharalingam G, Gale R, Cook TM; Difficult Airway Society; Intensive Care Society; Faculty of Intensive Care Medicine; Royal College of Anaesthetists. Guidelines for the management of tracheal intubation in critically ill adults. Br J Anaesth. 2018 Feb;120(2):323-352. doi: 10.1016/j.bja.2017.10.021. Epub 2017 Nov 26. PMID: 29406182.

(2) Casey JD, Janz DR et Al. PreVent Investigators and the Pragmatic Critical Care Research Group. Bag-Mask Ventilation during Tracheal Intubation of Critically Ill Adults. N Engl J Med. 2019 Feb 28;380(9):811-821. doi: 10.1056/NEJMoa1812405. Epub 2019 Feb 18. PMID: 30779528; PMCID: PMC6423976.

(3) Ramachandran SK, Cosnowski A, Shanks A, Turner CR. Apneic oxygenation during prolonged laryngoscopy in obese patients: a randomized, controlled trial of nasal oxygen administration. J Clin Anesth. 2010 May;22(3):164-8. doi: 10.1016/j.jclinane.2009.05.006. PMID: 20400000.

Resources

Chapter 7 Guidelines for the Provision of Anaesthesia Services (GPAS) Guidelines for the Provision of Anaesthesia Services in the Non-theatre Environment 2020.
https://www.rcoa.ac.uk/sites/default/files/documents/2020-02/GPAS-2020-07-ANTE.pdf

https://www.gov.uk/coronavirus

https://das.uk.com/guidelines/das_intubation_guidelines

Emergency Department RSI Checklist - PART 1 equipment check and planning for difficulty

Intubator and assistant check and response When equipment checklist and airway assessment are complete proceed with whole team pre-RSI checklist on the reverse	
Equipment (confirm correct size and function)	**Prepare for difficulty**
Check and response • Suction • Oxygen • BV Mask / Mapleson C • NPA / OPA • ETT x 2 • 10 ml Syringe • Laryngoscopes (McIntosh and McGrath) • Bougie / lubricant • Tape / Tie • Catheter mount / C02 • iGEL • FONA kit • Stethoscope • Ventilator and circuit • Infusion drugs and pumps • O2 cylinder • Additional equipment required?	**Assess airway** Difficulty predicted? If yes are any of the following required? • More help • Difficult airway trolley • Double prep (in anticipation of FONA) • Awake intubation **Dentures** • Does the patient have dentures? If so please place these in a labelled denture pot and document their location in the notes.

Emergency Department RSI Checklist - PART 2 whole team pre-RSI checklist

Whole team pre-RSI checklist (to be conducted once equipment check and planning for difficulty are complete)

Patient

Position optimised / ramped

Airway optimised

Pre-oxygenation optimised / nasal O2

Bleeding controlled

Reliable IV/IO + Belmont if indicated

CVS optimised

Monitoring

- $ETCO_2$
- ECG
- SpO2
- BP cycling (<2 min)

Anticipated difficulties

- Mitigation / plan

Equipment and drugs

Equipment ready

PPE correctly donned

Any known drug allergies?

Drugs and doses planned

- Opioid
- Induction
- Paralysis
- Inotropes / vasopressors
- On-going sedation

Define roles

Team lead

Monitoring

Intubator 1 (audit form)

Intubator 2

Assistant

Drugs

Cricoid (if indicated)

MILS (if indicated)

FONA

Difficulty

Not anticipated – as per DAS

Plan A (max 3+1 attempt)
- Oral intubation

Plan B (max 3 attempt)
- iGEL

Plan C (2 person)
- Face mask

Plan D
- FONA

Anticipated - Outline:
Plan A
Plan B
Plan C
Plan D