Guidance for the Care of the ADULT PATIENT WITH A TRACHEOSTOMY 2023

Clinical Design & Innovation
Person-centred, co-ordinated care

Tús Áite do Shábháilteacht Othar
Patient Safety First

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Contents

Foreword **3**
Introduction **5**
1. Standards 6
1.1. Multidisciplinary Team 6
1.2. Standardised Insertion & Care protocols 6
1.3 Staff education 6
1.4 Quality Assurance & Audit 7
1.5 Governance 7
1.6 Interhospital transfer of patients 8
2. Care Pathway **9**
2.1. Tracheostomy equipment 11
2.2. Emergency preparedness 11
2.3. Humidification 11
2.4. Suction equipment 11
2.5. Cleaning equipment and tracheostomy ties 11
2.6. Personal protective equipment 11
2.7. General maintenance of tracheostomy 17
2.8 Tracheostomy change 17
2.9. Humidification 17
2.10. Cuff pressures 17
2.11. Red flags: Airway 19
2.12. Red flags: Breathing 19
2.13. Red flags: Circulation 19
3. Tracheostomy Procedure **20**
3.1. Indications for tracheosotomy 20
3.2. Surgical tracheostomy 20
3.3. Percutaneous tracheostomy insertion 21
3.4 Postoperative tracheostomy stoma care 21
3.5. Types of tracheostomy tubes 22
3.6. Nomenclature of tracheostomy tubes 23
3.7. Tubes with inner cannulas 24
3.8. Cuffed tracheostomy tubes 24
3.9. Fenestrated tubes 25
3.10. Subglottic suction port 25
3.11. Choice of tracheostomy tube for individual patients 26
3.12. Adjustable flange or extra-long tubes 27
4. Communication & Swallowing **28**
4.1. Key Points 28
4.2. Communication (nature of communication difficulties) 29
4.3. Assessment 29
4.4. Options for achieving vocalisation 30
4.5. Speaking valves 30

4.6 Above cuff vocalisation 31
4.7. Intervention, rehabilitation and management 32
4.8. Swallowing 34
4.9. General guidelines for swallow assessment/intervention IASLT 34
4.10. Oral care 35
4.11. Laryngectomy 38
4.12. Communication following laryngectomy 39
4.13. Voice prothesis/tracheoesophageal speech/TEP speech 40
4.14. Electrolarynx 41
4.15. Oesophageal speech 41
4.16. Swallowing post-laryngectomy 41
5. Humidification, Suctioning, Tracheostomy Weaning and Decannulation 43
5.1. Humidification 43
5.2. Suctioning 44
5.3. Secretion management 46
5.4. Tracheostomy weaning and decannulation 47
5.4.1 Stage one: cuff deflation 47
5.4.2 Stage two:speaking valve/capping 47
5.4.3 Stage three : decannulation 48
5.4.4 Suggested recommendations for decannulation (NTSP) 48
6. Domiciliary Care Tracheostomy 50
6.1. Discharge planning 51
6.2. Education and Core Competencies 52
6.3. Discharge Pathway 54
6.4. Homecare Packages and Nursing Care 56
7. Complications 58
7.1. Complications of Tracheostomy 58
7.2. Late complications (>14 days post-tracheostomy) 59
8. Troubleshooting 62
8.1 Obstruction of Tracheostomy 62
8.2. Call an arrest where the patient is visibly deteriorating 63
8.3. Apnoea (call an arrest immediately) 63
8.4. Accidental decannulation 64
8.5. Bleeding from stoma site 64
8.6. Surgical emphysema (crackling under the skin, around the stoma site) 64
9. Trachy Pathway Working Group Membership 65
10. References 66
11. List of figures and tables 71
12. Acronyms and Abbreviations 73
13. Appendices 74

FOREWORD: TRACHEOSTOMY CARE TOWARDS A COMMON PATHWAY

Patients may require a tracheostomy for several reasons, some for neurological indications, others for prolonged respiratory failure, while others have a mechanical cause such as upper airway obstruction from cancer, vocal cord injury or oedema.

Regardless of the patient's journey before a tracheostomy is performed, common principles should apply to the postoperative care of all patients with a tracheostomy. The care pathway after insertion of a tracheostomy should be populated by checklists to mitigate against equipment deficiencies, observation sheets to detect deteriorating patients and safety algorithms such as those provided by the National Tracheostomy Safety Project (NTSP). Standardised care will ensure that red flag signs are identified early and that appropriate referrals are made.

The purpose of this document is to highlight the postoperative care of patients with a tracheostomy, this should be consistent between hospitals. Patient safety encompasses all the clinical acumen, practice guidelines, checklists, protocols, and standard operating procedures (SOPs) related to caring for patients with a tracheostomy. While expectations of each member of staff will vary, a broad knowledge of red flag signs should be universal.

Education and staff training must be given the highest institutional priority. To this end, the NTSP offers an excellent portfolio of e-learning materials, videos, and competency assessment modules. Healthcare professionals should be afforded the opportunity to attend tracheostomy study days, as well as dedicated time to avail of the online educational resources available from the NTSP.

To quote Dr Mike Durkin, former National Health Service (NHS) National Director of Patient Safety, ***"Safety is not just about checklists, teamwork or human factors…it is about checklists AND teamwork AND human factors."***

The appendices are downloadable and are presented as a means to provide a cohesive and uniform care approach. Appendix A contains the bedhead signs in PowerPoint format.

These may be edited, filled in, and laminated, and should be present for all patients with a tracheostomy or laryngectomy. Appendix B provides a pro forma observation sheet, again each institution may tailor this to the preferences of its own healthcare professionals.

Appendix C provides an example of a competency framework document, particular competencies will be prioritised by each discipline, i.e. those for speech and language therapy will be different to those necessary for physiotherapy and different again from competencies expected from medical and nursing staff. This appendix presents a generic competency assessment framework in development for HSeLanD. Finally, apart from standard references, appendix D contains several URLs which readers are encouraged to visit.

This document is divided into chapters. The second chapter provides a pictorial guide to tracheostomy care. Subsequent chapters provide a more detailed rationale for choice of tube, weaning, ward management, and the various multidisciplinary inputs for tracheostomy care. The target audience for this document is all healthcare professionals who will be involved in the care of patients with a tracheostomy or laryngectomy.

Acknowledgments

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We would like to thank those who participated in the preparation of this manuscript and acknowledge those who were asked to review it in draft form from a diversity of programs, learned groups, and professional bodies. This final document incorporates the feedback from each of these groups.

Introduction

While patient care is our primary focus in hospitals, patient safety is the obvious corollary. Good tracheostomy care will shorten the duration of time that each patient may need a tracheostomy, it will provide reassurance to patients and staff that care will be delivered in an organised and consistent fashion, and, ultimately, it will lead to earlier discharge from hospital.

Where patients may need a tracheostomy for a longer period, good tracheostomy care will enhance the comfort and quality of life for each patient, providing opportunities for early oral nutrition and communication. There are clear benefits of having a multidisciplinary team (MDT) to provide this care, from early inputs to follow-up after decannulation, and if necessary, follow-up through liaison with healthcare teams in the community.

The *4th National Audit Project of The Royal College of Anaesthetists and The Difficult Airway Society examined Major complications of airway management in the United Kingdom* (NAP4) (Cook *et al.*, 2011). Tracheostomy problems featured in more than 50% of cases occurring in the ICU. While tracheostomies are generally sutured in place after initial placement, patient factors such as body mass index, delirium, and hyperinflation may predispose to dislodgment. While tracheostomy displacements may not always be preventable, it is important that staff have the knowledge and skills to identify a displacement, obstruction, or haemorrhage. Where these incidents occur, there should be no delay in identifying the appropriate course of action and proceeding down the correct care pathway.

Good tracheostomy care involves an increased awareness of the potential for such complications among staff. Numerous excellent resources – such as the National Tracheostomy Safety Project (NTSP) and the Global Tracheostomy Collaborative are freely available, and all staff should be supported to avail of such resources. This guide for the care of adult patients with a tracheostomy provides a very brief overview of the principles of good tracheostomy care, but readers are strongly encouraged to access other freely available Internet resources.

NTSP: National Tracheostomy Safety Project. https://www.tracheostomy.org.uk/

1. STANDARDS

1.1. Multidisciplinary tracheostomy team

Each hospital should identify a clinical lead or institutional lead for tracheostomy care. This individual should be afforded the time to conduct internal reviews of tracheostomy care in order to identify areas for improvement, as well as the funding to implement change where appropriate. The lead will establish a multi-disciplinary tracheostomy team (MDT).

- All inpatients with a tracheostomy are seen at least weekly by a tracheostomy MDT.

1.2. Standardised insertion and care protocols

Standardised tracheostomy insertion and care protocols will include reference to consistency in bedside equipment and environment. The institutional adoption of standardised pathways promotes coordinated care and efficiency, and will improves outcomes in airway emergencies.

- Observe Local Safety Standards for Invasive Procedures
  - Consent, Checklist, Bronchoscopy, US, $ETCO_2$
- Ensure Bedhead signs are detailed with numbers from local Digital Electronic Cordless Telephones (DECT), mobile phones or pagers for emergencies.
- Ensure requisite equipment is available bedside
- Consider subglottic secretion drainage (SSD) tubes:
  - Allow aspiration of secretions and decrease ventilator assisted pneumonia (VAP)
  - Facilitate above cuff vocalisation.
- Ensure all critical care areas are equipped with an airway trolley (table 1, figure 4)
- Ensure all ICU beds are equipped with carbon dioxide (CO_2) monitoring.
- Complete standardised ward care documentation (appendix B)
- Observe and escalate humidification in accordance with secretion characteristics.

1.3. Broad staff education

All patient encounters should involve healthcare staff who have been appropriately trained in tracheostomy care. Though MDT members may not possess all necessary competencies, the team as a whole should possess the required skills and training. Study days and the incorporation of NTSP modules should be strongly promoted and supported (appendix D).

The competencies required of MDTs would be to:

- Recognise the different types of tracheostomies and their limitations.
- Identify appropriate equipment and environmental prerequisites for patients with a tracheostomy
- Manage tracheostomy emergencies
- Be familiar with assessment of swallowing
- Demonstrate an understanding of speech generation and have the options for speech in tracheostomy and laryngectomy

Advanced competencies are required for individuals working in ENT, in paediatric ENT and for those involved in management of patients post-laryngectomy.

1.4. Quality assurance and audit

From an institutional perspective it is reasonable to expect that there should be:

- A hospital clinical lead for tracheostomies
- Morbidity and mortality meetings related to tracheostomies
- Key performance measures and areas for improvement
- Audit to allow benchmarking.

1.5. Governance

While each patient admitted to hospital is under the care of a dedicated consultant, each consultant may not be familiar with, or comfortable providing care for patients with tracheostomies. A general rule of practice is that "whoever places a tube, regardless of the type (in this case a tracheostomy tube), has an ongoing clinical responsibility for care". This may last until either decannulation has occurred or, where appropriate, more long-term follow-up care has been secured. More formal guidance is outlined in the *Guide to Professional Conduct and Ethics for Registered Medical Practitioners (Amended), 8th Edition*, as follows:

- "Handover is the transfer of professional responsibility and accountability for some or all aspects of the care of a patient, or group of patients, to another person or professional group on a temporary or permanent basis."

- "When you hand over care for a patient to another healthcare professional, team and/or institution, you should check that they understand and accept responsibility for the patient's care."

Each hospital should have a named institutional lead for tracheostomy, or a tracheostomy 'champion'. The situation in individual hospitals will vary; some will have ENT leads, some will have general surgery or oral and maxillofacial surgery leads, and some will have ICU/anaesthesia leads. Much of the ward-based care is delivered by specialists such as speech and language therapists, physiotherapists, or clinical nurse specialists (CNS) in the area. Regardless of those providing care, a registered medical practitioner is responsible for each patient, and this person will liaise with the tracheostomy team – or, where appropriate, the institutional tracheostomy lead to coordinate therapy.

1.6. Interhospital Transfer of patients.

Close liaison between transferring and accepting teams will ensure that patients do not arrive in an accepting hospital without the appropriate tracheostomy spare tubes and inner cannulas. Two situations merit specific mention:

- Where the tracheostomy was placed for patients with a normal airway, ideally a recent tube change will have been performed (where possible, to the tracheostomy manufacturer used in the accepting hospital). This will ensure an immediate change is not mandated on arrival to the accepting hospital.

- Where an "abnormal" airway exists i.e. the tracheostomy has been placed for more complex airways e.g. stenosis, tumour, injuries or infection, the tract should be matured to the point where stay sutures have been removed and a first change has been performed safely.

Neither of the above preclude transfer, however both are recommendations and specific exceptions will be dictated by communication between referring and receiving teams.

2. CARE PATHWAY

Figure 1: Process map: patient on ward with tracheostomy or laryngectomy

Essentials
Completed bedhead signs (NTSP)
Emergency contacts
Date inserted/changed
Type of tracheostomy
Bedside tracheostomy supplies
Equipment – Trachy-box – Spares

If not present

Immediate nursing and medical review to complete checks

Ancillary equipment checked and present
Humidification plan in place

Apply
Continuous monitoring
Complete
Pro forma observations sheet

Desaturation, tachypnoea
Respiratory distress
Blocked/displaced tube
Bleeding

Ensure
Appropriate referrals completed
Include on tracheostomy MDT or tracheostomy clinical nurse specialist (CNS) rounds
Early speech and language therapy and physiotherapy referrals

MDT
Liaise with team and document recommendations and changes in medical record

Patient transfer

Receiving team should be fully apprised of tracheostomy details

Provide spare tracheostomy and inner cannulas for receiving hospital

Ensure schedule for tracheostomy change is communicated clearly
mature vs nonmature tract

Tracheostomy MDT rounds
Determine priorities and goals
Weaning
Facilitating speech
Swallow assessments

Patient requires long-term tracheostomy
Or
Patient has laryngectomy

Explore speech options

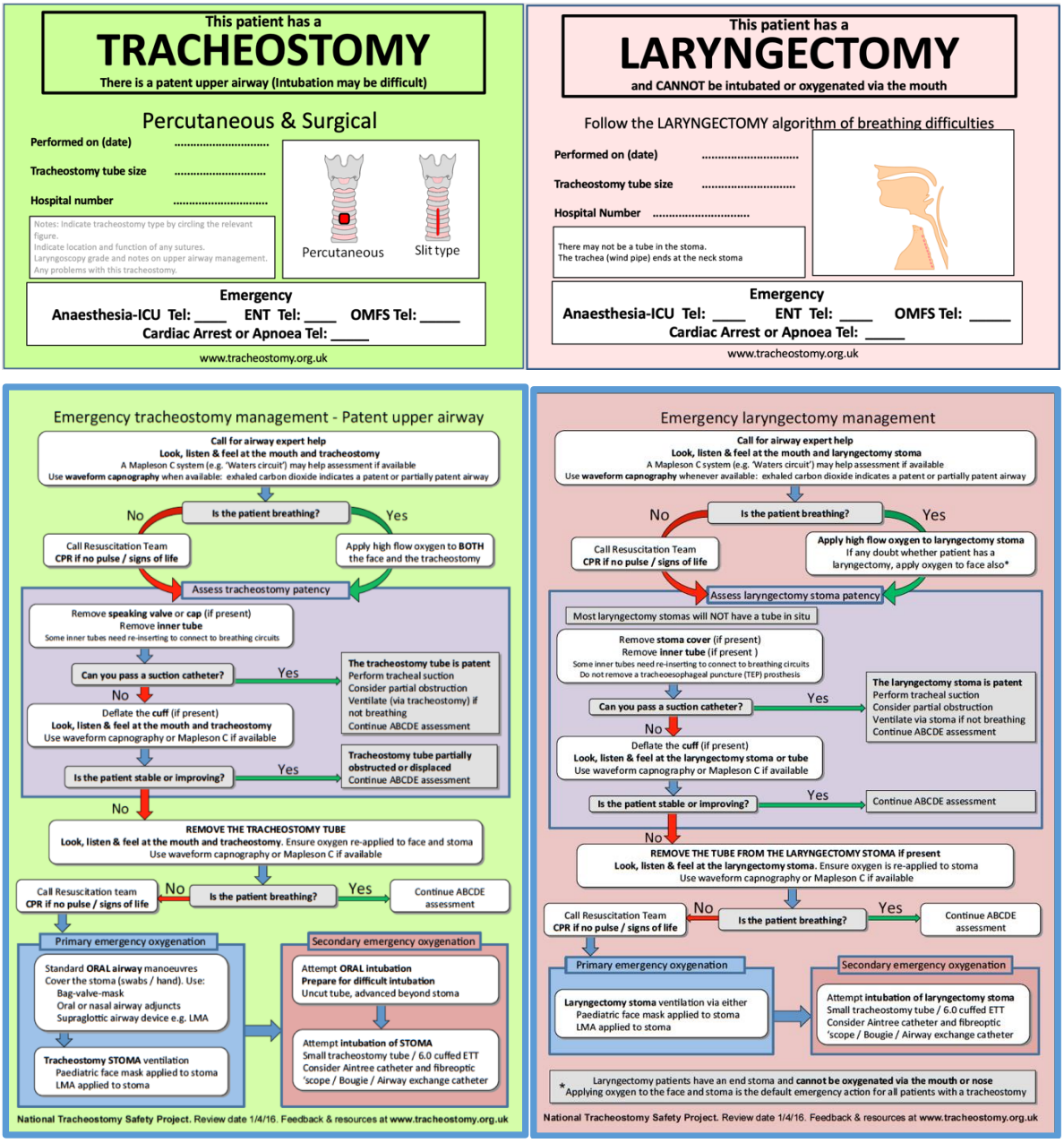
Ensure appropriate documentation or tracheostomy passport is completed and travels with patient

Liaise with long-term care providers

Weaning
Stage 1: Cuff deflation
Stage 2: Speaking valves
Capping trials
Stage 3: Decannulation

Speech options
Cuff deflation – valves
Above cuff vocalisation
Augmentative and alternative communication

Figure 2: Bedhead Signs and Emergency Algorithms (Appendix A)



Signs may be downloaded in PowerPoint format and amended to suit each hospital from Appendix A or online from https://www.tracheostomy.org.uk

2.1. Tracheostomy Equipment

Certain equipment must be always on standby. Equipment should be supplied in an organised manner at the bedside and stocks regularly checked and documented.

The resuscitation trolley for the ward should be accessible at all times.

2.2. Emergency preparedness

- Tracheal Dilator, Obturator, Bougie, Cuff Manometer, 10ml syringes
- Spare tracheostomy tubes, (1 x same size and 1 x smaller size; 1 should be cuffed)
- Scissors/stitch cutter (if tube is sutured in place)
- Ambu bag and masks, Mapleson C Circuit

2.3. Humidification

- Humidification circuit such as Fisher & Paykel
- Heat and moisture exchange such as a Swedish Nose
- Nebuliser or medication delivery system, e.g. Aerogen

2.4. Suction equipment

- Suction machine tubing, Y connector, and Yankauer suction tip
- Sterile suction catheters (size 10, 12, and 14) or in-line steri-cath system

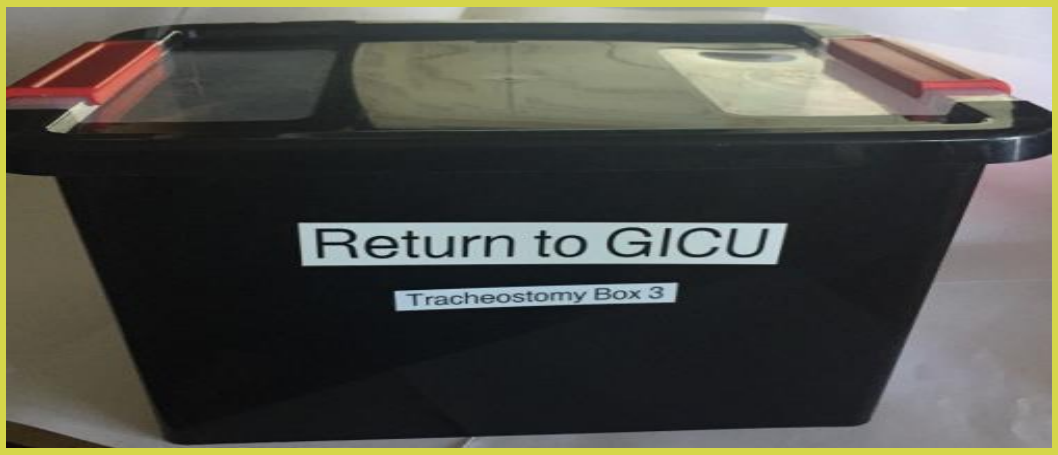
2.5. Cleaning equipment and tracheostomy ties

- Saline and sterile water, gauze swabs (most inner tubes are single use/disposable)
- Spare inner cannulas (including at least one non-fenestrated inner cannula)
- Tracheostomy dressings (depending on institutional preference):
    - Dry stoma: Metalline or charcoal dressings
    - Copious secretions: polyurethane foam (e.g. Lyofoam), silicone foam (e.g. Mepilex), or hydrocolloid dressing (e.g. DuoDERM)
    - Stomal infection: Carboxymethylcellulose and ionic silver dressings (e.g. AQUACEL Ag), or nylon and silver dressings (e.g. Silveron)

2.6. Personal protective equipment

- Disposable facemasks, gloves, aprons, goggles for high-risk patients

FIGURE 3: TYPICAL CONTENTS OF A TRACHEOSTOMY BEDSIDE BOX



Spare Tracheostomies: Same size, Smaller size Inner Cannulas
Pressure Monitor
Spare Tapes Tracheostomy dressings

Inner Cannulas

Tracheal Dilator

Manometer

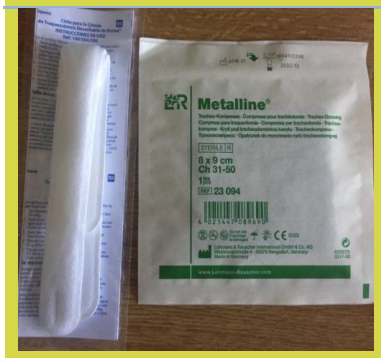


Table 1: Airway trolley. (DAS - adapted)

- **Bedside CO_2 monitoring at all ICU beds.**
- **Complete Intubation Checklist with team present**

Plan A Standard intubation drill Optimise position	Endotracheal tubes, Tape, Ties and Syringes Laryngoscopes Blades 2-4 Macintosh, Straight Blades 0-3 Magill Video-laryngoscope (e.g. McGrath) disposable blades 3 & 4
Plan B Supraglottic Airways	LMA Sizes 2.5 – 5. I-gels® 2.5-5 Xylocaine Spray 1%, Co-phenylcaine Spray
Plan C Oxygenation Facemask Ventilation	Disposable facemasks Naso pharyngeal airways Size 6.0 – 9.0 Oropharyngeal airways Geudel Size 2-5
Plan D Airway Rescue Cannot Intubate, Cannot Oxygenate (CICO)	Emergency Cricothyroidotomy Kit Size 6mm cuffed tracheal tube Bougie, Scalpel (No 10 blade)
Side of Trolley Laminated copies of Intubation checklist	Bougies: disposable (blue) & gum elastic, paediatric and adult Aintree Airway Exchange catheters Sealed disposable fibreoptic bronchoscope

Figure 4: Airway Trolley per Difficulty Airway Society- adapted (DAS – Resources)

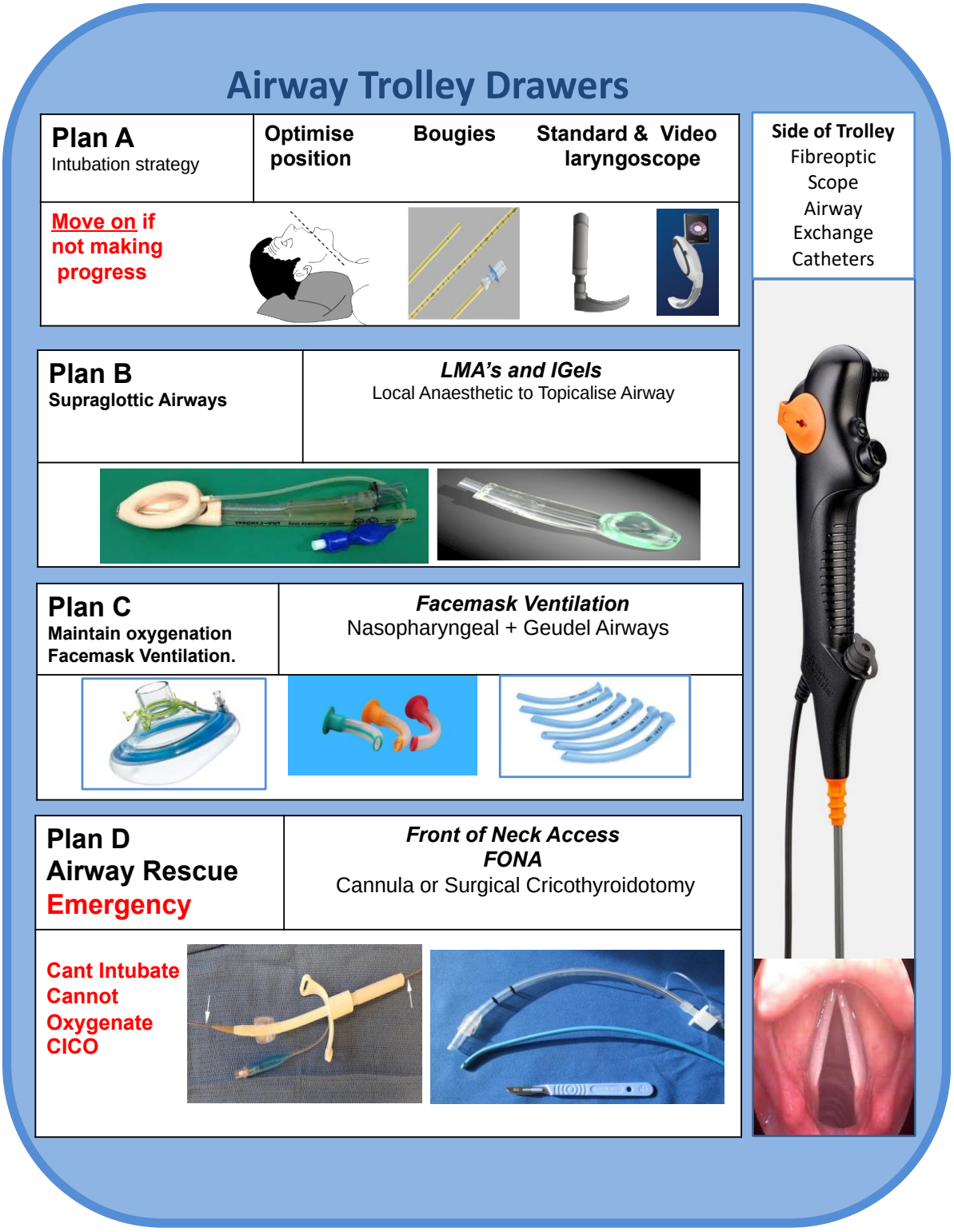


Figure 5: Mobile tracheostomy bag for MDT rounds and emergencies

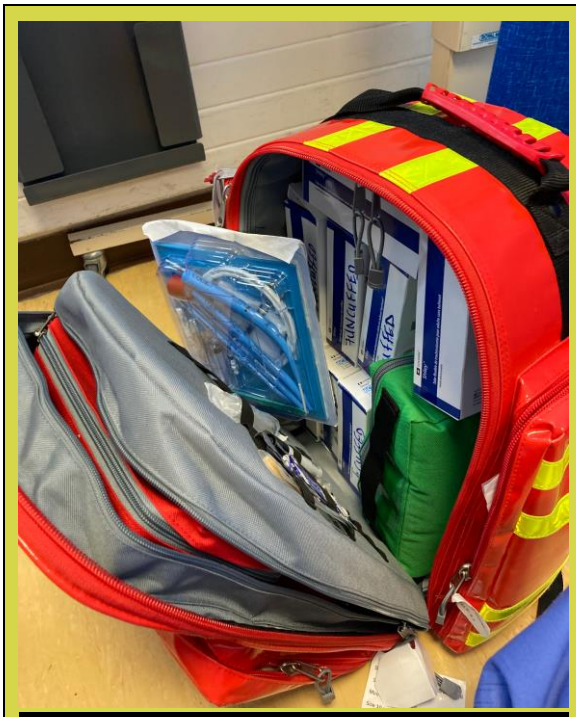
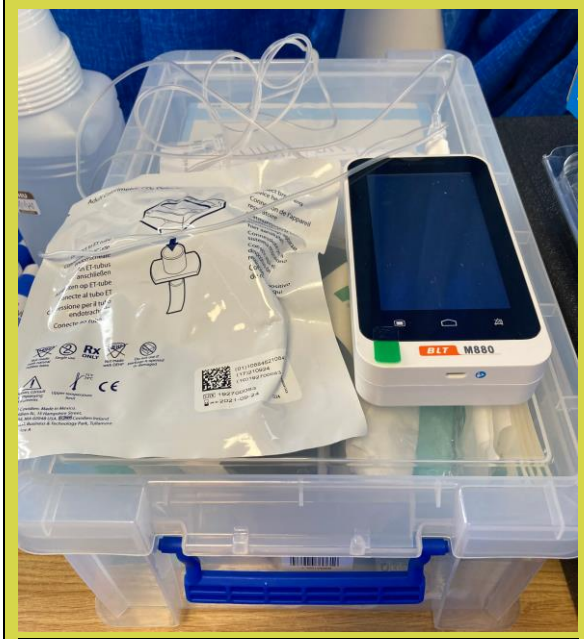
	**Spare tracheostomy tubes and cannulas** **Seldinger insertion kit** **Bougies** **Capnograph**
	**<u>Mobile Capnography</u>** **Colorimetric** **vs** **Electronic** **and Peripheral oxygen saturation (SpO_2) monitor**

Figure 6: Comparison between tracheostomy tube lengths and diameters

Shiley Standard Length Flexible Tapered Cuff Flex™ & EVAC 4,5,6,7,8,9,10 & DCT Model 4,6,8,10				Shiley Extralong XLT Prox/Dist			
Size	**ID with Inner Cannula**	**OD**	**Length**	**Size**	**ID with Inner Cannula**	**OD**	**Length**
4	5.5	9.4	62				
5	6.0	10.1	68	5	5.0	9.6	90
6	6.5	10.8	74	6	6.0	11.0	95
7	7.0	11.4	77	7	7.0	12.3	100
8	7.5	12.2	79	8	8.0	13.3	105
9	8.0	12.7	79				
10	9.0	13.8	79				

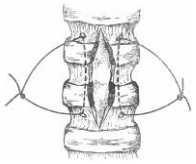
Portex BLUselect®				Portex Uniperc Adjustable Flange			
Size	**ID with Inner Cannula**	**OD**	**Length**	**Size**	**ID with Inner Cannula**	**OD**	**Length**
6	5.0	9.2	65				
7	6.0	10.5	70	7	7.0	11.6	115.0
8	7.0	11.9	75	8	8.0	12.6	125.0
9	8.0	13.3	81	9	9.0	13.6	135.0
10	8.5	14.0	87.5				

Tracoe Twist				Tracoe Twist Plus				Tracoe Vario
Size	**ID with Inner Cannula**	**OD**	**Length**	**Size**	**ID with Inner Cannula**	**Outer Diameter**	**Length**	**Adjustable Flange with fastener**
4	4.0	7.2	59					Single lumen only ID 6.0 – 11.0
5	5.0	8.6	66					
6	6.0	9.2	72					
7	7.0	10.4	74	7	7.0	9.8	85	
8	8.0	11.4	76	8	8.0	10.8	88	
9	9.0	12.5	78	9	9.0	11.8	90	
10	10.0	13.8	80	10	10.0	12.8	92	

2.7. General maintenance of tracheostomy

Removal of sutures
Percutaneous (through skin only)

- After 4 days unless otherwise specified.



Stay Sutures
Side attachment
Burke A

Surgical Stay Sutures
Maturation or Rescue sutures

- Anchored to the tracheal rings; pulling forward pulls the trachea towards the surface to aid tube reinsertion should displacement occur
- Attached to the side cartilage in slit tracheostomy (see bedhead sign)
- May encircle cartilage either above or below tracheal opening (see bedhead sign)
- Keep until first tracheostomy change (1 week, +/- 3 days)

2.8. Tracheostomy change
White AC 2010

- Minimum of 7–14 days after placement
- As a component of weaning plan
- Significant patient ventilator asynchrony
- Cuff leak
- Every 70–90 days for long-term tracheostomies
- Consider holding anticoagulation where a tube change is likely.

2.9. Humidification

- Where possible, all patients with new tracheostomy tubes ***should*** be managed on 'wet circuits':
  - Heated humidification systems (such as Airvo) are superior to standard 'Swedish nose' or heat and moisture exchangers in efficiency of humidification and the prevention of complications
  - Wet circuits prevent thickened secretions, crusting and tube obstruction

2.10. Cuff pressures

Cuff pressure should be maintained within the manometer 'green zone' at 20–30 centimetres of water (cm H_2O) in order to avoid tracheal mucosal ischaemia and necrosis, and eventual tracheal stenosis.

Figure 7: Schematic demonstrating importance of maintaining cuff pressure while preventing mucosal ischaemia

Table 2: Tracheostomy Weaning, Downsizing and Decannulation

Assessment of readiness for weaning	**Primary indication for tracheostomy has resolved** **Improved Glasgow Coma Scale (GCS) or level of consciousness** **Spontaneous breathing off ventilator for 24 hours** **Systemically well, absence of fever or infection** **Effective cough/secretion management plan is in place** **Caution advised with significantly weakness, myopathy or a neuromuscular diagnosis**
Assessment of sedation	Ensure that a sedative weaning plan is in place.
Fibreoptic laryngoscopy	Decided by ENT specialist of head and neck patient Vocal cord paralysis, tumours If patient cannot tolerate Stomal occlusion with cuff deflated in a Shiley tube size 6 or smaller
Secretion management	Upper airway – Sialorrhoea: Antisialagogues, botulinum toxin Lower airway, fibreoptic bronchoscopy
Ideally, where GCS allows, patients leaving the ICU should have an uncuffed tracheostomy. Bodenham 2014 (Intensive Care Society Standards 2014)	
Stages of weaning	Stage 1: Cuff deflation Stage 2: Speaking Valve-Capping trials* Stage 3: Decannulation ***Some services may decrease the capping period to 4 hours or completely skip capping and proceed straight to decannulation.***

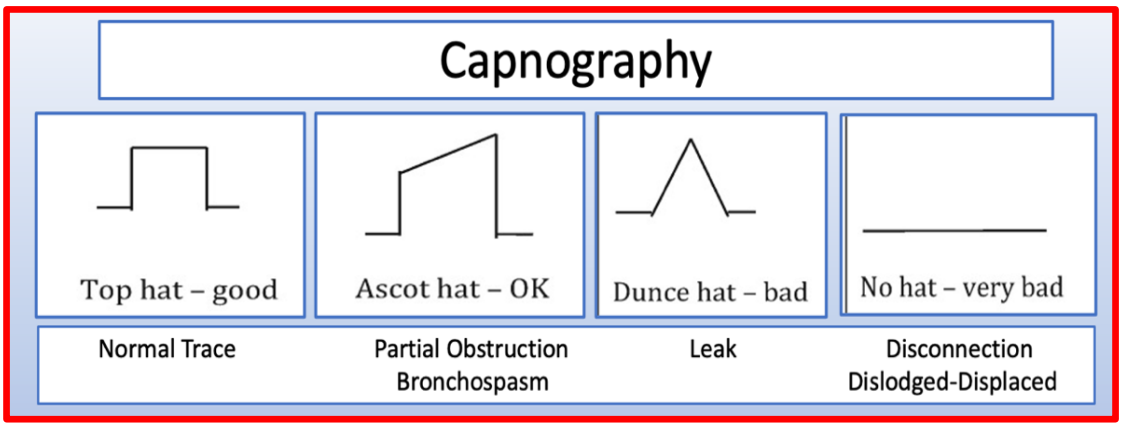
Red flags

INTENSIVE CARE SOCIETY STANDARDS (modified) Bodenhamet al 2014

2.11. Airway

1. Suction catheter does not pass easily into the trachea.
2. Bleeding from the tube or stoma.
3. Speech in patients with inflated cuffed tracheostomy tubes.
4. New air leaks, frequent requirement for cuff inflation to prevent air leaks.
5. New pain at tracheostomy site.
6. Visibly displaced tracheostomy tube (if flange is adjustable, check flange length when placed).
7. Absent or abnormal capnograph trace.

Figure 8: Capnography Tracings: Normal and Abnormal



2.12 Breathing

1. Respiratory distress, tachypnoea, or hypoxia.
2. Increasing ventilator support or oxygen requirements.
3. Subcutaneous emphysema (gas in the soft tissues).
4. Suspicion of aspiration (feed aspirated on tracheal toilet).

2.13 Circulation

1. Unexplained hypotension or arrhythmias without obvious cause.
2. New onset anxiety, restlessness, agitation, or confusion.

3. TRACHEOSTOMY PROCEDURE

A tracheostomy is a fistula created between the skin and the tracheal lumen, and the walls of this fistula or tract are kept open by a tracheostomy tube. After a period of time (typically between 3 and 7 days), the walls of the tract may remain open without the tracheostomy tube.

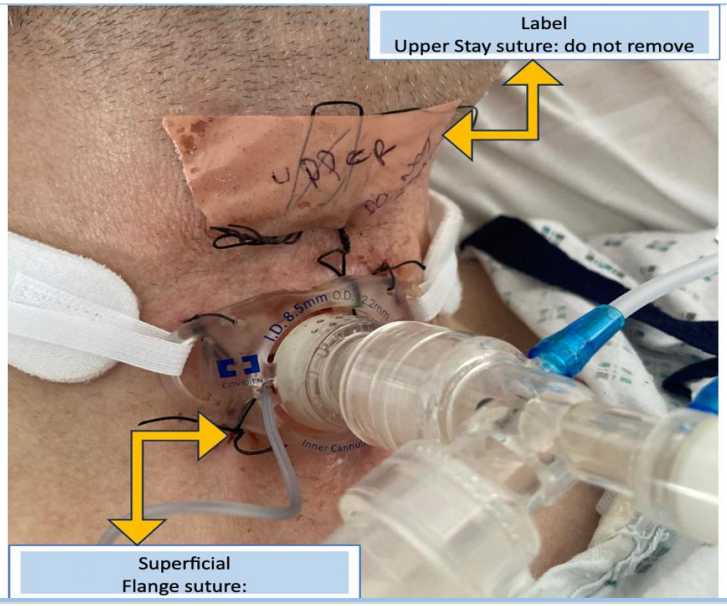
3.1. Indications for tracheostomy:

- Acute or chronic upper airway obstruction
- To obtain and maintain a patent airway following injury or major head and neck surgery
- To facilitate long-term mechanical ventilation
- To prevent and/or treat retained tracheobronchial secretions
- To reduce the risk of pulmonary aspiration

3.2. Surgical tracheostomy

This is most frequently performed by an ENT, Oral and Maxillofacial Surgery or General Surgery in the operating theatre. The patient is positioned with their neck extended and an incision is made over the second or third tracheal ring. The platysma and strap muscles are identified and retracted, the thyroid isthmus is divided and bleeding points coagulated or ligated. The trachea is 'skeletonised' and opened, and the tracheostomy tube inserted through this incision (Engels *et al*., 2009). Surgically inserted tracheostomies allow for the insertion of 'stay' sutures also known as 'maturation' or 'rescue' sutures.

Figure 9: Stay, Maturation or Rescue sutures



3.3. Percutaneous tracheostomy insertion

This technique is usually performed in the ICU. The trachea is punctured with a needle, a guidewire is inserted and the tract enlarged with standardised dilators and forceps. The tracheostomy tube is then inserted over the wire and the flange secured using silk sutures.

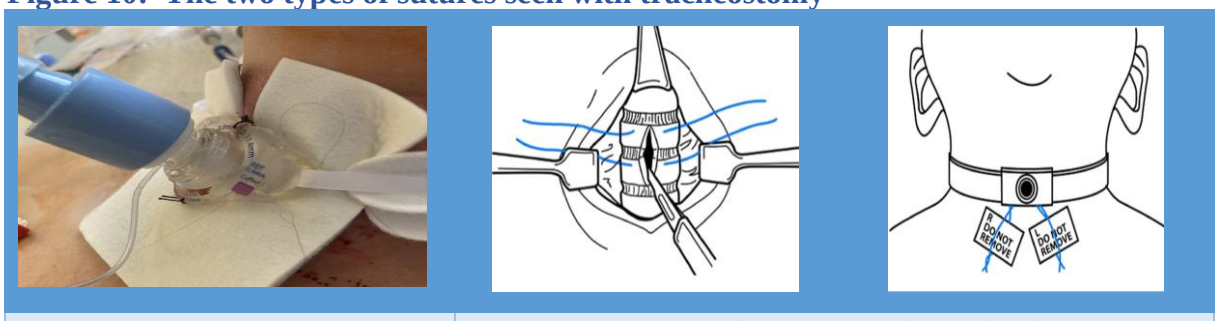
3.4 Postoperative Tracheostomy stoma care

Staff must monitor the tracheostomy site for bleeding for the first 24 hours post-insertion; a Kaltostat dressing may be used for minor ooze. If bleeding is continuous or dressings becoming soaked, medical review is necessary.

Tracheostomy stoma care should be carried out as required to keep the area clean and dry. Sterile water (or saline) and gauze may be used to clean the stoma site. If there are signs of excoriation/dryness, a barrier cream can be applied to the surrounding skin. The skin beneath the tracheostomy flange should be monitored for ulceration. A slim protective dressing can be applied beneath the tracheostomy flange to protect the skin while the tube is sutured in place.

Tracheostomy flange sutures may be removed between 4 (percutaneous) and 7 (surgical tracheostomy) days following tracheostomy insertion unless otherwise instructed. Once removed, appropriate dressings should be applied to protect the skin. (Figure 10).

Figure 10: The two types of sutures seen with tracheostomy



Flange Sutures (skin only)	Stay Sutures (deep - encircle tracheal rings) (Doherty C 2018)

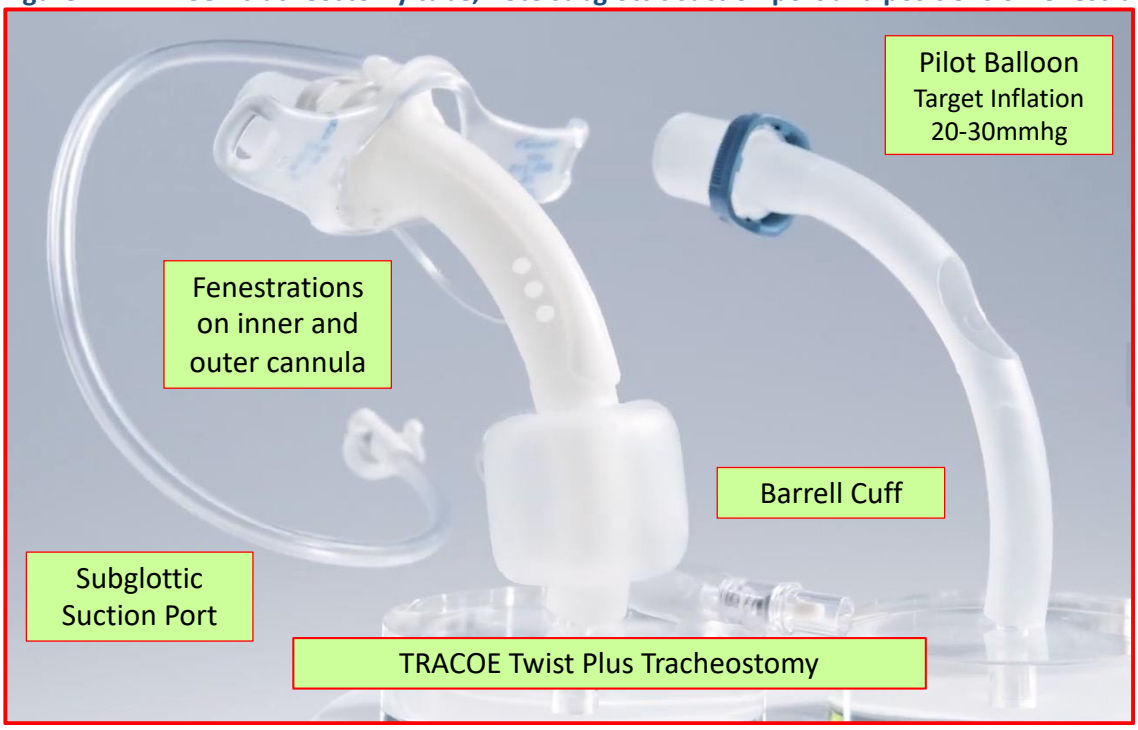
Tracheostomy stay sutures are removed on the day of the first tracheostomy change, or on day 10 following tracheostomy insertion (figure 9).

3.5. Types of tracheostomy tubes

Tracheostomy tubes may be characterised by the presence or absence of a cuff, fenestrations, or a subglottic suction port. Subglottic suction ports are supported by evidence where VAP is concerned. There is a balance between limiting tube selection to improve familiarity, while simultaneously providing an adequate range of tubes to cater for individual needs.

Single-lumen tubes were traditionally used to offer a larger diameter and a lower resistance to ventilation. The Intensive Care Society (UK) recommends the use of double-lumen tubes, as this mitigates against tube blockage. The patency of single-lumen tubes is verified by the passage of a suction catheter, tracheoscopy, or removal from a mature tract and inspection.

Figure 11: TRACOE tracheostomy tube, note subglottic suction port and positions of fenestrations



3.6. Nomenclature of tracheostomy tubes

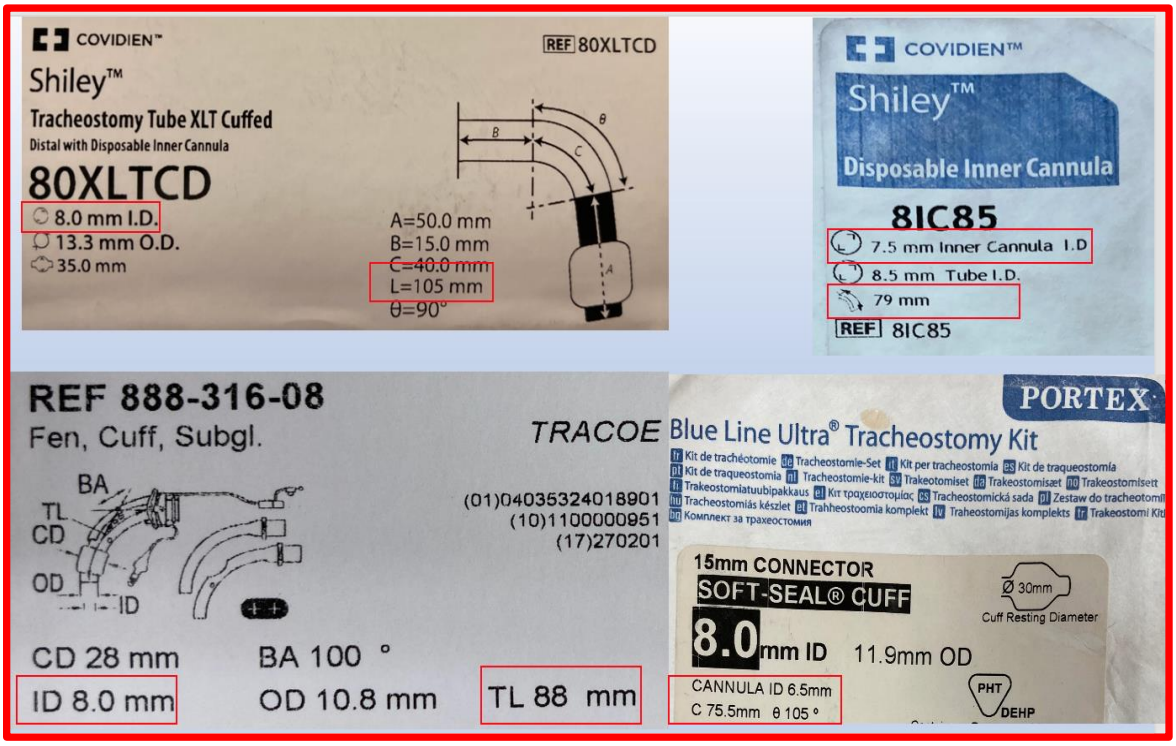
The International Organization for Standardization (ISO) stipulates that tracheostomy tubes be named in accordance with the *diameter of the cannula which fits the breathing circuit*; for some tubes this is the inner cannula, and for others it is the outer cannula.

TRACOE size 8: 8.0 mm ID of inner tube:	-----	Inner tube fits breathing circuit
Portex Blue line Ultra size 8: 6.5 mm ID of inner tube:	-----	Outer tube fits breathing circuit
Shiley size 8: 7.5 mm ID of inner tube:	-----	Outer tube fits breathing circuit

Shiley uses both Jackson and ISO sizing.

Figure 12: Size 8 Tracheostomy: Comparison of Inner Diameters (inner tubes) and Lengths (C, L ,TL)

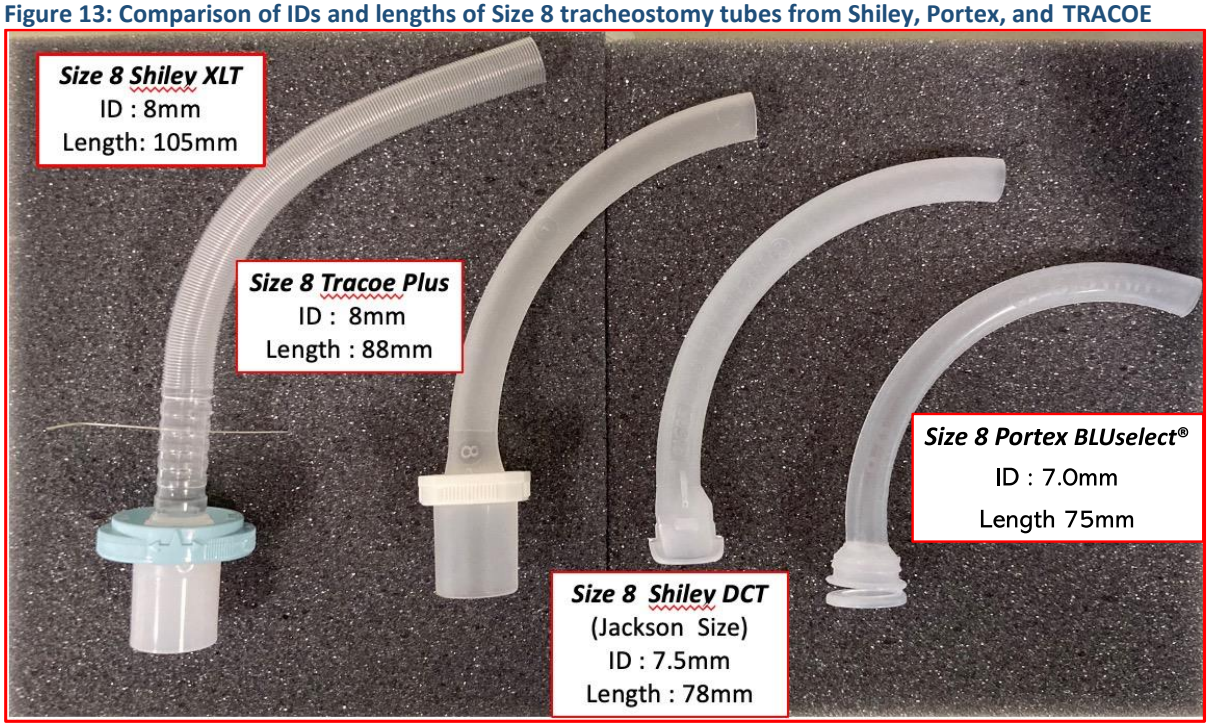
	ID/inner cannula (mm)	Length (mm)
Shiley Extended Length tracheostomy XLT	8.0	105
TRACOE Twist Plus	8.0	88
Shiley DCT Model	7.5	79
Portex Blue Line Ultra	6.5	75



3.7. Tubes with inner cannulas

Almost all adult tracheostomy tubes have a second 'lining tube' or inner cannula. Although most inner cannulas are disposable, some must be cleaned and reinserted. The inner cannula should be removed and checked regularly as part of scheduled care (Dougherty and Lister, 2015).

Figure 13: Comparison of IDs and lengths of Size 8 tracheostomy tubes from Shiley, Portex, and TRACOE



3.8. Cuffed tracheostomy tubes

Cuffed tubes have a soft balloon around the distal end of the tube which inflates to seal the airway when positive pressure ventilation is required or in situations where airway protection is necessary to minimise aspiration of oral and gastric secretions. Cuffs vary in shape – they can be 'barrell' or 'conical' – and can have specialist cuff features, such as 'foam-filled' or 'tight-to-shaft' cuffs.

One-way valves must never be placed on inflated cuffed tracheostomy tubes due to the risk of asphyxiation.

3.9. Fenestrated tubes

Fenestrated tubes have an opening on the outer cannula which allows air to pass through the patient's oral/nasal pharynx as well as through the tracheal opening. These tubes allow increased air flow to the oropharynx, potentially improving voice quality.

The position of the fenestrations in the trachea may be observed using tracheoscopy following insertion. They may lead to localised irritation or granuloma formation.

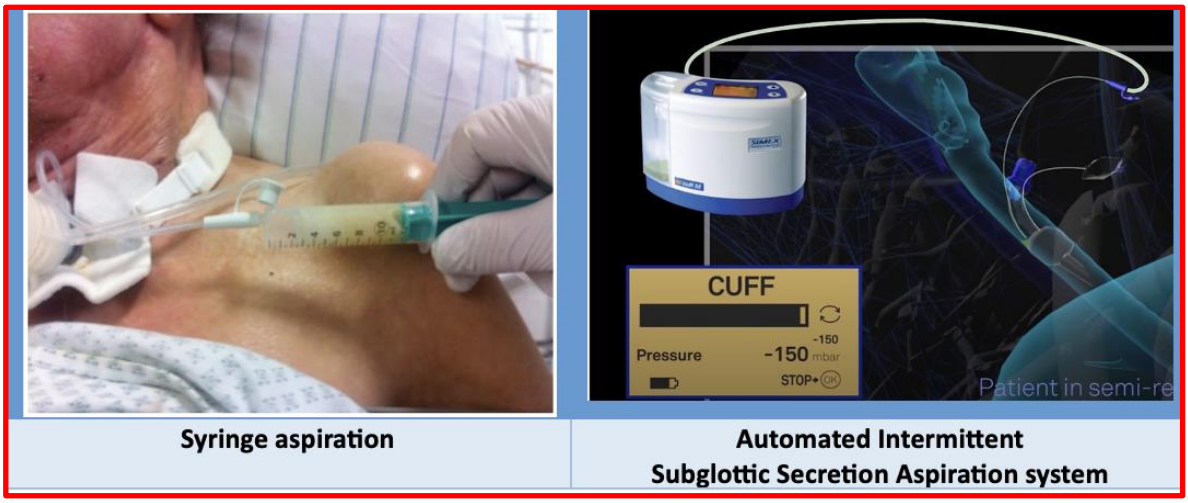
A non-fenestrated inner cannula must be inserted before suctioning patients with fenestrated outer cannulas.

3.10. Subglottic suction port

Subglottic suction, in combination with a bundle of other interventions, is likely to reduce the incidence of ventilator-associated pneumonia (Klompas 2022, Fitzgerald 2011). The subglottic suction port allows intermittent suction of material accumulated above the cuff of a tracheostomy tube.

Aspiration of the subglottic suction port may be either manual with a 10ml syringe, or via automated intermittent specialist subglottic secretion drainage machine. Vacuum pressures should not exceed -150mmhg on automated devices (American Association of Respiratory Care Guideline).

Figure 14: Subglottic Secretion Management



Syringe aspiration	Automated Intermittent Subglottic Secretion Aspiration system

The presence of the subglottic port also allows insufflation of air in order to facilitate above cuff vocalisation (figure 18).

3.11. Choice of tracheostomy tube for individual patients

Selecting the correct tube type for initial insertion is critical. Where the indication for tracheostomy insertion relates to the work of breathing (WOB), airflow and resistance are key factors, a large internal diameter tube would be preferable. Alternately, where a tube is placed in order to bypass a laryngeal obstruction or tumour, then WOB will be lower on the priority list and a smaller tube might allow more rapid weaning or earlier speech.

Differences in length and internal diameter (ID) of tracheostomy tubes are responsible for significant differences in airflow resistance and WOB (McCauley et al., 2022).

Tracheostomy tubes which are too short or too long may lead to irritation, coughing and patient-ventilator dyssynchrony. This may be misattributed to an underlying respiratory condition. A frequent course of action is to increase sedation and return the patient to mandatory ventilation. This may prolong ventilator dependence and delay weaning for the patient.

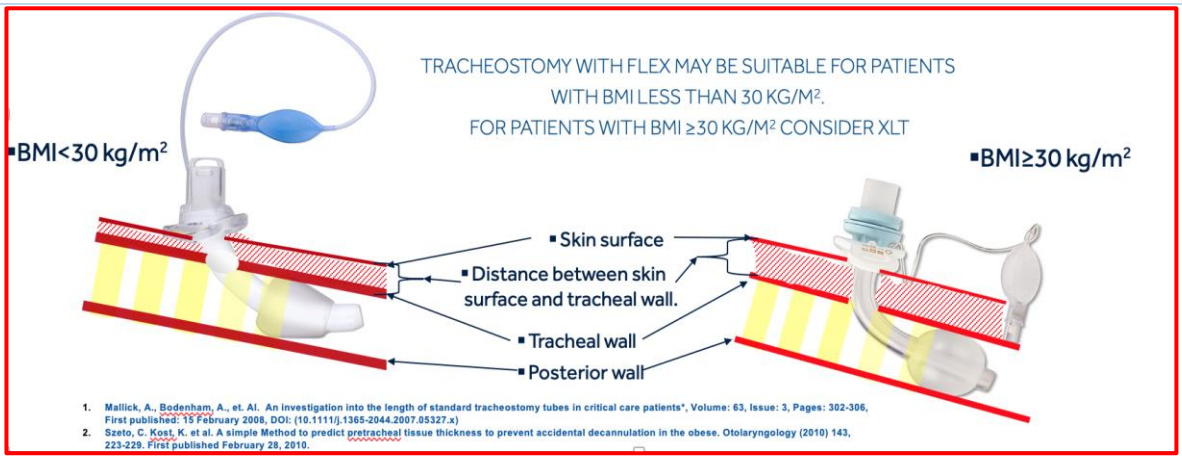
Table 3: Decision process in choosing the most appropriate type of tracheostomy

Clinical assessment	Advice	Rationale
Respiratory failure due to increased WOB	Choose the largest ID tracheostomy tube possible	↓ in ID of 1 mm ⇔ ↑ resistive WOB – 2.2-fold ↓ ID by 1 mm ⇔ ↓ flow by 41% (Carter et al., 2013; Pryor et al., 2016)
Check body mass index (BMI) and body habitus ***Review computed tomography (CT) scan if available*** ***Ultrasound depth to trachea***	Choose optimum tube length based on the "Lunar Study" (McGrath *et al.*, 2017) ***Portex Blue Line Ultra, size 8*** • Length: 75 mm ***Shiley Flex, size 8*** • Length: 78 mm ***TRACOE Twist Plus, size 8*** • Length: 88 mm ***Shiley XLT, size 8*** • Length: 105 mm	There is a significant risk of displacement where BMI is high, or the chest is hyper inflated. Significant traction effects by respiratory tubing There is a 3-cm difference between the shortest and longest size 8 tracheostomy tubes.
McGrath BA et al 2016, Scoring systems to describe the position of tracheostomy tubes within the airway The Lunar Study		

3.12. Adjustable flange or extra-long tubes

Adjustable flange or extra-long tubes (XLT) may be used for patients who have a large distance from skin to trachea, a standard-length tube may be more prone to displacement. Shiley recommends an extended-length tube for all patients with a BMI ≥30 kilograms per metre squared (kg/m^2) (figure 15).

Figure 15: Appropriate tube length tailored to body habitus, (source HC21- resources section)



Portex Adjustable Flange Tubes

Where units use the Portex variety of tracheostomy, consideration should be given to using an adjustable flanged version in patients with a BMI >30. In the report by NCEPOD, half of the patients who had an unplanned tube change before 7 days had a BMI >30. While earlier versions were single lumen, Portex adjustable flange tubes now come with inner cannulas

Figure 16: Standard Length Portex and Extralong Adjustable flange Model

4. COMMUNICATION AND SWALLOWING

4.1. Key points

While the benefits of tracheostomy on work of breathing, secretion clearance and comfort are well documented, one immediate negative side effect is the loss of the ability to speak and advocate for oneself. The loss of speech may have significant negative psychological effects, it may lead to anxiety, alienation, frustration and can impact the patient's relationships with their closest family and friends. (Stan et al. 2021)

Tracheostomy may also lead to longer-term speech and swallowing difficulties; these will only be detected if there is an awareness among staff. Treatment, when instituted early will undoubtedly improve the outcomes, this in mind the following key points are noteworthy:

- Patients with a tracheostomy may present with dysphonia (voice disorder)/aphonia (loss of voice) due to decreased trans laryngeal airflow. This may be compounded by communication difficulties due of concurrent medical conditions. Many patients with tracheostomies may also have neurological impairment, delirium, cognitive impairment, myopathies, or obstructive lesions such as head and neck cancers.

- All patients with a tracheostomy should have access to speech and language therapy (SLT) for early assessment of communication needs to enhance their ability to communicate with staff/family/carers and participate in goal setting and treatment planning.

- Dysphagia (difficulty swallowing) is common in patients with a tracheostomy. All patients with a tracheostomy should have access to a full assessment of swallow function, including an instrumental assessment of swallow where required.

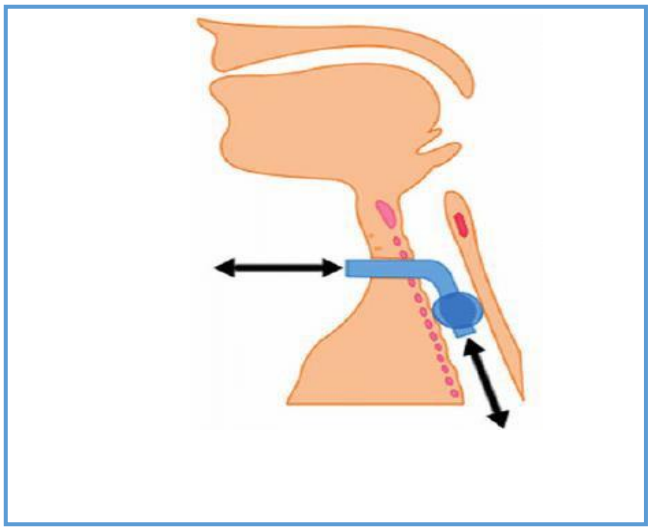
- Management of communication and swallowing in patients post-laryngectomy is different from that for standard tracheostomy patients. Clear communication regarding a patient's status as a laryngectomy versus a tracheostomy patient is vital for safety of management.

4.2. Communication (nature of communication difficulties)

A clinical speech and swallow evaluation should be completed for all patients with a tracheostomy by a speech and language therapist (Royal College of Speech and Language Therapists, 2019).

The first tracheostomy inserted for most patients will be a cuffed tracheostomy. When the cuff is inflated, all airflow is diverted through the lumen of the tracheostomy, and therefore vocalisation is not possible. Even with the cuff deflated or with a cuffless tube, there may be reduced airflow through the larynx, thus impeding vocalisation (figure 16).

Figure 17: An inflated cuff excludes airflow from the upper airway



4.3. Assessment

Thorough assessment of the individual's ability to communicate is required to determine the nature and extent of the impairment and to formulate an appropriate management plan for maximising functional communication.

For patients presenting with dysphonia, nasal endoscopy with video-stroboscopy can help determine the cause of the hoarseness (e.g., vocal fold immobility or vocal fold injury), which may be a result of intubation trauma. This may require involvement of ENT colleagues, as needed.

4.4. Options for achieving vocalisation

Digital occlusion – placing a gloved finger over the lumen of a tracheostomy, thereby locking flow may be used as an airway patency screen to determine a patient's suitability for a speaking valve. Patients may later use this as their primary method to allow vocalisation.

Speaking valves are one-way valves that may be attached directly onto a tracheostomy tube. They may also be inserted as part of the breathing circuit between the patient's tracheostomy and the ventilator.

4.5. Speaking valves

Speaking valves open during inspiration and close during expiration (the default position of the valve is closed). Speaking valves allow phonation, coughing, and restoration of subglottic pressures, and they improve laryngeal sensation and secretion management.

An uncuffed or cuff-deflated tracheostomy tube is required in order for a speaking valve to be placed. Placement on a cuffed tube without fully deflating the cuff may result in asphyxiation, respiratory arrest, and death.

A warning sticker should be placed on the pilot balloon if a cuffed tracheostomy tube is being used together with a speaking valve.
The MDT may be required to perform troubleshooting for optimum speaking valve tolerance and voice quality. This might include trying different tracheostomy tubes, fenestrations, and cuff management. Speaking valves are also used for the paediatric population (Greene *et al*., 2019).

The (NTSP) has created an educational video that shows the placement of a speaking valve:
https://www.tracheostomy.org.uk/healthcare-staff/vocalisation/speaking-valve-trials

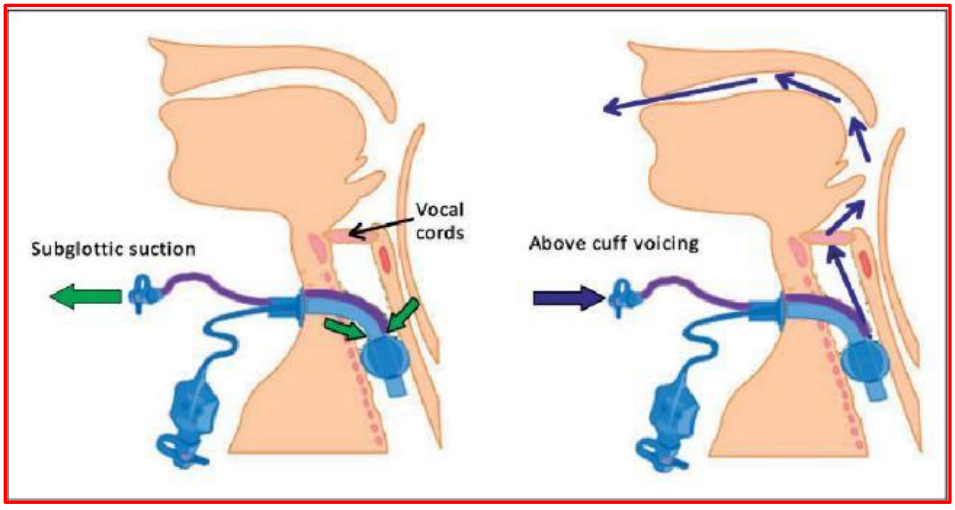
Figure 18: Selection of speaking valves from Passy Muir

4.6. Above cuff vocalisation

Due to the risk of aspiration or because of high ventilatory requirements, it may not be possible to deflate the tracheostomy tube cuff for some patients. Therefore, where a speaking valve, fenestrated tube, or cuff deflation may not be an option, above cuff vocalisation (ACV) may help patients to communicate effectively.

This technique uses the subglottic suction port of the tracheostomy tube to deliver a low flow of oxygen that exits above the cuff and flows through the larynx. This oxygen flow can then travel upwards through the trachea, pass through the vocal cords, and exit via the mouth. This can result in audible vocalisation (either a whisper or voice) in up to 88% of patients (Petosic *et al.*, 2021).

Figure 19: Tracheostomy tube with subglottic suction port for aspiration and ACV



Left-hand figure demonstrates the usual removal of secretions by aspiration.
Right-hand figure demonstrates the flow of air to the upper airways via the larynx when additional airflow is directed into the subglottic port. Source: McGrath *et al.* (2016)

The type of tracheostomy tube chosen impacts on communication. Smaller tracheostomy tube sizes, cuffless tubes, or fenestrated tracheostomy tubes increase airflow through the vocal cords, which will improve vocal quality. Subglottic suction ports may be used for both aspiration of secretions and above cuff vocalization (ACV).

Patients with tracheostomies and laryngectomies may have problems communicating. Loss of voice may have a substantial negative effect on the patient's demeanor and will limit the patient's ability to advocate for themselves. This loss of autonomy will lead to difficulty participating in care planning and rehabilitation. Strategies exist to help; the early facilitation of verbal and nonverbal communication options improves the recovery process, instills a sense of normality, and may reduce delirium (Freeman-Sanderson *et al.*, 2016; Tembo *et al.*, 2015., Thomas and Rodriguez, 2011).

Coexisting communication difficulties can include dysarthria, apraxia of speech, dysphonia, aphasia, and cognitive communication impairments. A patient with a tracheostomy or laryngectomy should be referred to SLT for early assessment and management.

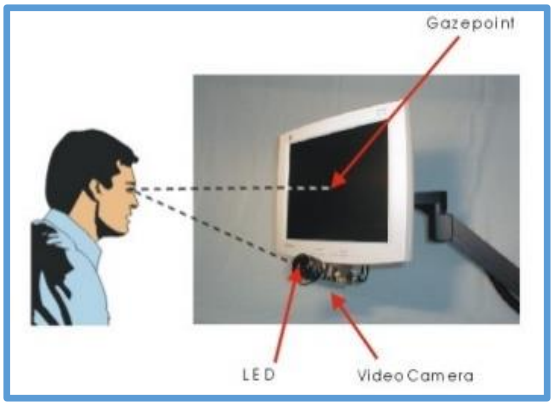
4.7. Intervention, rehabilitation, and management

Evidence shows that early communication intervention for patients with a tracheostomy optimises clinical outcomes. Speech and language therapists may use a variety of ***Augmentative & Alternative Communication*** *(AAC)* devices (figure 19)

AAC options include:

- Writing equipment e.g. pen and paper, whiteboard, LCD board
- Partner-assisted alphabet scanning
- Communication boards
- Speech synthesis devices e.g. an iPad and eye gaze technology
- Electrolarynx (a device that generates sound (not voice) via transmission of vibration through soft tissue, which is recognisable as speech with movement of the lips, tongue, and jaw (articulators)
- Lámh signs - recommended for use with young children to facilitate the development of language and communication skills

Figure 20: ***Augmentative & Alternative Communication*** *(AAC)* devices

Light writer	Electrolarynx
	
Touch screen AAC	**Eye gaze technology**

4.8. Swallowing

Swallow function in people with a tracheostomy

People with a tracheostomy often present with swallowing difficulties (dysphagia), a number of possible factors are responsible:

- Physiological and/or biomechanical changes including:
  - Myopathy/disuse atrophy due to reduced swallow frequency
  - Reduced subglottic pressure
  - Reduced sensory input
  - Possible laryngeal injury if they were intubated prior to tracheostomy insertion

  (Skoretz et al., 2020 Skoretz et al., 2010),
- Coexisting medical conditions e.g. stroke; head and neck cancer (Royal College of Speech and Language Therapists, 2021)
- Impact of medications, delirium, or critical illness polyneuropathy (Zuercher *et al.*, 2019)
- Impact of compromised respiratory function on swallow physiology (Zuercher *et al.*, 2019)

Aspiration is common in people with a tracheostomy. Patients may aspirate silently; this occurs when a person aspirates without the appropriate sensory response (e.g. coughing) (Marvin and Thibeault, 2021) (Kang Y 2013). Dysphagia may lead to respiratory complications, such as pneumonia and nutritional compromise (Skoretz *et al.*, 2020). Management needs to be directed towards the aetiology of the dysphagia. In some cases, beginning oral intake is reasonable despite ongoing aspiration risk.

4.9. General guidelines for swallow assessment/intervention Irish Association of Speech and Language Therapists (IASLT)

Patients should be medically stable before cuff deflation trials, the use of speaking valves and before formal swallow assessment is conducted.

Factors which may influence a person's ability to engage in rehabilitation may include:

- Patient-specific factors: motivation, cognition, delirium, sedatives, and pre-existing diagnoses such as stroke
- Medical factors: degree of clinical stability, presence of infection
- Environmental factors: access to equipment or objective assessments.

The upper aero digestive tract physiology should be optimised for swallowing by deflating the cuff and placing a one-way valve (Suiter *et al.*, 2003). Swallowing and oral intake may be possible for some patients with an inflated cuff, but this should ideally be determined through an instrumental assessment (McGowan *et al*., 2007).

Where possible, intervention should be informed by an objective assessment (e.g. fibreoptic endoscopic evaluation of swallowing (FEES)/video fluoroscopic swallow study (VFSS)) (NTSP, 2013; IASLT, 2017):

- A FEES assessment involves passing a scope through the nasal cavity to allow for direct visualisation of the pharynx and larynx.
- VFSS involves dynamic X-ray imaging of the swallow with different food and fluid consistencies.
- Blue dye testing for aspiration is no longer recommended due to high false negative rates (Béchet *et al*., 2016).

The goals of dysphagia management include a return to partial or full oral intake and improved airway protection. Nasogastric, gastrostomy, or parenteral feeding options may be required where dysphagia is significant. Patients should have access to a dietitian as needed to advise on the best course of action for their situation. Intervention options include:

- Exercises aimed at improving the safety and efficacy of swallowing
- Use of modified diets and modified fluids
- Use of behavioural and compensatory strategies when swallowing.

4.10. Oral care

Meticulous oral care is an ***essential*** tool for infection prevention and control in patients with a tracheostomy.

Placement of a tracheostomy reduces airflow through the oral cavity. Airflow will be completely absent when the tracheostomy cuff is inflated. This lack of airflow results in laryngeal desensitisation, disuse atrophy and consequent bacterial overgrowth. Nasogastric feeding and decreased swallowing also lead to the accumulation of oral secretions and debris.

The natural flow of saliva and constant turnover of oropharyngeal secretions are adversely affected by tracheostomy. A feeling of dry mouth (xerostomia) is common in patients with a tracheostomy. In addition many medications commonly used in hospitalised patients have anticholinergic side effects which further reducing salivary flow.

Accumulations of saliva, debris and plaque may lead to the development of gingivitis, oral thrush, and pneumonias. Hospital-acquired pneumonia in patients with a tracheostomy may be prevented through the adoption of a bundle of measures, components of a HAP prevention bundle are presented below.

Table 4: HAP Prevention Bundle

Hospital Acquired Pneumonia prevention in patients with tracheostomy (HAP)
• Meticulous oral hygiene • Minimise sedation • Appropriate humidification • Maintain a semi-recumbent posture of at least 30 degrees • Avoiding gastric over-distention; measure gastric residual volumes, particularly in patients at increased risk of reflux or aspiration • Early mobilisation and regular physiotherapy • Consider tracheostomy tubes with subglottic ports

Table 5: Oral care bundle for patients with a tracheostomy

Perform Systematic Assessment of Oral Hygiene.

Assessment and documentation should include the condition of the teeth, gums, tongue, mucous membranes and lips.

. "BRUSHED" Abidia RF 2007. Collins T 2020, Berry A 2011

Mechanical cleaning

Brush with a soft bristled toothbrush and a fluoride-containing toothpaste every 8 hours.

Clean tongue with brush every 8 hours to prevent debris accumulation.

Chemical oral disinfection

Use a chlorhexidine oral rinse (0.12%) every 12 hours**

Apply chlorhexidine gel (1%) to gums after chlorhexidine rinse every 12 hours**

Lip care

Apply aqueous oral moisturiser after oral care as required, e.g Bioxtra gel.

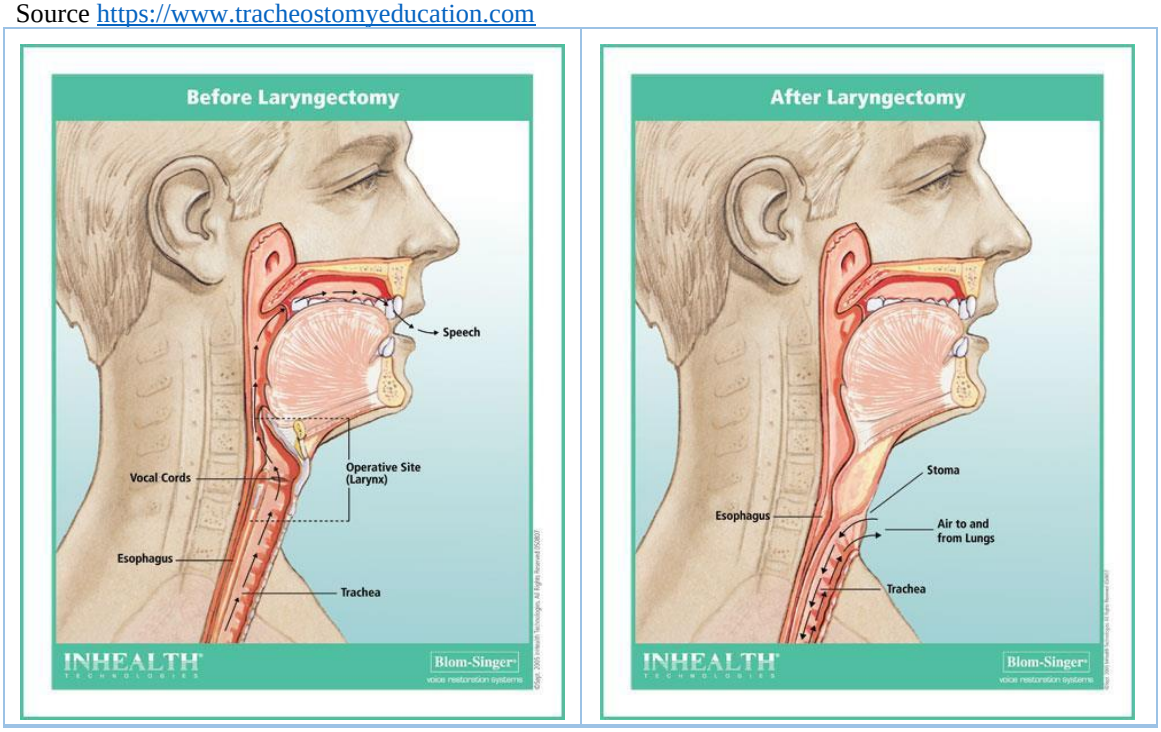
Overall meta-analysis: risk reduction for pneumonia: RR_{fixed} 0.61 (95% confidence interval : 0.23–0.92) (Kaneola et al., 2015)

** while oral chlorhexidine does reduce VAP, recent evidence suggests increased risk of pneumonitis from aspirated chlorhexidine (BACCN Guidelines)

4.11. Laryngectomy

A patient who has had a laryngectomy has had their larynx/vocal cords removed, usually as a treatment for cancer. Post-laryngectomy, there is no longer a connection between the trachea and oropharynx and patients will have a **permanent** tracheostoma at the front of their neck. The non-medical term 'neck breathers' may be used to describe their mode of respiration.

Figure 21: Anatomical Changes before and after Laryngectomy
Source https://www.tracheostomyeducation.com



- A quick review of the bedhead sign should alert all staff that a patient has had a laryngectomy rather than a tracheostomy.
- Patients may carry a laryngectomy card or passport, or a 'neck breather' wristband, in the community.
- Patients who have had a laryngectomy may look very similar to patients with a tracheostomy.
    - They may use a standard tracheostomy tube
    - They may use a soft laryngectomy tube
- Laryngectomy patients are likely to require lifelong support from their MDT to monitor their medical status, ensure adequate care of the tracheostoma, and optimise communication/swallow ability.

4.12. Communication following laryngectomy

Patients who have had a laryngectomy do not have a functional upper airway and lack a natural pathway between the trachea and upper airway (figure 20). Air does not pass through the mouth and therefore:

- Never place a speaking valve on a laryngectomy patient
- Never place a cap on the tracheostomy tube of a laryngectomy patient

A number of communication options exist for post-laryngectomy patients, these include the AAC devices described in Section 5.5. One option specific to the care of patients post-laryngectomy is tracheoesophageal puncture (TEP) with voice prosthesis.

4.13. Voice prosthesis/tracheoesophageal speech/TEP speech

A TracheoE Oesopheal Puncture (TEP) is a surgically created communication between the trachea and the oesophagus which will allow surgical voice restoration (SVR). This puncture is held patent with a voice prosthesis (figure 20 & 21). The voice prosthesis is a one-way valve that prevents aspiration. When the patient occludes their tracheostoma, this allows exhaled air to pass from the trachea up through the pharynx to the oesophagus, producing sound/voice.

Figure 22: Anatomy and adjuncts for speech following laryngectomy

Source https://www.tracheostomyeducation.com

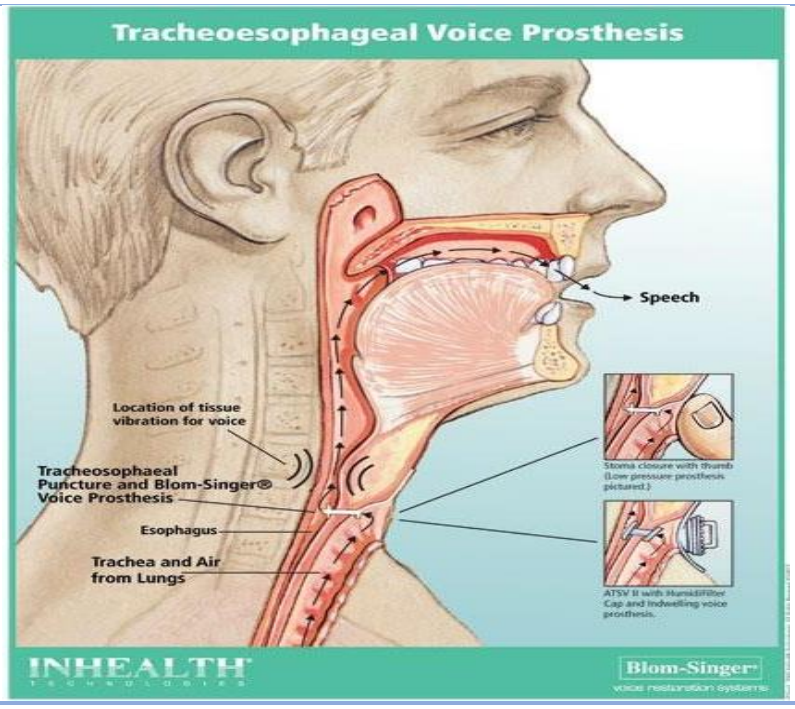
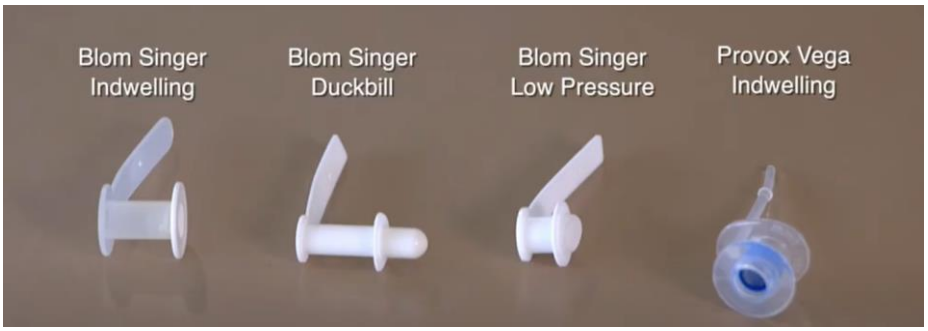
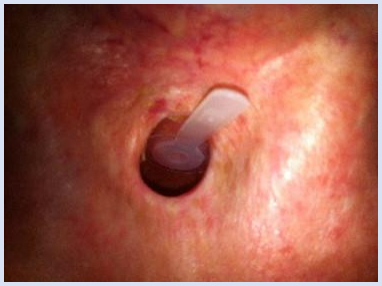


Figure 23: Voice prosthesis used for patients with TEP

TEP with foley catheter in situ	Open TEP





TEP with voice prosthesis in situ

Surgical Voice Restoration in a post-laryngectomy patient is achieved by creating the fistula between the oesophagus and the posterior wall of the trachea (TEP):

- The TEP may be performed as part of primary surgery or later as a secondary procedure.
- If a voice prosthesis is not placed during surgery, a feeding tube may be placed through the TEP until sufficient healing has taken place to allow insertion of a voice prosthesis Blom-Singer and Provox are two of the common brands for voice prostheses (figure 22)

- The TEP may close quickly if patency is not maintained by either a voice prosthesis or a feeding tube/catheter. If it closes, a secondary surgery may be required to reform the puncture. There is also a risk of aspiration of material through the puncture.
- In the event of voice prosthesis/tube dislodgement, a care pathway – including contact details for the MDT – should be clearly communicated to staff, and to the patient and their family and carers. Bedhead signs should be used in hospitals.

4.14. Electrolarynx

An electrolarynx/artificial larynx is a battery-powered, hand-held device. It produces vibration when held against tissue in the neck or cheek. This vibration/sound is then shaped by the articulators within the device to produce functional speech.

4.15. Oesophageal speech

Oesophageal speech is produced by expelling swallowed air from the oesophagus. It has the advantage of being hands-free. It can take some time and practice to master and may not be possible for some individuals.

4.16. Swallowing post-laryngectomy

Swallow function will vary between patients depending on the nature of surgery, the type of reconstruction and whether the patient received radiotherapy.

Some patients may have persistent swallowing difficulties for reasons such as a tightly reconstructed segment of pharynx, a pseudo-epiglottis or upper oesophageal stricture or stenosis. Dysphagia post-laryngectomy may result in prolonged mealtimes, compromised nutrition, weight loss, decreased psychological well-being, psychological distress, and diet and social interaction limitations (Coffey *et al*., 2018).

Many patients will be able to eat and drink well post-laryngectomy. Aspiration is generally not a concern unless there is leakage through a faulty voice prosthesis, an open TEP, or via a leak within the tracheoesophageal fistula.

Patients presenting with swallowing difficulties may benefit from modified food and drinks, specific strategies to aid swallowing and swallow rehabilitation. Where symptoms do not settle instrumental assessment of the swallow such as a VFSS of FEES examination may be indicated.

Supplementary or alternative non-oral feeding options may be required where dysphagia is significant. Patients should have access to a dietitian as needed to advise on their nutritional status.

5. HUMIDIFICATION, SUCTIONING, WEANING, AND DECANNULATION

5.1. Humidification

With normal breathing, the upper respiratory tract warms, humidifies and filters inspired gasses, this occurs primarily in the nasopharynx. With normal nasal breathing the temperature in the upper trachea is between 30 and 33 degrees with a relative humidity of 98% up to 33mg/l (mg-water/litre-gas).

Tracheostomy with high fresh gas flows bypasses this normal humidification pathway with can expose the lower airways to dry air at room temperatures (<10mg/l). As the mucosa dries, ciliary function is reduced, and thick sputum becomes a locus and reservoir for infection. Recommendations from learned bodies suggest that inhaled gasses should be filtered and humidified to between 12mg/l and 44mg/l.

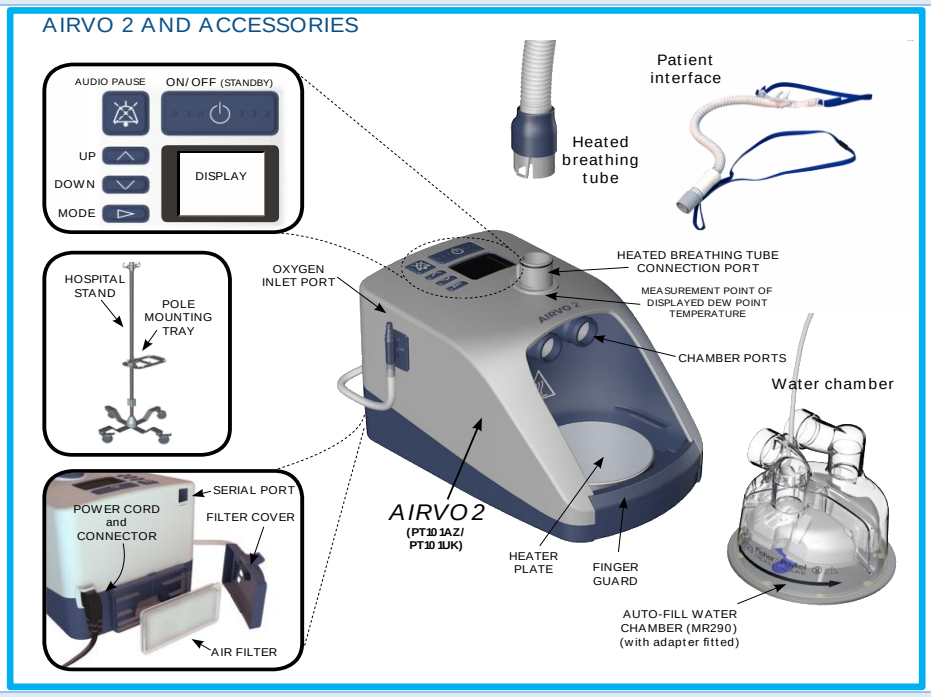
Humidification systems are described as “passive” or “active” depending upon the equipment involved (figure 23). Passive systems are generally less efficient, less expensive, and often preferred for short-term use, the Swedish nose in figure 23 typifies several characteristic features.

Active systems utilise driven gasses, are electrically heated, and are less susceptible to increased resistance from excessive humidification and less likely to be blocked by expectorated sputum. While they are can achieve much higher degrees of humidification, they are more bulky, more expensive and more likely to impede mobility.

- All patients with new tracheostomies should have heated humidification (e.g., Airvo).
- Failure to adequately humidify could result in blockage of the tracheostomy tube as secretions become dry and viscous.

Figure 24: Humidification options

Passive System: Thermovent HME - Swedish nose and Oxygen adaptor



Active System: Airvo heater/humidifier

Fisher & Paykel Circuit

5.2. Suctioning

Suctioning is an essential part of the routine care of patients with a tracheostomy. Frequency of suction will vary between patients depending on their secretion volume and tenacity. Suctioning systems can be 'open' or 'closed', as seen in Figure 24. Single-use catheters are inserted via the open end of the tracheostomy tube for open suction.

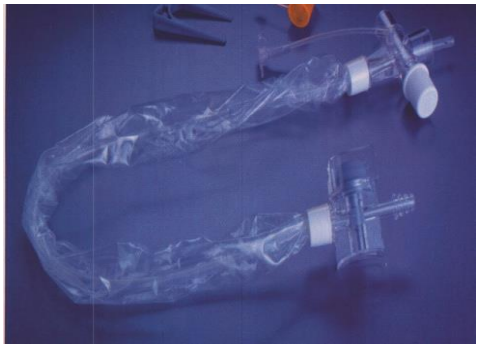
Correct Suction Catheter Size:

(Tracheostomy tube Size – 2) >< 2 = Size in French Gauge

Figure 25: Open and Closed Suction systems

Open suction system

Closed suction system



Insulated enclosed suction catheter

Closed suction systems allow the same catheter to be used multiple times (and changed according to the manufacturer's instructions).

Specific Indications:

- Patients are connected to the breathing circuits of a ventilator; repeated disconnection from the circuit may cause derecruitment and loss of end expiratory pressure.

- Patients have copious secretions requiring suctioning more frequently than every 2 hours.

- Patients have an infectious organism; closed suction systems reduce aerosolisaton and environmental contamination.

Tracheal damage and hypoxia may result from tracheal suction. The risk of this can be minimised by using an appropriately sized catheter and proper technique. Suctioning deeper than the length of the tracheostomy tube may be performed if necessary for secretion clearance. The procedure should take no longer than 15 seconds. Staff should perform the suction procedure and use appropriate personal protective equipment as per their hospital's policy.

The URL below provides a direct link to recommended suctioning techniques

https://www.tracheostomy.org.uk/storage/files/Suctioning.pdf

5.3. Secretion management

Table 6: Characterisation of Secretions and Management

	Aetiology	Management
Copious	***Sialorrhoea*** Impaired swallow Chronic neurological condition (e.g. cerebral palsy, Parkinson's disease)	Glycopyrrolate • No central nervous system effects Hyoscine patch (topical patch) • May cause drowsiness Botulinum toxin injection
	Bronchorrhoea Ongoing infection Tracheal irritation Chronic aspiration Reflux Pulmonary oedema	Antibiotics Bronchodilators, inhaled steroids Check gastric residual volumes Diuretics
Dry **Thickened** **Tenacious**	Inadequate humidification Excessive diuresis Infection	Rehydrate and consider the following: • 3% saline nebulisers ○ Use with caution for patients with asthma • Pulmozyme Oral – NG Mucolytics: • Carbocisteine • Acetylcysteine

5.4. Tracheostomy weaning and decannulation

Tracheostomies may be a short-term requirement for certain patients and should be removed as soon as they are no longer clinically needed. The process of weaning towards decannulation must be led by individuals competent to do so. In some situations, a smaller tube or a different type of tube (e.g. fenestrated) may be required to progress tracheostomy weaning. There are many variations of tracheostomy weaning and decannulation protocols. The following are the various stages that may be employed.

5.4.1. Stage one: cuff deflation

This stage assesses if the patient can manage their upper airway secretions. First suctioning should be performed orally with a Yankauer sucker, via a subglottic port (if present) and via the tracheostomy tube. Tracheal suctioning should also be performed simultaneously with cuff deflation to capture secretions which may not have been cleared by oral suctioning and are retained within the larynx. Cuff deflation allows partial airflow to the upper airway (i.e. through the mouth and nose).

5.4.2. Stage two: speaking valve/capping

The tracheostomy cuff must be deflated at all times when using a speaking valve or cap to enable airflow around the tracheostomy tube and through the larynx.

Speaking valves and/or decannulation caps can be used to progress tracheostomy weaning prior to tube removal (Figure 25). Speaking valves are one-way valves, air is inspired through the tracheostomy tube with the valve in place. During expiration, this one-way valve closes and forces air through the upper airways. Occasionally, patients have insufficient space around the tracheostomy to allow sufficient expiratory flow. Where inspiratory flow through the tracheostomy is adequate but expiratory flow is limited outside of the tracheostomy through the larynx, the phenomenon of 'breath stacking' may occur. This may lead to progressive hyperinflation and respiratory distress.

With a speaking valve in situ, it is easier to engage the core abdominal muscles, and this can aid respiratory muscle training and rehabilitation activity. In some circumstances, speaking valves can be used in breathing circuits with ventilators when patients are on low ventilator settings.

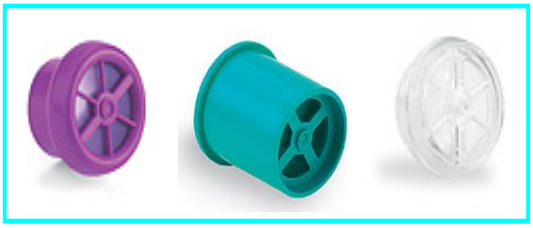
The size and type of tracheostomy tube should be considered before placing a decannulation cap. Decannulation caps block all airflow via the tracheostomy.

A large tracheostomy tube may not allow enough airflow when the cuff is deflated and patients may exhibit respiratory distress with capping. In these situations, a tube downsize to a smaller or uncuffed size may be indicated.

Extreme care should be taken in downsizing tubes as there is the potential for loss of the airway. Clinical expertise of those at the bedside will dictate the location and requisite equipment for downsizing. i.e., ward vs theatre vs ICU. All facilities must be available for immediate recannulation or endotracheal intubation if necessary.

One way speech valves and tracheostomy caps are not essential steps in all cases. Patients may be decannulated based upon the patient's clinical condition and the opinion of the medical professionals at the bedside.

Figure 26: Selection of one-way speaking valves and tracheostomy caps for complete occlusion



Speaking valves

Tracheostomy caps

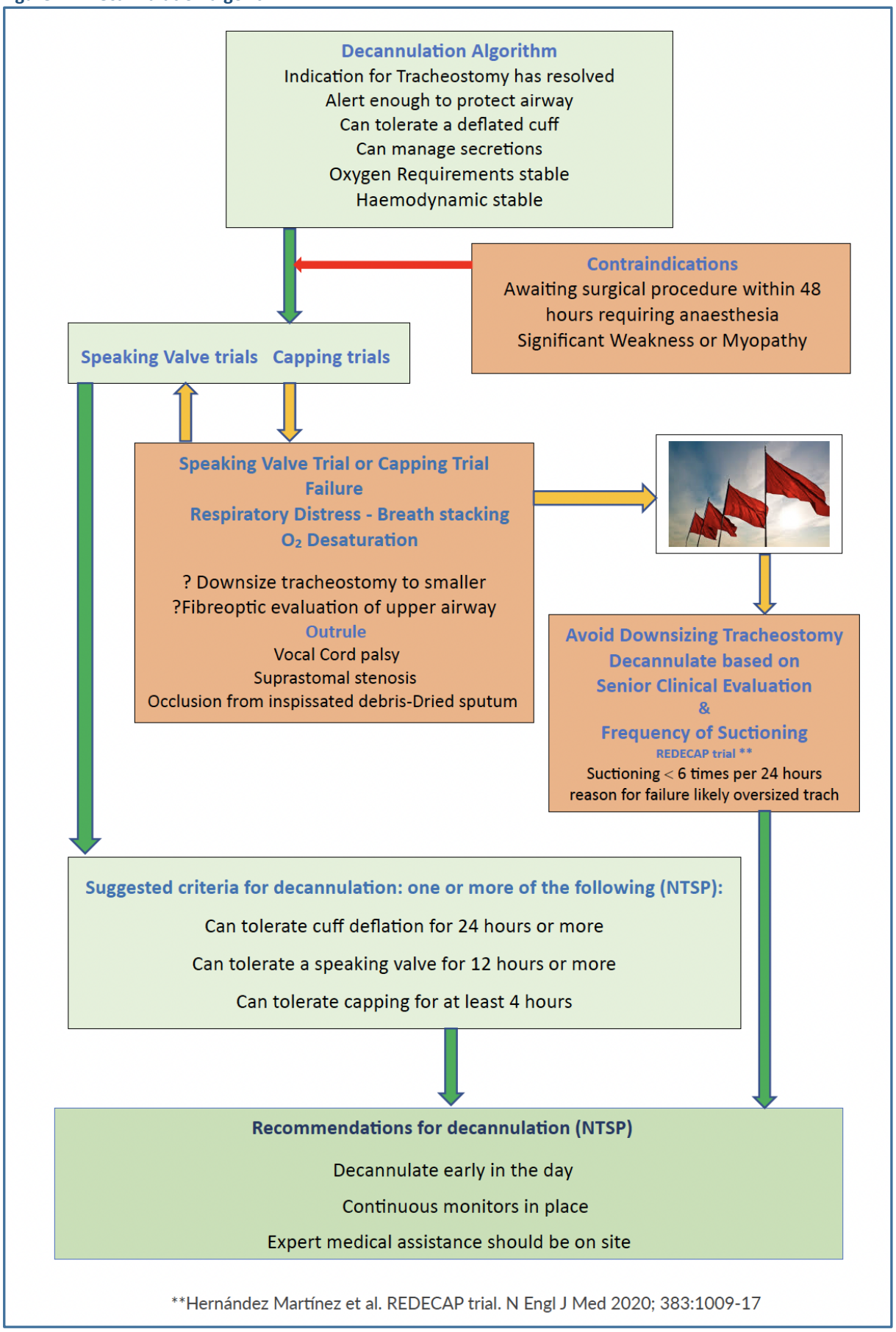
5.4.3. Stage three: decannulation

Prior to the removal of a temporary tracheostomy tube, the MDT must agree that the indication for the tracheostomy has been sufficiently resolved. When the patient can tolerate a deflated cuff, manage their secretions, protect their airway, and breathe adequately through their upper airways, then they may be ready for decannulation.

The situation in head and neck cancer and flap surgery is different where the surgeons may elect to wait for much longer periods.

Caution is advised where the patient has significant weakness, myopathy or a neuromuscular medical diagnosis.

Figure 27: Decannulation algorithm



**Hernández Martínez et al. REDECAP trial. N Engl J Med 2020; 383:1009-17

6. DOMICILIARY TRACHEOSTOMY

A significant number of patients with long-term tracheostomies live independent lives with outpatient follow-up in Ear Nose and Throat clinics. The spectrum of conditions requiring tracheostomy parallels the age of the patient, in young children for congenital reasons, in the older population for conditions such as airway tumours and laryngectomy. Patients with vocal cord or laryngeal injures or significant oropharyngeal dysfunction constitute the non-cancer community with tracheostomy. Long term tracheostomy and respiratory support frequently coexist, high spinal cord injury and the need for long-term invasive mechanical ventilation may affect all age groups. Congenital neuromuscular conditions such as Duchenne's may present with respiratory failure as late adolescents and require long-term tracheostomy and respiratory support.

The prevalence of tracheostomy in the community is likely to increase and will parallel increases in domiciliary respiratory support and full ventilation. A well planned and delivered service will enhance the quality of life for individuals who use the service. Thorough governance will promote safety, identify areas for improvement and ensure a just system of resource allocation.

For all patients and carers, education is key. The expectations for each patient, family member or carer will vary. One-day Basic Life Support courses are available and members of the homecare team should be prioritised. On a more advanced level, the NTSP offer several online modules and competency assessments specific to tracheostomy. Our goals are to promote autonomy while recognising individual limitations.

6.1. Discharge Planning

A. Individualised Care plan

- Homecare team to include General Practitioner, Public Health Nurse
- Ensure access to community Health and Social Care Professionals
    - Speech and Language Therapy, Physiotherapy, Occupational Therapy and Dietetics
- Social worker allocated
- Psychological counselling as required

B. Funding Sources identified

C. Clinical Governance

- Clinical Coordination from a medical perspective
    - ENT, Respiratory, MaxFax, Plastics
- Repeated evaluation of the service provided

D. Training of patient and carers

- Identify core clinical knowledge and skills
- High fidelity simulation, Post simulation debriefing
- Access to Telemedicine
- Competence evaluation
- Contingency planning: In Case of Emergency

E. Advanced Skills: Airway clearance strategies

- Insufflation-Exsufflation manoeuvres[1]
- Lung – volume recruitment[1]
- Active Cycle of Breathing techniques, Huffing, Autogenic drainage,
- Oscillating Positive Expiratory Pressure devices (OPEP)– Acapella, AerobiKa

F. Equipment

- Service level agreement for equipment maintenance
- Disposables

G. Agreed pathway at a local level for immediate referral: In Case of Emergency (ICE)

- Agreed pathway for alerting national ambulance service
- Community First Responders[2]
- 24-hour hot line to hospital and agreed pathway for hospital readmission.
- Regular OPD follow-up with appropriate specialities

1 https://www.canventottawa.ca/
2 https://www.nationalambulanceservice.ie/community/community-first-responders/

6.2. Education and Core Competencies

Competencies which should be attained by the patient with a tracheostomy before hospital discharge or for care providers of patients with a tracheostomy.

A. Understands the anatomy and purpose of the tracheostomy, identifies surface anatomy.
   - Can draw diagram of trachea, larynx and pharynx.

B. Understands tracheostomy daily care.
   - Competent at changing dressings, ties and inner cannulas

C. Understands how to perform suctioning, calculating the appropriate size catheter.
   - Can Demonstrate effective suction technique

D. Can perform or assist in active airway clearance techniques.
   - Lung volume recruitment strategies: stacked breathing with Ambu-bag
   - Insufflator-Exsufflation- Cough Assist device
   - Positive Expiratory Pressure devices (PEP)
   - Active Cycle of breathing techniques

E. Understands the importance of humidification.
   - Is familiar with use and purpose of all accessory equipment

F. Where cuffed tracheostomy in in-situ, understands the importance of cuff pressures.
   - Can demonstrate how to check and adjust cuff pressure

G. Emergency Preparedness
   - Can identify red flag signs and demonstrates the appropriate response to the red flags

The purpose of a competency system is to equip patients, their families and carers with the knowledge and skills to cope with expected and unusual situations. The list below is not exhaustive.

Figure 28: Potential complications associated with Tracheostomy

Red Flag Signs	Tracheostomy
Respiratory distress Desaturation Accidental decannulation Partial displacement Obstructed tracheostomy Bleeding from tracheostomy	Mucus plug Accidental decannulation Partial displacement Oxygen desaturation Blood-stained secretions
Infection	**Equipment failure and Contingency planning**
Recognise signs of sepsis Consider possible sources 1. Tracheitis 2. Pneumonia 3. Stoma site infection 4. Consider alternate source of infection e.g. UTI	Running out of oxygen Power cuts Missing equipment Ventilator failure Failure of suction, humidifier

6.3. Discharge Pathway

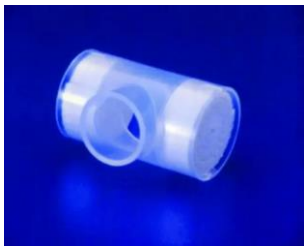
A detailed needs assessment must be completed for each patient likely to be discharged home with a tracheostomy. The baseline large equipment list is outlined below. While most patients will not need all this equipment, the funding stream must cover what is needed. Important considerations

- A service level agreement with the provider of domiciliary equipment is essential
- A 24-hour number which is available to troubleshoot equipment issues that arise
- All equipment should have battery back-ups should a power outage occur

Figure 29: Large budget equipment, considerations for discharge of patients with a tracheostomy

Monitor	Humidification	Respiratory support
Tracheostomy Box	Airway Clearance Devices	Nebulisers: Venturi & Ultrasonic
Suction	Home Modifications	Oxygen Concentrator

Figure 30: Tracheostomy Disposables, Care and Accessories

Velcro tapes and Gauze dressings	Speech Valves Tracheostomy Masks	Shower Shield
Buchanon bib	HME's Thermovents with Oxygen Side port	
		
AMBU Self inflating Bag	Speech Valves 15mm connectors for breathing circuits Secure tie for speaking valve	
Gloves Sterile Water	Yankuer & Endotracheal	Oxygen therapy

6.4. Homecare Packages and Nursing care

While most patients will relish the prospects of discharge into the community, it is important that expectations are managed. Support systems must be in place before hospital discharge. The provision of nursing care in the community with the assistance of qualified care assistants may be necessary with contingency required for sickness.

The needs of many patients may extend beyond tracheostomy into equipment such as mobility aids such as hoists and chairs and major reconstructive changes may be necessary in the patients' home.

Above all patients must feel safe and supported, a clear pathway must exist for immediate consultation and referral back to hospital should difficulties arise. Bearing in mind the fact that many patients with tracheostomies may have difficulties speaking, the senior's alert scheme is available to all who are likely to benefit from this technology.

Figure 31: Medical alert systems for vulnerable persons
https://www.pobal.ie/programmes/seniors-alert-scheme-sas/

7. COMPLICATIONS

Staff encountered difficulties while suctioning through this tube

Examination

- Tube sitting with flange >1 cm from skin

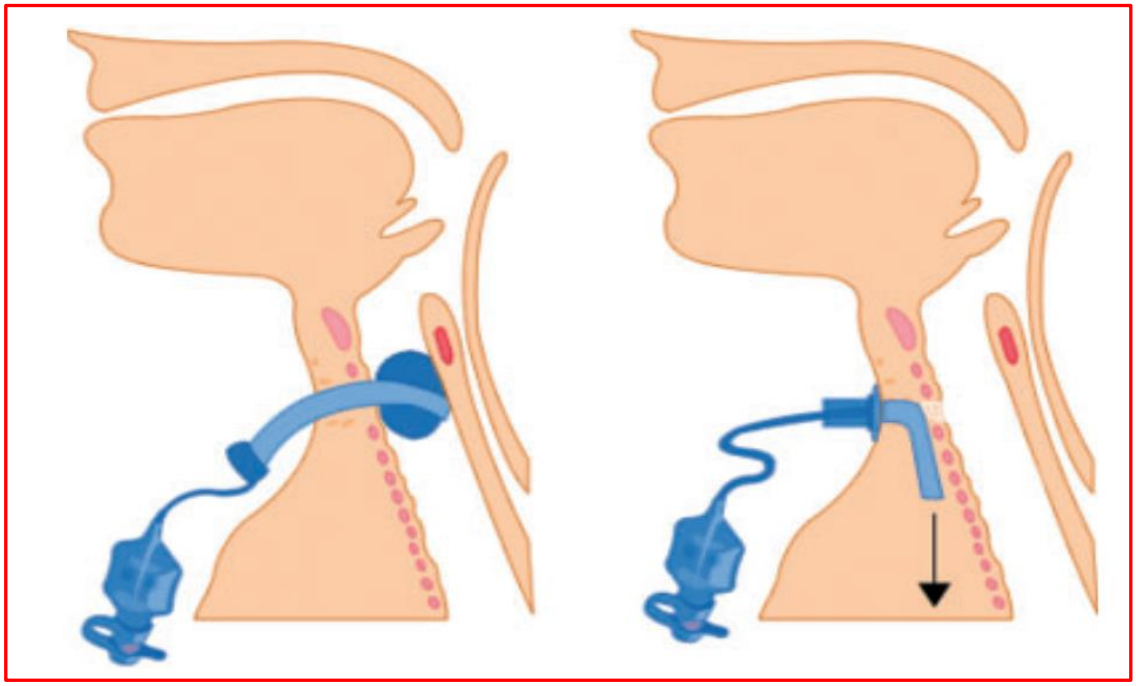
Risk factors

- Tube length >76 mm (relatively short)
- High BMI
- Uncuffed tube (increased mobility)

Management

- Ask for senior help
- Check bedhead sign
- Ear to tube (listen and feel)
  - Evidence of airflow?
- Place on C Circuit
  - Moving bag?
- Check Capnography
- Consider Fibreoptic tracheoscopy

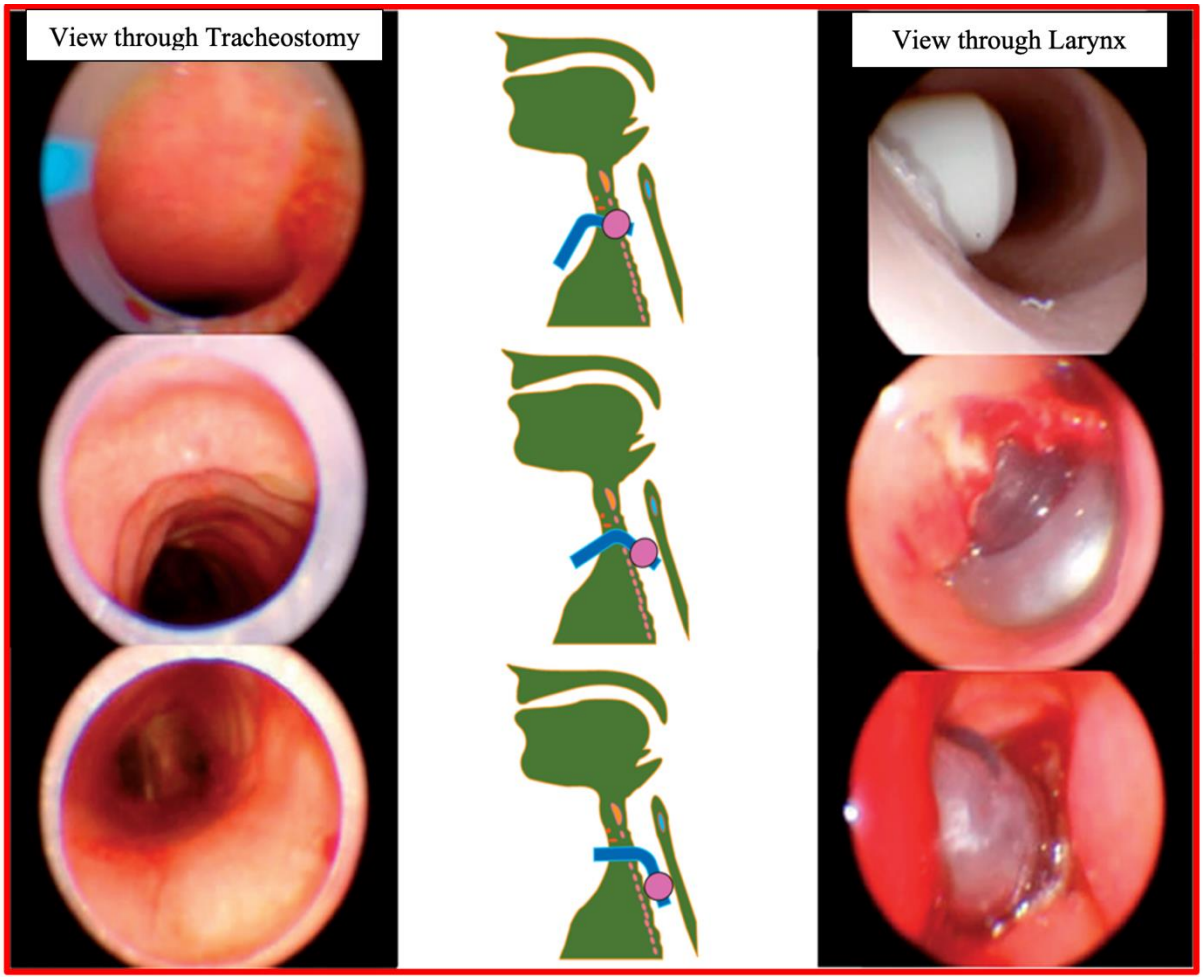
Figure 32: Potential positions of tracheostomy tube tip (McGrath 2012)



Partially obstructed	False passage

***Likely diagnosis*: Dislodgement, misplacement, obstruction**

Figure *33:* **The position of tracheostomy tubes within the airway as determined by endoscopy: The lunar study.** ***McGrath et al. (2017)***



7.1. Complications of Tracheostomy

1. Partial misplacement, inappropriate size (half-moon sign on bronchoscopy)
2. Occlusion by neck in obese or fatigued patients
3. Surgical emphysema, Pneumomediastinum, or pneumothorax
4. Burst, overinflated, or herniated cuff
5. Bleeding from stoma considerations:
    - Site and character of bleeding (i.e., arterial or venous)
    - Superficial or deep
    - Blood bypassing cuff and contaminating lower airways while cuff inflated.
6. Infection of stoma
7. Pneumonia
8. Distension of trachea due to overinflated cuff (can lead to ulceration, necrosis)

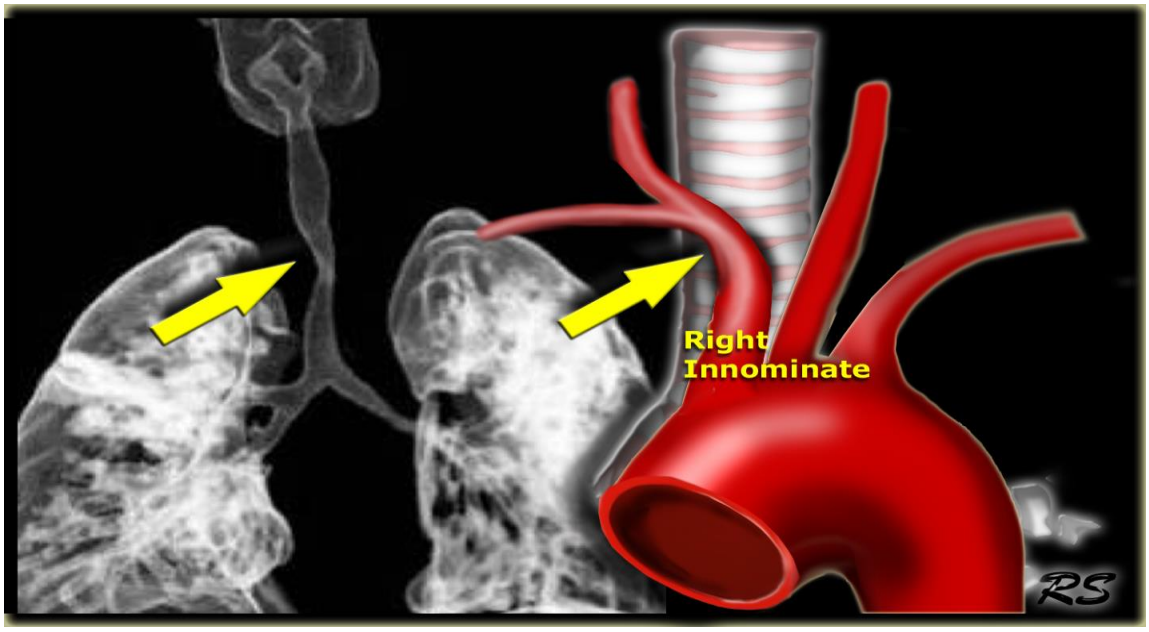
9. Mucosal ulceration due to asymmetrical inflation of cuff, excessive cuff pressure, or tube migration
10. Secondary haemorrhage due to erosion of tube into major vessel.

7.2. Late complications (>14 days post-tracheostomy)

All of the above and in addition the following:

1. Haemorrhage or tracheoinnominate fistula, which may be preceded by smaller bleeding episodes (known as 'herald bleeding') (Figure 32)

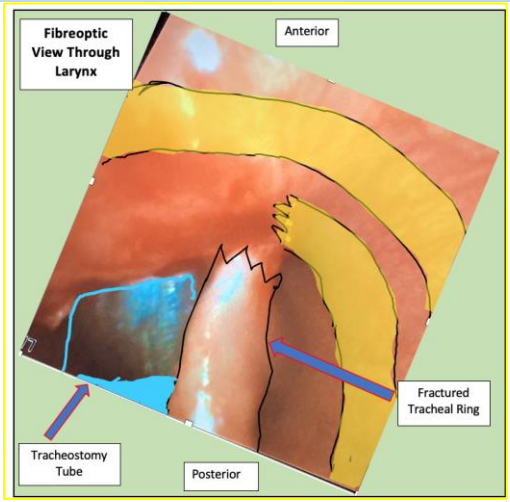
Figure 34: Schematic demonstrating sites of erosion in tracheoinnominate fistula



Source Siegel MJ, Smithuis R 2007

2. Granuloma of trachea (can cause respiratory difficulty when tube is removed)
3. Tracheal dilation
4. Tracheomalacia due to long-term pressure on tracheal cartilage
5. Persistent sinus at tracheostomy site, Scar formation, requiring revision
6. Tracheoesophageal fistula.
7. Tracheal ring fracture (may only become manifest with weaning)

Figure 35: Tracheal ring fracture during placement or change



8. Tracheal stenosis (may be suprastomal, at the site of the cuff, or infrastomal) (Figures 36 & 37)

Figure 36: Tracheal stenosis - *Source: Evans et al. (2015)*

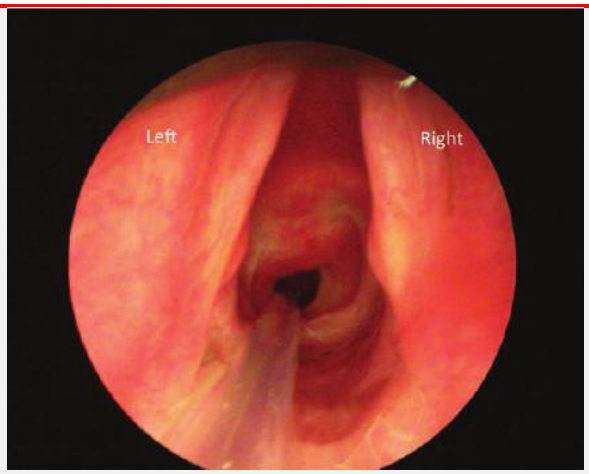
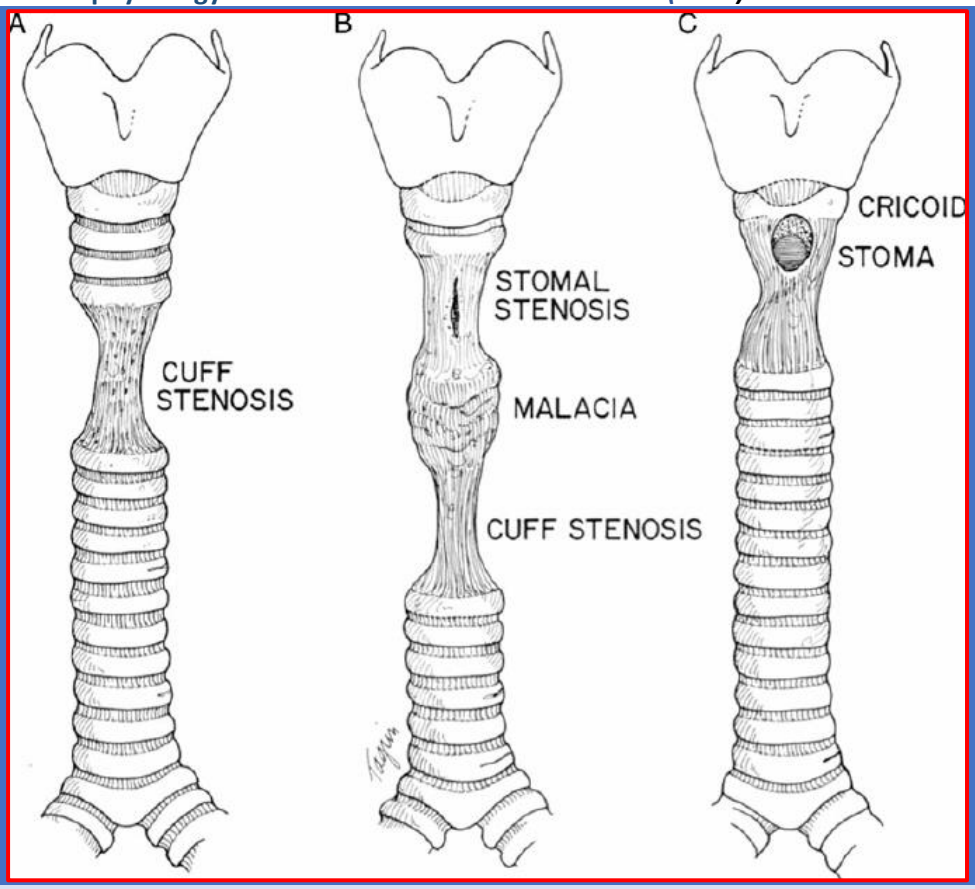
Late complications **Tracheal stenosis** 4 mm subglottic stenosis at the distal edge of the cricoid cartilage. Jet ventilation catheter passing through the stenosis.	

Figure 37: Pathophysiology of tracheal stenosis - ***Source: Evans (2015)***

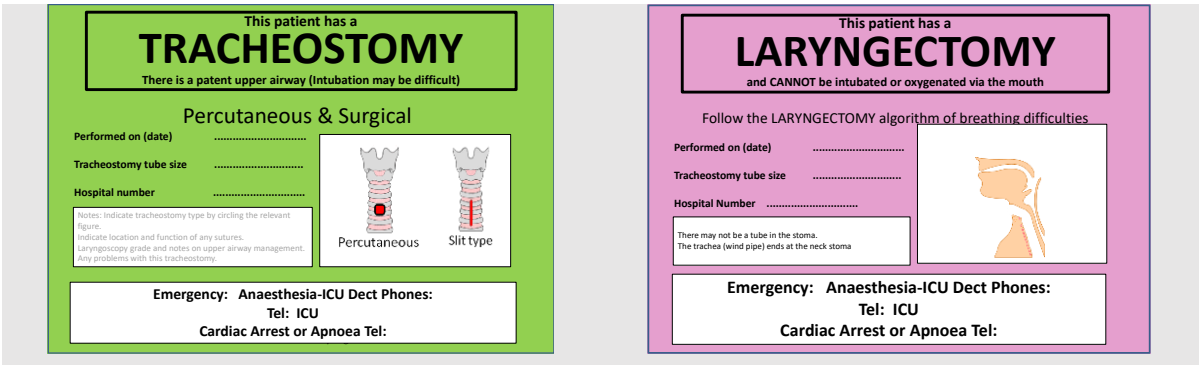


Mucosal ischaemia → Chondritis → healing by fibrosis → stenosis

8. TROUBLESHOOTING

All health professionals must be aware of the emergencies that can occur when patients have a tracheostomy. In all cases it is very important to stay with the patient.

Each patient with a tracheostomy ***must*** have a bedhead sign. As a first step, a quick check of the sign will inform staff whether the patient has a tracheostomy or a laryngectomy, the date it was inserted or changed and contact details of medical professionals in case of emergency.



Check bedhead signs

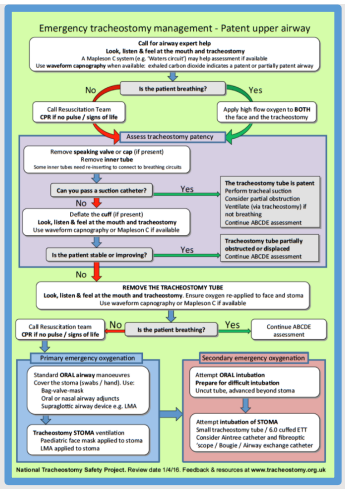
8.1. Obstruction of tracheostomy

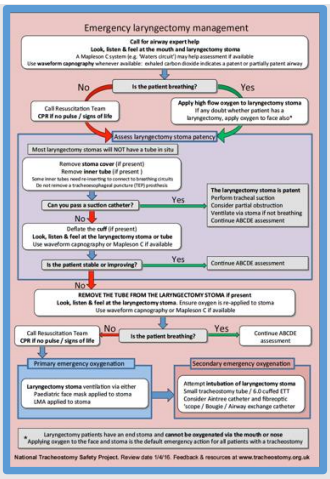
Signs:

- Use of accessory muscles
- Noisy, laboured breathing (stridor) and absence of or limited expired air from the tracheostomy tube
- Anxiety
- Increased pulse, blood pressure and respiratory rate
- Decreased oxygen saturation & Cyanosis
- Increased resistance to passage of suction catheter

8.2. Call an arrest where the patient is visibly deteriorating

1. Call for assistance and medical help
2. Administer oxygen via tracheostomy mask, C Circuit or Ambu bag
3. Apply electrocardiogram (ECG) and pulse oximetry monitors
4. Remove inner cannula and assess if plugged or blocked
5. Ask the patient to cough and suction through the tracheostomy tube
6. Deflate the cuff
7. If the patient is still in distress, the tracheostomy may need to be changed
8. Use C Circuit to attempt ventilation
9. Constantly reassess and Provide reassurance to the patient





Check emergency algorithms

Should be with bedhead signs or in tracheostomy box.

8.3. Apnoea (call an arrest immediately)

1. Lay the patient flat
2. If the tracheostomy tube is in place, inflate the cuff and manually ventilate the patient using a catheter mount attached to the C Circuit
3. Check for a pulse
4. If the patient has no pulse, commence cardiopulmonary resuscitation (CPR)
5. Continue full resuscitation as per the patient's needs and medical requirements

NB: *If the patient has a permanent tracheostomy or laryngectomy, ventilation is achieved by inserting a cuffed tracheostomy tube into the stoma and bagging with an Ambu bag, or C Circuit.*

8.4. Accidental decannulation

1. Call for immediate medical assistance and reassure the patient
2. Administer oxygen over the stoma site
3. Stay sutures, if present may be used to guide reinsertion of the tube, they should be labelled and visible around the stoma
4. If stay sutures are not present and the tracheal orifice is collapsed, consider inserting a tracheal dilator until skilled help arrives

8.5. Bleeding from stoma site

1. Seek immediate medical assistance and reassure the patient
2. Stop nasogastric or gastrostomy feeds, aspirate NG tube or vent the PEG
3. Monitor oxygen saturation, blood pressure, and heart rate
4. Position the patient upright
5. Use suction as needed
6. Liaise with the medical team regarding preoperative requirements
7. Commence intravenous fluids as prescribed
8. Obtain consent for theatre

8.6. Surgical emphysema (crackling under the skin, around the stoma site)

1. Administer oxygen
2. Observe respiratory status
3. Check oxygen saturation
4. Inform the medical team for immediate review
5. Observe and monitor the patient closely
6. Call for portable chest X-ray

9. Guidance for the treatment of the Adult Patient with a Tracheostomy Working Group Membership

NAME	REPRESENTING
Dr James O'Rourke	Consultant Anaesthesia and Intensive Care
Mr Joe Hughes	Consultant ENT Surgeon National Lead Tracheostomy
Dr Michael Power	Clinical Lead (past) National Critical Care Programme
Professor Des Murphy	Clinical Lead National Clinical Programme for Respiratory
Ms Una Quill	Programme Manager National Critical Care Programme
Ms Jane Savage	Clinical Nurse Specialist Limerick University Hospital
Ms Siobhan Healy	Clinical Specialist Physiotherapist Cork University Hospital
Ms Eanna Horan	Speech & Language Therapy Tallaght University Hospital
Ms. Deirdre Gilchriest Ms. Michelle Hayes	Speech & Language Therapy St. James Hospitazl
Ms Ciara Hughes	Programme Manager National Clinical Programme for Surgery
Ms Aileen McCabe	ANP Critical Care Outreach Tallaght University Hospital
Ms Lydia Saturi Sharon	Clinical Nurse Specialist, Tracheostomy St. James' Hospital
Ms Rynagh Gilligan	ADON Critical Care Services St. James' Hospital
Mr Pedro Vasquez	ICU Physiotherapy Lead Beaumont Hospital
Ms Una Deane	Speech and Language Therapy

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North western Medicine: Care of Tracheostomy in the home

11. LIST OF FIGURES AND TABLES

Figure Number	Title	Page
1	Process map: patient on ward with tracheostomy or laryngectomy	9
2	Bedhead Signs and Emergency Algorithms (Appendix A)	10
3	Typical contents of a Tracheostomy Bedside Box	12
4	Airway trolley per Difficult Airway Society	14
5	Mobile tracheostomy bag for MDT rounds and emergencies	15
6	Comparison between tracheostomy tube lengths and diameters	16
7	Schematic demonstrating importance of maintaining cuff pressure while preventing mucosal ischaemia	18
8	Capnography Tracings: Normal and Abnormal	19
9	Stay, Maturation or Rescue sutures	20
10	Skin flange sutures and deep stay sutures	21
11	TRACOE tracheostomy tube, additional features: subglottic suction port & fenestrations highlighted	22
12	Comparison of Inner Diameters (inner tubes) and Lengths (C, L or TL) of Size 8 tracheostomy tubes	23
13	Inner Cannulas of Size 8 tracheostomy tubes from Shiley, Portex and Tracoe: A Comparison of IDs and lengths	24
14	Subglottic secretion drainage options	25
15	Appropriate tube length tailored to body habitus, (source HC21- resource section)	27
16	Standard Length Portex and Extralong Adjustable flange Model	27
17	An inflated cuff excludes airflow from the upper airway	29
18	Selection of speaking valves from Passy Muir	31
19	Tracheostomy tube with subglottic suction ports: suction and vocalisation options	31
20	Augmentative & Alternative communication (AAC) Devices	33
21	Anatomical Changes before and after Laryngectomy	38
22	Anatomy and adjuncts for speech following laryngectomy	39
23	Voice prosthesis used for patients with TEP	40
24	Humidification options	44
25	Open and Closed Suction systems	45
26	Selection of one-way speaking valves and tracheostomy caps for complete occlusion	48
27	Decannulation algorithm	49
28	Potential complications associated with Tracheostomy	53
29	Large budget equipment for discharge of patients with a tracheostomy	54
30	Tracheostomy Disposables, Care and Accessories	55
31	Medical Alert systems	56
32	Potential positions of tracheostomy tube tip	57
33	The position of tracheostomy tubes within the airway as determined by endoscopy: The Lunar Study	58
34	Schematic demonstrating sites of erosion in tracheoinnominate fistula	59
35	Tracheal ring fracture during placement or change	60
36	Tracheal stenosis	61

37	Pathophysiology of tracheal stenosis - Source: Evans (2015)	62

List of Tables

Number	Table Title	Page No.
1	Airway Trolley	13
2	Tracheostomy Weaning, Downsizing and Decannulation	18
3	Decision process in choosing the most appropriate type of tracheostomy	26
4	Hospital Acquired Pneumonia prevention bundle in patient with tracheostomy	36
5	Oral care bundle for patients with a tracheostomy	37
6	Characterisation of Secretion and Management	42

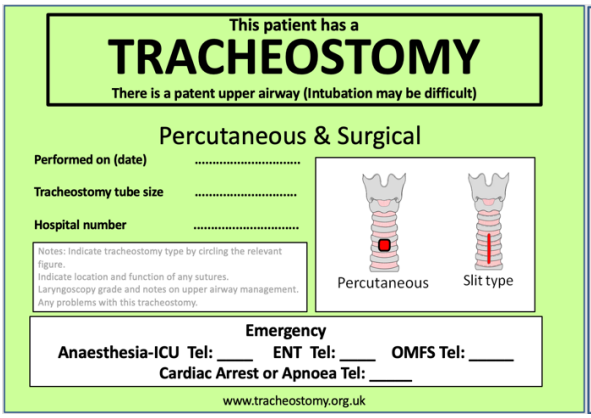
12. Acronyms and Abbreviations

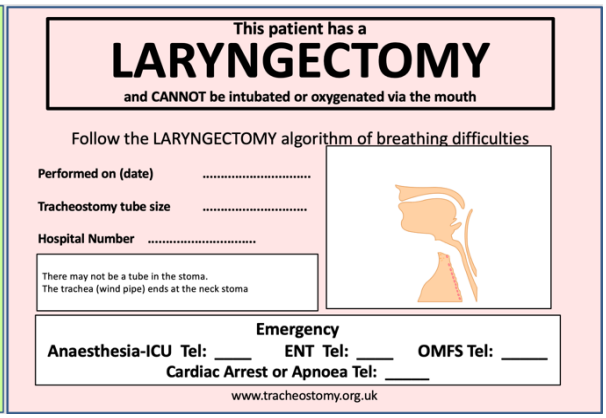
ACV	Above Cuff Vocalisation
AAC	Augmentative & Alternative Communication devices
BMI	Body Mass Index
C Circuit	Also known as the Mapleson C or Waters Circuit
CNS	Clinical Nurse Specialist
DECT	digital enhanced cordless telecommunications
ENT	Ear Nose & Throat
FEES	Fibreoptic Endoscopic
GCS	Glasgow Coma Scale
ICS	Intensive Care Society
ICU	Intensive Care Unit
ID	Inner diameter
MDT	Multi-disciplinary team
NTSP	National Tracheostomy Safety Project
OMFA	oral maxillofacial surgeon
Shiley Flex™	Shiley flexible Evac Tracheostomy Tubes with Taperguard™ Cuff Technolog
Shiley XLT	Extended-Length Tracheostomy Tubes with Disposable Inner Cannula
SLT	Speech and Language Therapy
SOP	Standard Operating Procedure
VAP	Ventilator Associated Pneumonia
VSS	Video Fluoroscopic Swallow Study
SSD	Subglottic secretion drainage
TEP	TracheoE Oesopheal Puncture
WOB	Work of breathing

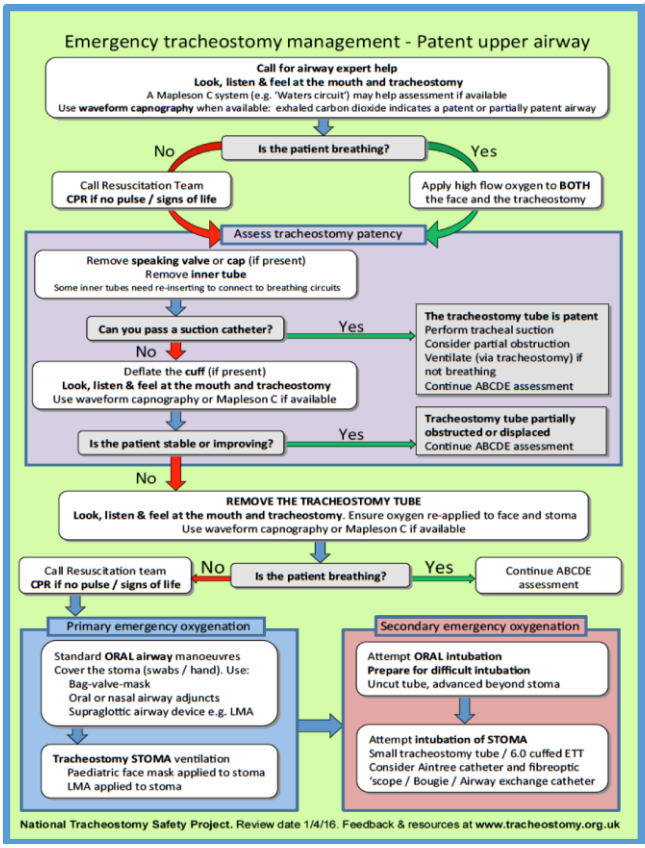
13. APPENDICES

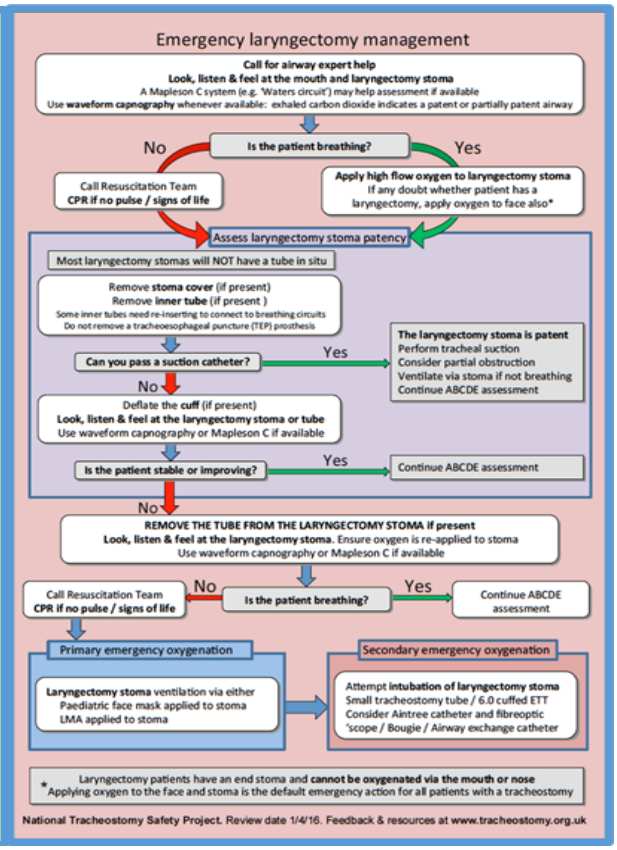
A	Bedhead Signs and emergency algorithms
B	Pro-forma Observation sheet
C	Competency document
D	Online Resources and References
E	Tracheostomy Passport

Appendix A: Bedhead signs and emergency algorithms









Appendix B: Ward care: Tracheostomy observation sheet

Name: _____ MRN: _____Ward: _____

Date:											
Time:											
Shiley = S; Portex = P											
Tube size											
Cuffed = C; Uncuffed = NC											
Cuff: Up, down; N/A											
Cuff pressure (cm H_2O) (Only if cuff inflated)											
Fenestrated = **F** Non-fenestrated = **NF**											
Inner cannula Fenestrated = **F** Non-fenestrated = **NF**											
Speaking valve On/off											
Humidification: Y/N											
Heated											
Saline nebuliser											
Swedish nose											
BiB											
Inner cannula Patent: Y/N % Occlusion (1–3) 1: <25% 2: 25–75% 3: >75%											
Changed: Y/N											
% Oxygen inspired											
% $Sa0_2$											
Self-expectorating: Y/N											
Suctioned: Y/N											
Volume 1: Minimal 3: Copious											
Colour (1–5) 1: Clear 2: White 3: Purulent 4: Bloody 5: Brown (old blood)											
Viscosity (1–3) 1: Loose 2: Frothy 3: Tenacious											
Sputum specimen: Y/N											
Signature											

APPENDIX D: RESOURCES

Airway Clearance Techniques
https://www.canventottawa.ca/
https://www.physio-pedia.com/Active_Cycle_of_Breathing_Technique

Instructional Videos on Airvo from Fisher and Paykel
https://youtu.be/vF5INHtJNio
https://youtu.be/uGZ8GGYxLhs
https://youtu.be/f_OkSQshJQU

National Tracheostomy Safety Project website:
https://www.tracheostomy.org.uk/Tracheostomy passport:
https://www.ccs-sth.org/resources/Documents/Tracheostomy%20Care%20Group/Trachi-Pass%20VERSION%202%20July%2015.pdf

https://www.medtronic.com/content/dam/covidien/library/us/en/product/tracheostomy/shiley-tracheostomy-product-guide-brochure.pdf

https://healthcare21.eu/product/shiley-flexible-tracheostomy-tubes/
downloadable document products sizing of XLT tubes (figure 15)

https://www.tracheostomy.org.uk/healthcare-staff/vocalisation/speaking-valve-trials

NATSSIPS and Loc SSIPs
https://www.england.nhs.uk/wp-content/uploads/2015/09/natssips-safety-standards.pdf

Royal College of Speech and Language therapists

https://www.rcslt.org/

https://www.tracheostomyeducation.com

https://www.tracheostomy.org.uk/storage/files/Suctioning.pdf

Images Seigel MJ, Smituis R.

https://radiologyassistant.nl/cardiovascular/thoracic-aorta/vascular-anomalies-of-aorta-pulmonary-and-systemic-vessels#pulmonary-venous-anomalies-scimitar-syndrome

The Difficult Airway Society

www.https://das.uk.com

Subglottic Secretion Drainage, Benefits and technique.

https://effectivehealthcare.ahrq.gov/sites/default/files/wysiwyg/nominated-topics/1016-subglottic-secretion-drainage-supplemental-document.pdf

National Ambulance service, Community First Responders

https://www.nationalambulanceservice.ie/community/community-first-responders/

Appendix E: Tracheostomy Passport

Passport Document

TRACHEOSTOMY

Passport

Patient Name:
Address:

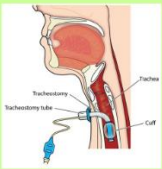
DOB:

Reason Tracheostomy Required .....

.....

Tracheostomy Model and Size .....

Inner Cannula Y-N	
Cuffed Y-N	
Fenestrated Y-N	



In Case of Emergency 999 or Hospital Emergency Department:
Hospital Consultant: Tel:
General Practitioner: Tel:

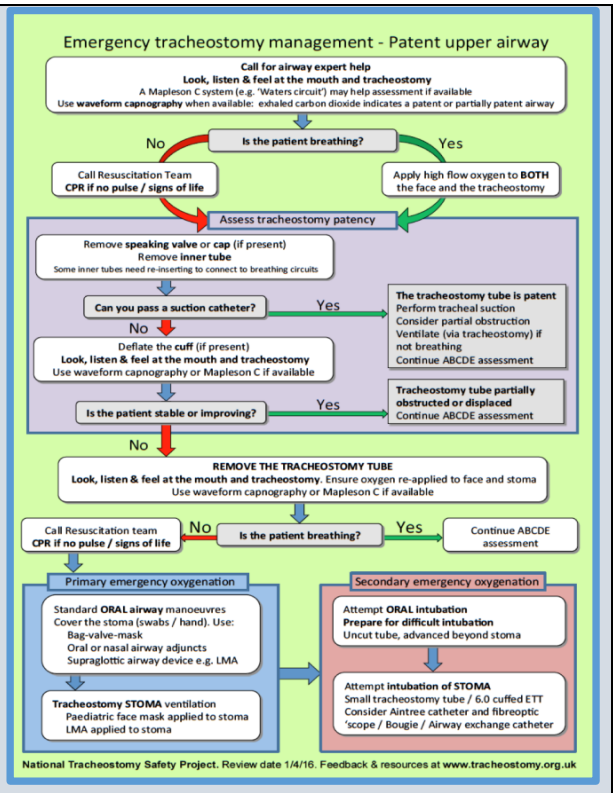
www.tracheostomy.org.uk

Next of Kin:
Tel:

1st Contact:
Relationship

2nd Contact:
Relationship

Homecare Team Lead:
Tel:



Passport Document

This patient has a

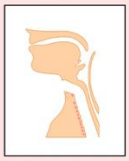
LARYNGECTOMY

and CANNOT be intubated or oxygenated via the mouth

Patient Name:
Address:

DOB:

Tube in stoma	None	Tracheostomy	Laryngectomy tube
Inner Cannula Y-N			
Cuffed Y-N			
Fenestrated Y-N			



In Case of Emergency 999 or Hospital Emergency Department:
Hospital Consultant: Tel:
General Practitioner: Tel:

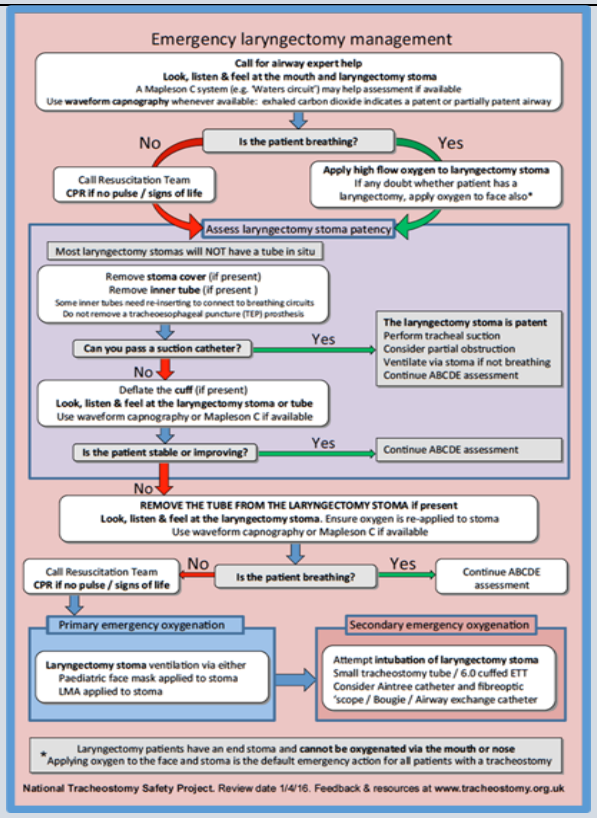
www.tracheostomy.org.uk

Next of Kin:
Tel:

1st Contact:
Relationship

2nd Contact:
Relationship

Homecare Team Lead:
Tel:



Appendix C: Tracheostomy competency training record

Healthcare professional: _____ Grade: _____

Supervisor of training: _____ Supervisor of training: _____ *(signature)*

Date of assessment: _____ Grading system: Competency initialled when satisfactory

	Domain	Competency assessed	Date step completed	Trainee initials	Supervisor initials

1.	**Theoretical knowledge**	• Practitioner can describe the anatomy and physiology of the normal airway, cartilages, and surface anatomy.
		• Practitioner can describe the insertion point of the tracheostomy and differentiate between tracheostomy and Cricothroidotomy.
		• Practitioner can describe the anatomy of the patient post-laryngectomy.
		• Practitioner can present examples of indications and contraindications for tracheostomy.
		• Practitioner understands emergency algorithms and can guide the supervisor through the algorithms.
		• Practitioner can discuss the risks of tracheostomy and cite major complications.
		  ○ Describe red flags.
		• Practitioner can outline a strategy for management of:
		  ○ Haemorrhage from tracheostomy
		  ○ Suspected tube displacement
		  ○ Tube obstruction
		  ○ Inspissated secretions.			

	Domain	Competency assessed	Date step completed	Trainee initials	Supervisor initials
		• Practitioner is familiar with the basic principles of basic life support, depending on the practitioner's grade.			

2.	**Knowledge of equipment**	• Practitioner can describe the rationale for bedhead signs.
		
		• Practitioner can name the requisite bedside equipment and perform a tracheostomy box check.
		
		• Practitioner can identify the type and size of a tracheostomy and state the rationale for various types of tubes:
		  ○ Non-fenestrated
		  ○ Fenestrated
		  ○ Inner tube
		  ○ Extra-long tubes
		  ○ Can discriminate flange sutures versus stay sutures
		  ○ Can differentiate between laryngectomy tube and tracheostomy tube.
		
		• Practitioner can check/change the inner tube and explain the rationale for doing this.
		
		• Practitioner can describe the level of respiratory support:
		  ○ Oxygen therapy high air flow oxygen enrichment (HAFOE) devices
		  ○ Humidification systems
		  ○ Airvo
		  ○ Ventilator and interface with patient.			

3.	**Tracheostomy care**	• Practitioner demonstrates a knowledge of basic stoma care and dressings.
		
		• Practitioner can identify requirements for suctioning.
		  ○ Correctly characterises sputum.
		
		• Practitioner can perform suctioning, and can:
		  ○ Differentiate between open and closed systems
		  ○ Subglottic suction port.			

	Domain	Competency assessed	Date step completed	Trainee initials	Supervisor initials
4.	**Weaning**	• Practitioner can cite essential criteria for weaning. • Practitioner can discuss rationale for switching to a fenestrated tube versus downsizing the tube. • Practitioner can discuss the implications of weaning for rehabilitation.			
		Cuff deflation • Practitioner can present the stages of weaning. • Practitioner can deflate cuff safely. • Practitioner can discuss laryngeal desensitisation. • Practitioner can identify tolerance of this weaning stage and make an appropriate plan.			

5.	**Communication**	• Practitioner can present options for verbal and nonverbal communication.
		Speaking valves
		• Practitioner can discriminate between tracheostomy and laryngectomy speech:
		  ○ Passy Muir speaking valves
		  ○ Blom-Singer, Provox.
		• Practitioner can discuss the safety aspects of speaking valve application, including:
		  ○ Significance of cuff inflation/deflation
		  ○ Aspiration risks.
		• Practitioner can discuss reasons for failure of speaking valve trials, including:
		  ○ Size implications for phonation
		  ○ Identifying a troubleshooting strategy.
		• Practitioner can explain the theory of above cuff vocalisation.			