CLINICAL PRACTICE GUIDE

Care of adult patients in acute care facilities with a tracheostomy

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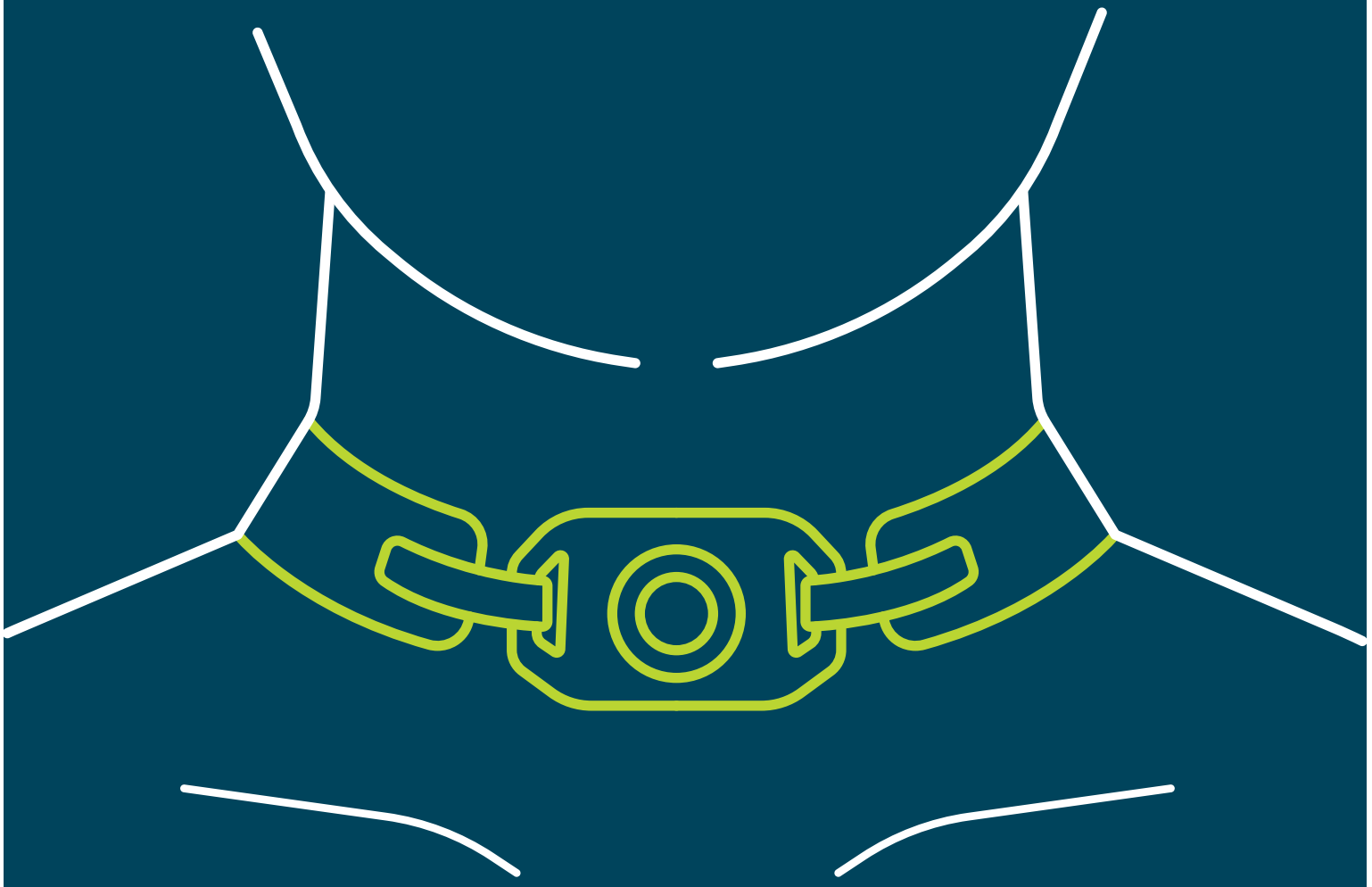

NSW GOVERNMENT

AGENCY FOR CLINICAL INNOVATION

Intensive Care NSW

The information is not a substitute for healthcare providers' professional judgement.

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Contents

Introduction

This guide has been developed to support local health districts (LHDs) and hospitals to develop local procedures and guidelines that map to their specific patient population.

Tracheotomy or tracheostomy refers to an artificial opening into the trachea, which may be temporary or permanent. Most patients with a tracheostomy tube will have healthcare needs that cover several healthcare disciplines and the complexity of this care means ideally an experienced clinician or a tracheostomy team will be required to coordinate this care.

The recommendations apply to adult patients in acute care facilities with a temporary or permanent tracheostomy tube, it does not address patients with long term tracheostomies or patients transitioning to community care. Laryngectomies are mentioned with tracheostomies with regards to emergency action plans only. Patients with laryngectomies have their own unique airway needs and specialised multidisciplinary team care and this is not within the scope of this guide.

Hospital case mix and resources vary, and therefore each hospital will need to examine local conditions to make appropriate decisions to ensure that patients receive person-centred, time-sensitive care in a safe environment.

A suite of tools is available to support implementation of this guide in the Care of adult patients in acute care facilities with a tracheostomy: Toolkit.

Overarching principles

This guide aims to ensure:

- patients receive appropriate care at the right time
- services are safe, effective, and sustainable.

Method

This is an update to the *Clinical practice guideline: Care of adult patients in acute care facilities with a tracheostomy*[1] which was released in 2013. The original clinical practice guideline was developed based on a systematic review of the literature and expert consensus.

To inform the update of this guide, a literature review including publications from 2012 to March 2019 was commissioned and used to inform updates to recommendations where indicated.[2] In July 2020, a rapid evidence review was undertaken from 2019 onwards to capture any new publications since the commissioned review. This review was limited to high-level evidence (randomised controlled trials, systematic reviews and meta-analysis). A supplementary evidence review was undertaken by clinicians in the working groups for subsections of the guides.

This guide was reviewed formally in 2020 by a working group including 29 expert medical, nursing and allied health representatives from a range of LHDs across NSW. Sub-working groups were formed to work on individual sections of the guide and met via teleconference weekly for four weeks. The whole working group met twice for six-hour, face-to-face workshops, and twice for two-hourly teleconference meetings. These meetings were held to reach consensus on recommendation statements. Consensus was reached on all recommendations included within this guide.

To assess the current state, Intensive Care NSW reviewed tracheostomy data from the Clinical Excellence Commission's Incident Information Management System.[3] 219 reported tracheostomy incidents from July 2016-October 2018 were reviewed for themed incidence.

System of care

Environment of care

All patients with a tracheostomy must be cared for in an environment with the necessary systems to manage the complex nature of their care.

Table 1: Recommendations for the environment of care

Recommendations	Source
The management plan for patients should be a coordinated and collaborative multi-disciplinary approach. Where established, tracheostomy review team members should include: • medical specialist • senior nurse specialist • physiotherapist • speech pathologist.	Hockey, van Zundert, Paratz. 2016[4]
Hospitals without a tracheostomy review team or equivalent expertise should develop close links with the tracheostomy review team or specialist clinicians at their tertiary referral centre to ensure optimal patient outcomes.	Working group consensus
Each hospital should establish referral processes to the multidisciplinary team to ensure timely assessment and intervention occurs.	Working group consensus
All hospitals should have specific policies and procedures to guide the clinical management of patients with tracheostomies. These documents must be readily accessible.	Working group consensus
Patients with tracheostomy tubes must be cared for in ward areas that are able to provide care appropriate to the patient's general clinical condition: • where nursing staff have been assessed as being competent to care for patients with a tracheostomy • appropriate equipment is available to facilitate safe patient care and monitoring (refer to the toolkit for a bedside and emergency equipment list).	Esquinas. 2011[5]
All LHDs must monitor and evaluate adverse events of patients with a tracheostomy. At a minimum this should include regular and systematic evaluation using incident monitoring systems.	Working group consensus
All LHDs should: • evaluate current practice against this guideline • develop an implementation plan to address any gaps • monitor uptake of the guideline.	Working group consensus

Plan of care and communication

A review of Incident Information Management System data conducted by the Clinical Excellence Commission from July 2016-October 2018 found that inadequate communication and documentation were significant contributors to adverse events with patients with tracheostomy tubes.[3] Examples of incidents were:

- inadequate clinical handover
- insufficient written documentation in the patients' plan of care
- missing documentation of clinical events
- errors in correct patient procedure or site
- documentation of correct 'time out' procedures lacking.

Table 2: Recommendations for the plan of care and communication

Recommendations	Source
Informed written consent for the tracheostomy procedure must be obtained from the patient or next of kin and documented in the health record.	Clinical Excellence Commission, 2017[6]
The team inserting the tracheostomy must ensure a 'time out' is performed as per the *NSW Health Policy Directive: Clinical Procedure Safety (PD2017_32).*	Clinical Excellence Commission, 2017[6]
All patients with a tracheostomy tube should have an individualised documented plan of care (including discharge plan), developed collaboratively by the admitting medical team, tracheostomy review team, patient and carer on insertion or admission. This plan may require regular review and updating as required.	Working group consensus
All changes to the plan should be documented and verbally communicated to the admitting medical team nurse, the patient and carer.	Working group consensus
Where patients and carers come from culturally and linguistically diverse backgrounds, healthcare interpreters should be involved to ensure patients and carers understand all aspects of tracheostomy care.	Working group consensus
When transfer of care occurs, clinicians should ensure their work practices are consistent with the standard key principles for clinical handover. This should include visual, verbal and written handover including: • patient history, including reason for the tracheostomy tube, airway anatomy and physiology • tracheostomy tube insertion date, type of tube, method of insertion, size, sutures and method of stabilising • date of next tube change • secretion management (amount, colour, consistency, ability to cough, shallow or deep suction and frequency) • humidification method • oxygen requirements – current method, FiO_2 and SpO_2 target range • nutrition • communication method.	Agency for Clinical Innovation, 2007[7]

Patient preparation

It is important that patients receiving a tracheostomy and their caregivers are provided written and verbal information about the reasons for a tracheostomy insertion and the ongoing tracheostomy care. This ensures they understand and can participate in making decisions about their care. A glossary of terms can be used to ensure patients and carers understand the technical terms used in the information provided.

Table 3: Recommendations for patient preparation

Recommendations	Source
All patients with a tracheostomy should receive a patient-centred multidisciplinary approach, allowing the patient and carers access to all members of the tracheostomy review team.	Working group consensus
The plan of care should be developed in consultation with the multidisciplinary team, patient and carer where possible at the following times: • elective tracheostomy – a preoperative assessment should be undertaken • emergency tracheostomy – as early as possible following tracheostomy insertion. The plan of care should include: • education of patient and carers or parents relating to tracheostomy procedure, post procedure care, clinical management and communication strategies post-insertion • identification of available psychological and psychosocial support.	Working group consensus
Patients and carers should be provided with information in a format and language that they can understand. This information should include: reason for the tracheostomy, securement, suctioning, sputum, cleaning and dressing of stoma, inner cannula care, humidification, communication differences, use of speaking valves, hand hygiene, cleaning and storage of reusable equipment.	Working group consensus

Patient assessment

There are many domains involved in assessing a patient with a tracheostomy in the acute care setting. The following recommendations focus on components of the physical assessment and should be incorporated in conjunction with a complete physical assessment.

Table 4: Recommendations for patient assessment

Recommendations	Source
All healthcare professionals directly involved in patient care must complete and document patient assessment at intervals appropriate for the patient's clinical condition.	Working group consensus
For nursing staff, this interval should be: • intensive care and close observations units: as clinical condition, and unit policy directs • ward areas: minimum four-hourly and more often if clinically indicated.	Working group consensus
For nursing staff, patient assessment should include: • airway: evaluation of securement device, tube patency, type and size of tracheostomy, cuff pressure, humidification, need for suction, inner cannula in situ, dressing integrity and stoma site inspection • breathing: chest auscultation and movement, Sp02 and respiratory rate • level of consciousness and orientation.	Working group consensus
Continuous pulse oximetry should be in place where clinically indicated. This should include patients: • with a new or recently changed tracheostomy tube (not inclusive of long-term tracheostomy patients) • receiving continuous oxygen ≥4Lpm • with variation from target respiratory parameters • following changes to tracheostomy tube management • on ventilatory support.	Working group consensus

Equipment

Management of the patient with a tracheostomy requires use of and access to specialised equipment. To facilitate optimal clinical care and intervention the following equipment must always be available in the clinical area that a patient with a tracheostomy is being cared for. Example of bedside and emergency equipment checklists are available in the toolkit.

Table 5: Recommendations for bedside and emergency equipment

Recommendations	Source
Bedside equipment must include all items required to manage daily needs for tracheostomy care including: • emergency equipment • stoma care • inner cannula change and cleaning • suction • humidification • cuff management.	Working group consensus
Emergency equipment should be available at the bedside in a self-contained box, bag or pack.	Working group consensus

Patient transportation between clinical areas

This group of recommendations concerns safe and appropriate movement between clinical areas including transfer to new ward settings, theatre or diagnostic units.

Table 6: Recommendations for safe patient transport between clinical areas

Recommendations	Source
Prior to transporting a patient from one hospital to another, the patient must be clinically assessed by a senior medical clinician. The senior clinician should check that it is appropriate to transport them and ensure that any signs of acute deterioration are managed prior to transport.	Working group consensus
Patients must be supervised by clinical staff who: • have tracheostomy care within their scope of practice • can provide appropriate care for the patient's clinical condition and airway requirements • have had training in emergency tracheostomy airway management.	Working group consensus
A transport safety checklist must be attended prior to patient transport to ensure the patient is appropriately prepared (see toolkit for an example). The emergency equipment required for transport must be contained in a dedicated bag, box or pack must be readily available (see toolkit). Transport equipment must be checked immediately prior to transport to ensure that it is functional.	Working group consensus
Where patients are transferred between clinical settings, a comprehensive handover must occur at the bedside: • based on ISBAR principles • include information regarding the purpose for the tracheostomy tube, especially with respect to airway maintenance, type of tube and size, sputum, humidification, patient's clinical condition and vital signs • be communicated verbally and documented in health record.	Wang, Tsai, Chen, et al. 2017[8]
Following transport or transfer to a different clinical setting a patient assessment should be completed to ensure that the patient's airway and general condition has not deteriorated. This should occur regardless of the length of time since last assessment.	Working group consensus

Clinician education

All nursing staff caring for a patient with a tracheostomy should receive education on airway anatomy and physiology, airway safety management, tracheostomy management, emergency management of the tracheostomy and infection control practices. Regular scenario-based training with a focus on clinical care and emergency management in the clinical environment should occur to maintain currency of knowledge and skills. Non-technical skills should also be incorporated into scenario-based training.

All education regarding tracheostomy management should involve evaluation of learning. Assessment of competency should occur through completion of a formal assessment to ensure bedside staff are competent to care for the patient with a tracheostomy. This should incorporate a consistent transparent level of assessment by designated clinicians who have expert knowledge and skills in tracheostomy management.

The continuing professional development toolkit provides guidance on domains to be included in tracheostomy competency assessment and education courses.

Table 7: Recommendations for education for clinicians

Recommendations	Source
Education and competency assessment must include: • understanding of airway anatomy and physiology • clinical management of the tracheostomy • recognition, management and escalation of the deteriorating patient • airway management skills • emergency tracheostomy management • infection control practices.	Working group consensus
Clinicians caring for patients with a tracheostomy must be provided with a continuing professional development program that prepares them to provide safe and effective care of patients with a tracheostomy.	Working group consensus
Local hospitals and districts should ensure staff are provided with refresher training prior to patients being admitted where exposure to patients with a tracheostomy is infrequent.	Working group consensus
The management of tracheostomy and laryngectomy emergencies should be included in clinician education programs.	Working group consensus
At least 50% of staff working in clinical areas caring for tracheostomy patients should have passed a competency assessment in the management of the relevant emergency situations.	Working group consensus
The program should be targeted towards developing the clinician's scope of practice.	Working group consensus
Health care facilities should evaluate their tracheostomy education programs on an annual basis for the effectiveness in meeting the needs of the patient population and the clinical staff.	Working group consensus

Maintaining a patent airway

Maintaining a patent airway

Choice of tracheostomy tube

The choice of the tracheostomy tube will be influenced by clinical condition, the type of the tracheostomy performed (surgical versus percutaneous), expected duration of tracheostomy and the individual patient's needs.[2, 5]

In general, cuffed tracheostomy tubes are used for patients requiring mechanical ventilation or at risk of aspiration. Uncuffed tubes are used for patients who are spontaneously breathing and can clear their own secretions. Tubes are also available with or without fenestrated tubes. A fenestrated tube allows additional airflow to the larynx to assist with vocalisation.

Maintenance of tracheostomy tube position

Maintenance of tracheostomy tube position is of paramount importance in the daily care of the patient.

The optimal position for a tracheostomy tube within the trachea is important to ensure:

- adequate ventilation
- prevention of complications such as injury to the trachea.

Maintaining the optimal position of the tracheostomy tube within the trachea requires attention to:

- patient condition: presenting problem, level of consciousness, degree of cooperation, agitation or delirium
- stabilisation: method of securing the tube so that it remains within the trachea
- clinical staff: level of competency and experience.

Stabilisation of the tube

Tracheostomy stabilisation is achieved using securement devices that may include tapes and sutures.

Securement devices may include:

- cotton tapes secured with a bow tie or double knot to secure new tracheostomy tubes as these are less likely to become loose
- manufactured tapes using nylon fastener where the tracheostomy tube is unlikely to be removed and self-decannulate
- stabilisation using flange or stay sutures are forms of securement devices that may be used when there is:
  - oedema formation secondary to interruption of venous and lymph drainage
  - increased intra-cranial pressure
  - complete loss of the airway if the tracheostomy was to be displaced
  - micro vascular reconstruction (flap) to the head and neck area.

If a patient has flange or stay sutures, more frequent assessment of the stoma is required with extra attention to the skin under the flange, as a pressure injury may quickly develop.

Table 8: Recommendations for maintaining the patient airway

Recommendations	Source
To minimise damage to the tracheal wall by the distal end of the tracheostomy tube, the tube should be maintained in a central position, avoiding angling and contact between tracheal mucosa and tube. Traction and unnecessary movement of the tube should be avoided.	Working group consensus
Two clinicians must always be present to change the tracheostomy tube securement device: • one clinician changes the securement device • one clinician holds the tracheostomy in position • at least one clinician must be experienced in tracheostomy management.	Working group consensus
The securement method and dressing should not be changed for 24 hours after insertion or as specified by post-insertion orders due to the risk of accidental decannulation or displacement. If the patient's securement is too loose or tight, the patient should have a medical review.	Working group consensus
Tracheostomy tapes should be changed at least once daily (except within the first 24 hours) and more frequently under the following circumstances: • increased risk of pressure injury (fragile skin, excoriation, skin surrounding stoma soiled or wet, securement device soiled or wet) • where tapes are too tight (unable to insert one digit between tapes and skin) • where tapes are too loose and there is excess movement (>1cm in any direction) of the tracheostomy tube.	Working group consensus
The method of stabilisation should be consistent within a unit and supported by a protocol or procedure to promote staff proficiency in safe and effective tracheostomy care.	Working group consensus
The most appropriate method of stabilisation should be based on the: • patient's diagnosis, current medical condition and neck shape • patient's level of consciousness, orientation, understanding, memory and cooperation • maturity of cutaneo-tracheal tract • skin condition (including oedema, excoriation, maceration or excess exudate) • level of difficulty in achieving an airway if accidental decannulation or tube displacement were to occur.	Working group consensus
• Where the tube is sutured in, scissors or a suture cutter must be by the bedside in the event of partial tube displacement occurring. • If airway is secured by sutures only, a nurse who has tracheostomy experience must be available. • Stabilisation or flange sutures should be reviewed daily and removed as soon as practicable. • Assessment of flange sutures and stoma must be documented in the health record.	Working group consensus

Recommendations	Source
Location of stay sutures, if present, in tracheal cartilage must be documented (north and south or east and west) and easy to access in the event of emergency.	Working group consensus
Closed suction and attached tubing must be supported so the tube is maintained in a central position and there is no lateral drag on the tracheostomy tube.	Working group consensus
Where an adjustable flange tracheostomy tube is used, the position and orientation of the flange relative to the tube must be: • marked permanently • inspected at least once a shift to ensure the mechanism is fully locked and correctly orientated (refer to manufacturer's instructions) • documented in health record to identify tube lock confirmed, orientation, position and if migration has occurred notify medical officer immediately.	Working group consensus
A trained clinician must hold the tracheostomy tube and support the patient's head when: • the patient is mechanically ventilated during repositioning or pressure area care (PAC) • the patient has a newly inserted tracheostomy tube (<7 days) or their cutaneo-tracheal tract is not mature for repositioning or PAC or mobilising • changing the dressing • the patient has an identified difficult airway • repositioning where there is tubing attached to the tracheostomy. Beyond seven days, a risk assessment by a staff specialist and senior nurse must be conducted to decide if a designated clinician to hold the tube is required in the following circumstances: • position changes in a bed, theatre table or chair • moving from bed to chair and the reverse • standing from a chair • walking • excessive coughing.	Working group consensus

Cuff management

Tracheostomy tubes may be cuffed or uncuffed. A cuffed tracheostomy tube provides a seal in the trachea to facilitate positive pressure mechanical ventilation and reduce aspiration of gastric or oropharyngeal secretions into the lungs. An inflated cuff will reduce the patient's ability to communicate by speech as airflow will not be directed through the larynx. Ensuring the cuff pressure is in the recommended ranges will prevent tracheal mucosal ischemia and minimise microaspiration.[4]

Table 9: Recommendations for cuff management

Recommendations	Source
Intracuff pressure of a cuffed tracheostomy tube must be maintained at 20-30cm H_2O.	Hockey, van Zundert, Paratz. 2016[4]
Cuff pressure should be measured directly using a cuff manometer: • at least once every eight hours and when clinically indicated • immediately post-tracheostomy insertion • on transfer of care • after significant patient movement • where there are any concerns about air leak from the respiratory system • post cuff inflation by a syringe.	Hockey, van Zundert, Paratz. 2016[4]
Where there is a persistent cuff leak, the clinician who identified the leak should notify either the intensive care team, admitting medical team, tracheostomy review team or ear nose throat (ENT) team to review the patient.	Working group consensus
• Where a cuff manometer is used among multiple patients, it must be cleaned between patients using the hospital infection control practices, according to manufacturer's instructions. • Infectious patients should have their own cuff manometer.	Working group consensus
Cuff deflation must only occur if ordered by medical team, tracheostomy review team or nurse practitioner responsible for management of the tracheostomy tube, with documented clinical parameters and changes to the patient's condition escalated to the medical team.	Working group consensus

Tracheostomy humidification

Inspired gases delivered to the patient via a tracheostomy tube bypass the normal mechanisms of humidification and warming supplied by the naso-oropharynx. To compound this problem, supplies of medical air and oxygen delivered to the patient are cool and dry. As piped wall gases increases, the absolute humidity significantly decreases.[5]

Artificial humidification via the tracheostomy is essential to maintain effective respiratory function and prevent secondary complications such as tracheal tube occlusion.

Inhaled gases can be actively or passively humidified. Active humidification occurs through the use of a heater that warms and moistens gases as they pass over the surface of a heated water reservoir connected to the respiratory circuit.[9] Passive humidification occurs through the use of a heat and moisture exchanger (HME) where the condenser retains heat and moisture from the exhaled breath and returns the heat and moisture on the inspired breath.[9]

Table 10: Types of humidification

Humidification type	Device	Patient with the following
Passive (artificial)	Heat and moisture exchanger	• Spontaneous breathing • Stable respiratory function • Volume of secretions is moderate or low • Tracheostomy tube with or without an inner cannula • Requirement of FiO_2 <40%.
Active	Specialised ventilation circuit, humidifier base and sterile water in a continuous irrigation bag.	• Large volume, thick or tenacious secretions • Hypothermia • Thermal injury to airway • Single lumen, adjustable flange, foam or silicone tracheostomy tubes • Irritable airways • Airway bleeding • At clinical discretion.

Table 11: Recommendations for humidification

Recommendations	Source
Inspired gases should be humidified to maintain effective mucociliary function and gas exchange.	Working group consensus
Humidification method should be selected on an individual patient basis, assessed daily and documented.	Working group consensus
The patient's systemic hydration should be assessed and maintained to reduce the viscosity of sputum.	Working group consensus
• Active humidification should be applied where a speaking valve is in place for longer than 30 minutes for a spontaneously breathing patient. • Active humidification should be used for adult patients where a speaking valve is in the ventilator circuit.	Working group consensus
HMEs should be checked at a minimum, every four hours. Patients with an increased sputum load or thick secretions will require more frequent checks or a change to active humification system.	Working group consensus
HMEs should be changed: • at least once every 24 hours • when soiled or as per manufacturer's guidelines.	Working group consensus
The active humidification circuit must be 37°C to ensure 100% relative humidity.	Gillies, Todd, Foster, et al. 2017[9]
Sterile water for irrigation should be used for water-bath humidifiers and they must not be left to run dry.	Working group consensus
Active humidification circuits should be changed if soiled or as per manufacturer's recommendations.	Working group consensus
Humidification circuit must always be lower than the level of the tracheostomy tube to prevent aspiration of condensation from the tube.	Working group consensus

Tracheostomy suctioning

Suctioning is necessary for patients with a tracheostomy tube to maintain the patency and integrity of the airway. Patient monitoring for suction requirements should include:

- continuous clinical assessment of ventilated patients for need for suction, in conjunction with chest auscultation performed every two hours or more frequently if indicated
- assessment of non-ventilated patient with a tracheostomy for need to suction at a minimum four-hourly or more frequently if clinically indicated.

Suctioning carries risks of haemodynamic instability, hypoxia and mucosal damage.[7] Careful monitoring of the patient during and after the suctioning event is important. In adult ventilated patients, a closed suction system minimises aerosolisation of respiratory secretions, is safer for clinicians and is a technically simpler procedure.[7]

Closed suction systems are of benefit for patients with:

- copious secretions
- high FiO_2
- positive end expiratory pressure (PEEP)
- patients requiring droplet or airborne precautions.

Care should be taken as the closed suction system adds weight to the tracheostomy tube and there is potential for dislodgment. Consideration of tracheostomy tubes with subglottic suction capabilities where suctions are removed above the cuff, may be of benefit as part of a coordinated program to prevent nosocomial pneumonia. This would depend on unit, hospital or district policy.[10]

A systematic review and meta-analysis found that normal saline instillation before suctioning did not benefit patients and resulted in a reduction of oxygen saturation five minutes after the suction.[9]

Evidence does not support the use of routine pre-oxygenation prior to suctioning.[10] However pre-oxygenation is recommended in patients who are hypoxemic or at risk of significant desaturation during or after suction.[10]

Table 12: Descriptors of clinical signs and symptoms that may be indicative the patient requires suctioning[4]

Clinical sign or symptom	Description
Secretions	Visible or audible secretions (such as sputum, gastric or upper airway contents or blood).
Respiratory	• Desaturation • Rising peak inspiratory pressure • Decreasing tidal volume • Increased respiratory rate • Increased work of breathing • Coarse breath sounds on auscultation.
Ventilation graphics	Saw-tooth pattern on a flow-volume loop or expiratory flow-time waveform (Figure 1).
Other	• Increased heart rate and blood pressure • Restless, agitated or diaphoretic patient.

Figure 1: Ventilator graphics courtesy of Prince of Wales adult intensive care unit

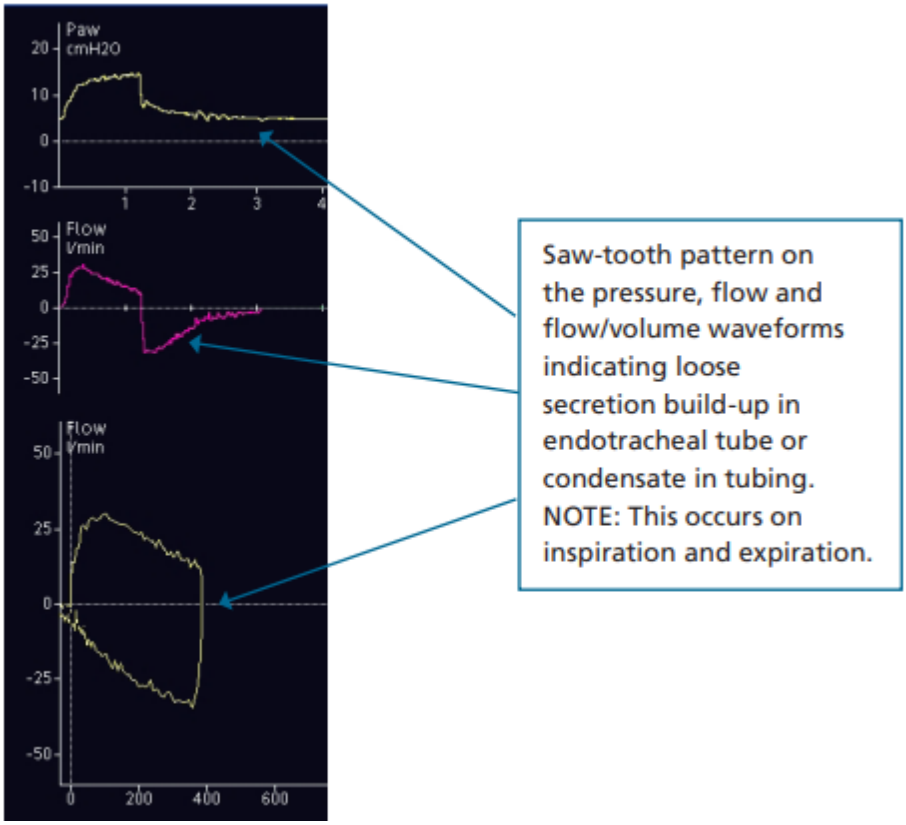

Table 13: Recommendations for suctioning

Recommendations	Source
Clinicians completing suction procedures must wear personal protective equipment and perform hand hygiene appropriate for the precautions required for the patient.	Clinical Excellence Commission. 2020[11]
Tracheal suctioning should only be performed when clinically necessary for the patient and not dictated by routine.	Wang, Tsai, Chen, et al. 2017[8] American Association for Respiratory Care. 2010[10]
A referral to physiotherapy should be made for patients with coarse crackles, increased sputum load, retained secretions or an inability to clear their own secretions and if possible, verified on chest X-ray.	Working group consensus
Prior to suctioning, a clear explanation regarding the procedure and process should be given to the patient.	Working group consensus
During a suction procedure, the patient must be assessed for clinical stability, and the need to repeat suctioning depending on the amount of secretions and patient stability.	Working group consensus
Where a fenestrated tracheostomy tube is in-situ, a non-fenestrated inner cannula should be inserted prior to suction.	Working group consensus
The upper airway should be suctioned as required to remove oral secretions above the tracheostomy cuff, or as part of oral care with a Y suction catheter.	Working group consensus
The size of the suction catheter should occlude no more than 50% of the internal diameter of the artificial airway.	American Association for Respiratory Care. 2010[10]
Suction catheters should be specific for use with a tracheostomy tube. If longer catheters are used, they must be measured against spare inner cannula or tracheostomy to measure required length of insertion to reduce risk of tracheal trauma.	Working group consensus
Closed suction systems should be changed according to manufacturer's guidelines and as required labelled to identify when a change is due.	Working group consensus
Suction procedures using an open technique should be completed using non-touch technique.	Working group consensus
Single use suction catheters must be used for one suction procedure only and then disposed in appropriate waste bag.	Working group consensus
The total suction procedure (from insertion to removal of catheter) should take a maximum of 15 seconds with negative pressure applied continuously as the catheter is being withdrawn.	Wang, Tsai, Chen, et al. 2017[8]

Recommendations	Source
The wall outlet should have a high-pressure regulator attached and high suction pressure applied based upon sputum load and consistency using the lowest effective pressure.	Wang, Tsai, Chen, et al. 2017[8]
For patients with an effective cough, the suction catheter should be inserted down a tracheostomy tube until it emerges out of the lumen of the tube. For patients with a poor cough, an appropriate length suction catheter needs to be assessed by the tracheostomy team and documented in the care plan to the length of catheter insertion. To prevent trauma to the carina mucosa and potential perforation.	Wang, Tsai, Chen, et al. 2017[8] Gillies, Todd, Foster, et al. 2017[9]
Suction procedure and outcomes should be documented including patient assessment, indications for suction, outcome of suction procedure including patient tolerance, sputum colour, degree of suctioning, consistency and volume.	Working group consensus

Care of the inner cannula

Cleaning aims to remove secretions from the inner cannula, reducing the risk of potential obstruction with sputum and risk of infection. The care of an inner cannula is a clean procedure which requires hand hygiene before and after donning and doffing the appropriate personal protective equipment (PPE).

Table 14: Recommendations for care of the inner canula

Recommendations	Source
A tracheostomy with an inner cannula should be the standard of care when heated humidification is not used for tracheostomy tubes.	Working group consensus
• The inner cannula should be checked for patency and tube integrity; and cleaned and replaced at minimum four hourly. • More frequent checks may be required for patients with tenacious or high sputum load and for those on mechanical ventilation. • If mechanically ventilated, it may not be safe to repeatedly disconnect the circuit. If the inner cannula cannot be changed, this should be escalated to the tracheostomy review team or medical staff and documented in the health record with the concern and rationale.	Working group consensus
• The inner cannula should be cleaned and dried according to manufacturer's guidelines, reinserted in tracheostomy or immediately stored in a clean dry sealable container. • The inner cannula should not be cleaned at hand washing basins because of the risk of contaminating both the hand basin and inner cannula with microorganisms from the other.	Working group consensus
A spare clean inner cannula must always be at the bedside.	Working group consensus

Changing the tracheostomy tube

Avoid elective early tracheostomy tube change within 72 hours of the formation of the cutaneo-tracheal tract as this may be hazardous, particularly in patients with a history of difficult intubations. Where the change is required, it is suggested 7-14 days post-insertion to ensure the cutaneo-tracheal track has matured. If required earlier, the tube change should be undertaken with extra caution and review by a multidisciplinary team is required. If patient had a surgical tracheostomy that used flaps to form the tracheostomy, creating a formed track earlier, this may allow earlier tracheostomy tube change. If an earlier tracheostomy tube change is required, multidisciplinary team assessment should occur.

The clinician performing the tracheostomy change procedure should have appropriate equipment to undertake the procedure according to unit policy and individual patient needs. All necessary equipment should be readily available, prepared and checked with the plan discussed with the team and patient prior to procedure. An emergency airway trolley should be readily accessible.

Table 15: Recommendations for changing the tracheostomy tube

Recommendations	Source
• The decision to change a tracheostomy tube must be made by a multidisciplinary team experienced in tracheostomy care, in conjunction with the admitting medical team. The clinical reason for the tracheostomy tube change should be documented in the health record. • Local procedure for frequency of tracheostomy change should take into consideration manufacturer recommendations.	Working group consensus
Informed written consent for the tracheostomy procedure must be obtained from the patient or next of kin and documented in the health record.	Wong, Shakir, Farboud, et al. 2016[12]
The procedure should be undertaken in a safe environment with staff skilled in tracheostomy care with appropriate emergency equipment readily available.	Working group consensus
The team inserting the tracheostomy must ensure a '*time out*' is performed as outlined in *NSW Health Policy Directive: Clinical Procedure Safety* (PD2017_32).	Clinical Excellence Commission, 2017[6]
Where the tracheostomy change is required within the first seven days, or when there is a risk of difficult re-cannulation, a senior medical officer with advanced life support training and advanced airway skills must be present.	Working group consensus
• Tracheostomy tube changes must only be performed by, or under the direct supervision of, a clinician with competency in this skill, and where it is within their scope of practice. • A tracheostomy tube change should be a minimum two-person procedure. • Complex patients may require additional team members.	Working group consensus

Recommendations	Source
• Where the change is a planned procedure, the patient should be assessed for the risk of aspiration of gastric contents and action taken if risk identified. • The patient should be nil by mouth for a minimum of six hours prior to tracheostomy change. Alternatively, if a nasogastric tube, percutaneous endoscopic gastrostomy (PEG) tube or percutaneous endoscopic jejunum (PEJ) tube is present, feeding should be turned off four hours prior and the tube aspirated to empty the stomach immediately prior to tracheostomy tube change.	Working group consensus
Patient should be physically monitored for 30 minutes post-first tracheostomy change, then clinical observations including continuous pulse oximetry and full set of vital signs, hourly for four hours, then four-hourly for 24 hours or as clinically indicated.	Working group consensus
The procedure should be documented in the patient's health record, tracheostomy management plan and observation notes. The documentation should include: • size and type of tracheostomy tube, the product's lot number and expiry date • any complications or problems arising during procedure e.g. abnormal bleeding, trauma or difficult insertion • the condition of the tracheostomy stoma and the surrounding skin e.g. over-granulation, wound breakdown • if subsequent tube change is required, document due date.	Working group consensus

Stoma care

Patients with a tracheostomy can often be predisposed to device-related pressure injuries including exposure to direct pressure from the tracheostomy flange, shear and friction forces, skin moisture or secretions, exacerbated by patient clinical condition and malnutrition.[13]

To prevent potential device-related pressure injury and stoma breakdown it is necessary for clinicians to assess the site for signs of inflammation, infection, excoriation, maceration, oedema, excess exudate, bleeding, pressure injury, granuloma formation or subcutaneous emphysema.

Dressing choice is an important consideration in stoma care. Dressings should be large enough so as to not pose a threat of aspiration into the stoma cavity or airway. The use of a pre-cut dressing should be considered to prevent the risk of fibres entering the stoma.

Tracheostomy dressings are not essential but should be utilised where there is excessive exudate, increased risk of pressure injury from the tracheostomy or where it is more comfortable for the patient. Post-decannulation an airtight dressing will assist in stoma closure.

Table 16: Recommendations for care of the stoma

Recommendations	Source
Assessment of the tracheostomy stoma and surrounding skin (including under securement devices and dressing) should be undertaken once each shift and more frequently if clinically indicated.	Working group consensus
Increased frequency of tracheostomy assessment should occur where flange sutures are in situ as pressure injury may quickly develop.	O'Toole, Jacobs, Hondorp, et al. 2017[13]
Preventative strategies to protect the patient's skin should be implemented, including: • maintaining tube stability and position; reduce shear and friction forces • apply hydrocolloid or foam dressing • use of barrier wipes around stoma site for patients with moist skin or excessive secretions.	Yue, Lei, Liu, et al. 2019[14]
The tracheostomy stoma should be cleaned, at minimum, daily with 0.9% sodium chloride and sterile gauze using an aseptic technique. Increased frequency may be required if clinically indicated to ensure the stoma and surrounding skin remain clean and dry.	Working group consensus
Pre-packaged tracheostomy dressings should be used. If flange sutures do not allow for pre-packaged dressings to be used, they must be cut to appropriate size using an aseptic technique.	Working group consensus
Stoma assessment and care must be documented in the health record.	Working group consensus
If there is heavy exudate, bleeding or stoma breakdown a medical review must occur with wound care clinical nurse consultant referral if available and the plan and outcome of the review documented in the health record.	Working group consensus

Prevention of infection

Clinicians must follow the five moments of hand hygiene,[11] wear appropriate PPE and follow NSW Health infection control policies.[15] Secretions from a tracheostomy could be considered a potential risk of exposure, so compliance with appropriate PPE is required, this may take the form of protective eye wear, face shield and surgical mask as per hospital or LHD infection control policies and guidelines. Respiratory and cough etiquette should be followed with strategies to manage the secretions.

Patients and carers must receive direct instructions and education on hand hygiene and other infection control principles required in their care.

Oral hygiene

Dental plaque accumulates rapidly in patients in the acute care setting. This increases the patient's predisposition to oral colonisation by microbial pathogens.[16] Micro aspiration of colonised pharyngeal secretions around an imperfect tracheostomy seal can contribute to nosocomial pneumonia.[16]

Both mechanical removal of the plaque using a toothbrush to disturb the biofilm and chemical control as part of a coordinated oral hygiene program has been found to reduce the incidence of nosocomial pneumonia in ventilated patients.[16]

Table 17: Recommendations for oral hygiene

Recommendations	Source
Nursing assessment of the patient's oral hygiene should incorporate: • daily assessment of the oral cavity using an oral assessment tool to evaluate oral health and plan appropriate oral care • evaluation of the patient's ability to complete their own oral care • escalation of care for patients with poor oral health including dentistry assessment if required.	Working group consensus
Teeth brushing should occur twice daily and incorporate: • brushing of the teeth, gums, tongue and hard palate with a soft toothbrush and a small amount of low foaming toothpaste to remove and prevent plaque development • use of a suction toothbrush if available • cleaning of dentures • rinsing or irrigation with small amount of clean water to remove toothpaste and debris • deep oropharyngeal suctioning to remove secretions if patient unable to spit contents out.	Zhao, Wu, Zhang, et al. 2016[16]
To maintain a moist oral cavity the mouth should be rinsed or moistened at regular intervals: • antiseptic solution should be considered four-hourly in patients unable to attend their own mouth care • distilled, sterile or bottled water should be applied using swabs in between antiseptic solution.	Zhao, Wu, Zhang, et al. 2016[16]
For patients with reduced saliva flow (xerostomia), a regular salivary replacement should be considered.	Working group consensus
The oral hygiene regime should be modified for patients who have, or are at a high risk for, bleeding gums. Regular rinsing with antiseptic and the use of swabs may be necessary.	Working group consensus

Weaning to decannulation

The requirements for a tracheostomy vary between patients and this may impact the rate of weaning to final decannulation. The decision to commence weaning and proceed to decannulation should be a collaborative decision involving the admitting medical team, multidisciplinary team, tracheostomy review team (if available), patient and carer. The decision should be informed by the local hospital or district processes.

Patients may be considered for decannulation if they fulfil the following:

- the patient is hemodynamically stable
- the patient has been free from ventilatory support for >24 hours
- the airway has been assessed as patent with cuff deflation and digital occlusion (described below) or nasendoscopic visualisation of the airway
- a cuff to protect their airway from oral secretions is not required
- the patient has a strong cough and is able to clear secretions spontaneously
- the original reason for the tracheostomy has resolved.

This section will not discuss weaning a patient with a tracheostomy tube from mechanical ventilation. This is influenced by many factors and is out of scope for this guide.

The process towards decannulation can occur through different methods. These can include direct removal, routine downsizing, changing to a cuffless tracheostomy, use of fenestrated tracheostomy tube, spigotting, capping, corking or use of a speaking valve and in the presence of a cuffed tracheostomy tube, cuff deflation.

Appendix 1 includes an example of a guideline on weaning and decannulation that has been produced by Northern Sydney Local Health District and reproduced in this guide with permission.

Complete cuff deflation

This involves deflating the tracheostomy cuff to restore the passage of air to the upper airway. This process assists in determining the ability of patients to manage their own oral secretions, protect their own airway and assist clinicians to determine upper airway patency.

During cuff deflation, clinicians assess for signs of respiratory distress and aspiration. Consultation with the multidisciplinary team will determine the length of time for cuff deflation trial, this may be as brief as five to ten minutes initially and extended as the patient tolerates. Clinical practice strongly supports 24-48 hours of full cuff deflation in the presence of a patent airway as an indicator of the patient selection for decannulation.

If a patient is unable to tolerate cuff deflation for extended periods, the cuff should be re-inflated and the reasons for failure should be documented and communicated to the medical team. Where dysphagia is present it is not a contraindication for an initial cuff deflation trial. However, where there is dysphagia present or the swallow is noted to be impaired or absent, a speech pathologist should be consulted.

Determination of the progression to a speaking valve or capping of the tube, requires cuff deflation in conjunction with digital occlusion to assess airway patency. If patient is unable to tolerate digital occlusion, further assessment by an ENT specialist may be required with consideration of downsizing tube or changing to a cuffless tracheostomy tube.

A cap or speaking valve trial may be performed to assess adequate airflow, cough effectiveness, swallow and secretion management. The patient must be closely monitored for signs of decompensation during the weaning process, cared for and escalated appropriately. Local policy, including the use of speaking valves or caps on fenestrated tubes, should be adhered to.

Signs to observe for when weaning for decannulation and observations required during the process

When a patient is weaning for decannulation, observe for the following signs of decompensation:

- Absence of audible airflow
- Stridor
- Sudden increase in airflow when occlusion removed
- Significant secretions
- Poor cough
- Tachycardia
- Anxious, restless, sweaty, clammy
- Increased work of breathing:
  - Tachyponea
  - Decreased oxygen requirements
  - Accessory muscle use, nasal flaring
  - Sternal notch retraction
- Decreased Glasgow Coma Score.

The following observations should be done following a new intervention for a patient, e.g. first cuff deflation, first capping or phonation valve placement or decannulation:

- Continuous pulse oximetry for 24 hours
- A complete set of vital signs hourly for the first four hours then four-hourly for 24 hours.

Table 18: Recommendations for weaning to decannulation

Recommendations	Source
The decision to commence weaning and proceed to decannulation should be a collaborative decision involving the admitting medical team, multidisciplinary team, patient and carer. Advice could be sought from a tertiary tracheostomy review team if required.	Working group consensus
The plan should be based on the patient's overall clinical presentation and status.	Working group consensus
The plan should be documented in the health record, reviewed at least daily and updated as required.	Working group consensus
Emergency equipment must be available and checked as part of preparation for weaning and decannulation (see toolkit).	Working group consensus
Clinicians involved must have, or be supervised by clinicians with, tracheostomy knowledge, emergency tracheostomy management and experience to decannulate the patient.	Working group consensus
Weaning should be limited to clinical areas where ongoing assessment and close monitoring of the patient can occur, where experienced clinicians or the tracheostomy review team are available to provide timely clinical advice if complications occur.	Working group consensus
In patients who do not meet typical decannulation criteria, weaning and decannulation could still be considered with multidisciplinary team input, using a risk-benefit approach including quality of life factors.	Working group consensus
Patients must have an individualised plan with acceptable clinical parameters developed and discussed with the clinicians responsible to identify clinical tolerance, acute emergency or gradual deterioration.	Working group consensus
For patients who have had head and neck surgery, the decision to decannulate should be made by, or in consultation with, the ear nose and throat team and surgeon and multidisciplinary team.	Working group consensus
The patient should be fasted for a minimum of six hours prior to removal of the tracheostomy and if a nasogastric tube is present, this should be aspirated to empty the stomach.	Working group consensus
If sutures were used in securing of the tracheostomy tube, these must be removed prior to decannulation.	Working group consensus

Recommendations	Source
An occlusive dressing should be applied to the stoma after the tracheostomy tube is removed and is required to be: • assessed at least daily • large enough to cover the stoma • changed if odorous, contaminated by secretions or if no longer airtight.	Working group consensus
Post-decannulation clinical observations including continuous pulse oximetry and full set of vital signs, must occur hourly for four hours, then four-hourly for 24 hours or as clinically indicated.	Working group consensus
An electrocardiogram dot may be applied centrally over the top of the dressing, for the patient to apply digital pressure when coughing and talking.	Garcia-Rodriguez, Miah, Lindholm, et al. 2017[17]
The procedure must be documented in the patient's health record, tracheostomy management plan and observation notes and should include: • any complications or problems arising during procedure the condition of the tracheostomy stoma and the surrounding skin, e.g. over-granulation or wound breakdown.	Working group consensus
Once stoma is closed, clean and dry, dressings should cease.	Working group consensus

Emergency care

Patients with a tracheostomy or laryngectomy can suffer from acute respiratory distress, respiratory dysfunction or cardiorespiratory arrest at any time during their patient journey.

The presence of a tracheal stoma increases the incidence of emergencies and the harm suffered by patients as a result.[18, 19] This has led to safety notices being issued in Australia and the United Kingdom highlighting the need for strategies to prevent and manage tracheostomy and laryngectomy emergencies, including emergency algorithms.[18]

Analysis of adverse events in NSW and internationally has identified the following recurring themes:[3, 18, 19]

- Obese patients are at risk – thick layer of adipose tissue overlying the trachea, meaning that the standard length of tracheostomy tubes is not long enough and the tubes may become displaced.[20]
- The cause of the respiratory emergency may not be clear, it can be difficult to distinguish between a displaced tube, a blocked or partially blocked tube, cuff leak or rupture, airway haemorrhage, pulmonary or neuromuscular problems.
- The most immediate life-threatening emergencies occur with blocked or displaced tubes, with most adverse events occurring with a failure to assess tube patency, inadequate attempts to clear the airway and delay in removing the tube.
- Continuous waveform capnography increases safety in patients with tracheostomy and laryngectomy, allowing for earlier detection of accidental decannulation, tube displacement and partial and complete tube blockages. Its lack of use has been implicated in many adverse events.[18]
- Emergency management algorithms suggest the use of a Mapleson C system.[18] A manual breathing system with a flow inflating bag (rather than a self-inflating bag), such as a Mapleson C or F system, is a useful tool in the assessment of tube or stoma patency, adequacy of ventilation (in spontaneously breathing patients) and pulmonary compliance and resistance (when providing manual ventilation).
- Life threatening surgical emphysema may result from manual ventilation via a displaced tracheostomy and laryngectomy tube. This occurs when manual ventilation is performed without first checking tube position and patency.
- Replacing tracheostomy or laryngectomy tubes in an emergency can cause formation of false tracts, bleeding, surgical emphysema, loss of airway and death. These attempts also divert attention away from simple oral or stomal airway manoeuvres which are often neglected in reported incidents.[18]
- The age of the stoma is not a reliable indicator of ease of re-insertion of tracheostomy or laryngectomy tubes, especially in obese patients. Emergency re-insertion of tracheostomy tubes has resulted in patient harm and should only be carried out when other methods of oxygenation have failed.

An emergency algorithm should be followed to manage tracheostomy or laryngectomy emergencies. The emergency algorithms are located at Appendix 2 to manage tracheostomy emergencies and Appendix 3 for laryngectomy emergencies.

Specific life-threatening emergencies

Accidental decannulation and tube displacement

Accidental decannulation describes the situation where a tracheostomy or laryngectomy tube has become completely removed from the stoma. This may occur due to traction from tubing, being pulled out by a confused patient or being inadequately secured.

Tube displacement is said to have occurred when the tube moves out of its correct anatomical position, while still appearing to be in the stoma. This can result in partial or complete airway obstruction.

Tube displacement can be particularly dangerous as it may go undetected, with the outcomes for tube displacement therefore worse than for accidental decannulation.[21]

Patients are particularly vulnerable to these emergencies:

- when they are moved, especially if there are any attachments to the tube (such as suction, oxygen or ventilation tubing)
- within the first seven days, before their cutaneo-tracheal tract has matured
- if they have impaired cognition or level of consciousness and are therefore unable to fully understand the consequences of manipulation of their tube
- when the airway above the tracheostomy tube is not patent.

It is important that when tubes are accidentally removed or displaced, they are not simply pushed back into place, as this increases the risk of creating a false tract between the skin and trachea which makes the tracheostomy tube appear to be in position, when it is in fact outside the trachea.

Blocked tracheostomy or laryngectomy tube

A blocked or partially blocked tube is associated with significant harm to patients[3, 18] and is commonly the result of a combination of factors including:

- inadequate humidification and/or patient hydration leading to thick tenacious sputum
- absent or infrequent cleaning of the inner cannula.

Tracheostomy tubes with inner cannulas are preferred because the removal of the inner cannula may resolve a blockage. For blocked tubes without an inner cannula, suctioning or removal of the tube are the only options.

Table 19: Recommendations for emergency care

Recommendations	Source
All hospitals should have documented emergency plans that identify how tracheostomy and laryngectomy emergencies are to be managed. These plans should include: • emergency algorithms describing actions to be taken by ward clinicians and by emergency teams when patients are showing signs or symptoms of respiratory distress or dysfunction (see Appendix 2 and Appendix 3) • identification of key emergency response personnel at all times of the day • emergency equipment that should be available at the point of care and within the hospital (see toolkit).	Working group consensus
Patients should have a bedhead sign and emergency algorithm visible at the bedside which alerts clinicians that the patient has a tracheostomy or laryngectomy and contains the following information: • patient name • date and method of stoma formation (percutaneous or surgical) • size and type of tube in place • grade of intubation, ease of facemask ventilation (if known) • presence of flange sutures, stay sutures, dental wires or bands • contact details of clinicians to be called in an emergency • other relevant details, for example, upper airway patency, stenosis or cancer • the information should also be easily accessible in the tracheostomy insertion record.	Working group consensus
A box or bag of equipment for the management of respiratory emergencies should be kept in close proximity to patients with tracheostomy or laryngectomy at all times (including spare tracheostomy tubes the same size and smaller) (see toolkit).	Working group consensus
A flexible bronchoscope should be readily available to check the position of tracheostomy tubes and assist with fibre-optic oral, nasal or stoma intubation. This guidance applies only to hospitals where there is an intensive care unit (ICU) and clinician(s) with the relevant expertise to use a flexible bronchoscope.	Working group consensus
All staff caring for patients with tracheostomy or laryngectomy should be familiar with the signs and symptoms of respiratory distress or dysfunction.	Clinical Excellence Commission. 2020[22]
When signs and symptoms of respiratory distress are identified, a tracheostomy competent clinician should stay with the patient and initiate the emergency algorithm. Another clinician should activate the appropriate level of emergency call according to clinical criteria to mobilise the rapid response team or equivalent.	Working group consensus

Recommendations	Source
The emergency algorithm should describe the management of tracheostomy patient with respiratory distress, dysfunction and cardiorespiratory arrest. They should be available at the point of care and should align with the following principles: • Oxygenation of the patient should be prioritised at every step. • In spontaneously breathing patients, tube patency and breathing efficacy should be assessed by attempting to pass a suction catheter, waveform capnography and or a manual breathing system with a flow-inflating bag, before manual ventilation is performed. • Manoeuvres to assess tube patency should be combined with manoeuvres to clear the airway, including timely removal of a tube as soon as it is deemed to be displaced out of the trachea or irretrievably blocked. • If decannulation occurs, clinicians should concentrate on oral airway manoeuvres (in patients with a potentially patent upper airway) or stoma oxygenation and ventilation (in laryngectomy patients and tracheostomy patients without a patent upper airway). Re-intubation of the stoma should be performed by an experienced clinician, only when other methods of oxygenation have been ineffective. • The age of the stoma should not influence decision-making in the management of tracheostomy and laryngectomy emergencies.	Working group consensus
The admitting medical team and tracheostomy review team where available, must be notified if the patient is experiencing a respiratory emergency.	Working group consensus
Once an emergency has resolved, the ongoing airway management plan should be reviewed and updated in relation to contributory factors and patient status. This may include, but is *not* limited to the following: • type of monitoring required e.g. pulse oximetry • type of airway device • method of tube stabilisation • the patient's current level of supervision and visibility on the ward • the use of chemical or physical restraints where appropriate • method of humidification.	Working group consensus
Continuous waveform capnography must be used in patients receiving mechanical ventilation and easily accessible for all other patients with tracheostomy or laryngectomy.	Working group consensus
Elective early tube change, defined as within 72 hours of the formation of the tracheal stoma, may be hazardous and should be avoided, particularly in patients with a history of difficult oral intubation	Working group consensus
In obese patients, adjustable flange or extended-length tracheostomy tubes should be considered and extra care taken in securing them, especially before and during turning or moving the patient.	Russell, Matta. 2004[23]
When a patient experiences a respiratory emergency, this must be documented in the patient medical record and notification made to the primary care team and, where in place, the tracheostomy team.	Working group consensus
The management of tracheostomy and laryngectomy emergencies should be included in clinician education programs. At least 50% of staff working in clinical areas caring for tracheostomy and laryngectomy patients should have passed a competency assessment in the management of the relevant emergency situations.	Working group consensus

Tracheostomy complications

Irrespective of the stage or age of a tracheostomy, a patient is always at risk of developing complications. Table 20 outlines the list of potential complications and risks and precautions to be considered.

Table 20: Potential complications associated with a tracheostomy and precautions to be considered[23]

Complication	Description	Risks and precautions
Haemorrhage	• Bleeding may occur during insertion or as a complication at any time the tracheostomy is in situ. • This is usually minor but can be significant if there is damage to the paratracheal, thyroid or adjacent blood vessels either during or following insertion due to direct tissue trauma, infection or erosion of the tracheal wall due to cuff or tube pressure. • Coagulopathic patients are at increased risk of haemorrhage. • Blood clots may block the tracheostomy tube requiring suctioning to remove. If blood clots are large these will not be easily removed by usual suction catheters and may require the tube to be removed.	Delay in removing a blocked tube could result in hypoxia.
Tracheo-arterial fistula	• A rare complication which can occur when the tube erodes the innominate artery. Hyperinflation of the cuff (if present), or digital pressure on the stoma may tamponade the bleed temporarily while assistance is sought.	Any haemorrhage should prompt fibre optic inspection and immediate referral for definitive surgical management.
Pseudotract or false lumen	• A false passage anterior to the trachea can develop with reinsertion of a tracheostomy.	Delay in identification could result in hypoxia and death.
Subcutaneous emphysema	• May occur as a result of imperfect positioning of the tracheostomy tube at the time of insertion or following secondary tube displacement. • Patients who are mechanically ventilated are at particular risk if the tube is not adequately secured or maintained during routine care or attachments (circuits and suction catheters) are not appropriately secured.	Subglottic suction ports should not be used for speech in a freshly formed stoma, as the air intended for speech may leak though the stoma preventing speech but causing subcutaneous emphysema.
Pneumothorax	• Rare occurrence during insertion of low tracheostomy stoma.	

Complication	Description	Risks and precautions
Infection	• Patients with a tracheostomy are at increased risk of tracheobronchial infections due to bacterial colonisation of the tracheostomy tube and mucosal injuries related to airway cannulation. • Care must be taken to attend to oral care, oral and tube suction and regular inner cannula cleaning using infection prevention strategies. • Stoma site infections may be prevented by close attention to regular assessment and cleaning of the stoma site. Ulceration and necrosis of stoma site may occur if the stoma is not kept dry and clean.	Due to the risk of contracting hospital acquired infection while in hospital, all tracheostomies should be managed using clean, non-touch techniques and infection prevention principles.
Pressure injury	• Patients with a tracheostomy have multiple risk factors for device related pressure injury development including being exposed to direct pressure due to tracheostomy flange, shear and friction forces, skin moisture or secretions, exacerbated by patient clinical condition and malnutrition.[23] • Device related pressure injuries can cause devastating injuries and infection, resulting in increased patient discomfort and increased length of stay. • Regular assessment of the skin surrounding the stoma should be undertaken.	Stoma cleaning and application of a dressing should be attended to if required. Particular care should be taken where sutures are in situ. Maintaining the tube stability and position reduces shear or friction forces.
Granuloma	• Granulation tissue, which may be initiated by ulceration or damage in the airway, leading to inflammation and finally increased scar tissue formation which may partially obstruct the airway. • Treatment includes placement of a longer tracheostomy tube, surgical intervention or placement of a tracheal stent.	
Tracheomalacia	• Characterised by flaccidity of the supporting tracheal cartilage, widening of the posterior membranous wall, and reduced anterior-posterior airway diameter. • These factors cause tracheal collapse, especially during times of increased airflow.	
Tracheal stenosis	• Narrowing of the airway generally above the stoma but below the vocal cords due to the formation of scar tissue or malformation of the cartilage in the trachea. • While mild narrowing in the trachea does not usually present difficulties, significant narrowing of more than 50% of the airway can lead to serious complications including preventing weaning to decannulation.	

Nutrition

Nutrition may be an issue for people who have a tracheostomy. Malnutrition has been shown to negatively impact multiple outcomes such as length of stay, infections, hospital readmissions, cost and mortality.[24]

Screening and assessment of patients with a tracheostomy can ensure that patients considered at high nutritional risk, or who are malnourished, are identified early. Appendix 4 provides a flowchart outlining key points for screening, admission and re-commencement of feeding process for an adult patient with a tracheostomy.

Dietitians have been found to be a beneficial addition to the multidisciplinary tracheostomy team. A dedicated tracheostomy team, including a dietitian, has been found to significantly reduce the time the tracheostomy was in situ by expediting the decannulation process. It is recommended that dietitians be included throughout the continuum of care, allowing early identification and treatment of patients at high nutritional risk. Frequent dietitian contact has been associated with improvements in quality of life and nutritional outcomes.

Nutrition screening and assessment

Screening tools

A validated screening tool should be used to screen for malnutrition. Head and neck cancer guidelines suggest the use of either the Malnutrition Screening Tool or the Malnutrition Universal Screening Tool.[24,25] Refer to the toolkit for examples of malnutrition screening tools.

Currently there is no validated malnutrition screening tool universally recommended for use in the critically ill patient.

Critical care guidelines recommend that all patients who stay greater than 48 hours should be considered at high nutritional risk.[26]

In the absence of a validated malnutrition screening tool major European critical care guidelines have recommended the following risk factors for malnutrition be considered:

- intensive care length of stay of more than two days
- mechanically ventilated
- presence of an infection
- being underfed for >5 days
- presence of a severe chronic disease.[26]

Some critical care guidelines recommend screening all patients who are expected to have insufficient oral intakes using the NRS 2002 tool or the NUTRIC score. Patients at high nutritional risk are thought most likely to benefit from early enteral feeding support.[27]

Assessment tool

The Subjective Global Assessment (SGA) tool and the Patient Generated Subjective Global Assessment (PG-SGA) have both been recommended to assess nutritional status in head and neck cancer patients.[28, 29]

These tools have not been validated in the intensive care population and a pragmatic approach to dietitian referral should also occur if the patient has identified risk factors for malnutrition.

Table 21: Recommendations for nutrition screening and assessment

Recommendations	Source
A dietitian should be included as part of the multidisciplinary team when treating patients with a tracheostomy.	Working group consensus
Pre-admission assessment of a patient should be planned for an *elective* tracheostomy and should include a nutrition risk screen to determine the patient's current nutritional status and mode of feeding in order to develop a plan for nutrition delivery post-tracheostomy insertion.	Working group consensus
All patients with *an existing* tracheostomy should be screened for risk of malnutrition on admission and routinely thereafter.	Working group consensus
Patients found to be at high risk of malnutrition should be referred to the dietitian for early nutrition assessment and intervention, and ongoing care planning as appropriate.	Talwar, Donnelly, Skelly, et al. 2016[25]

Nutritional requirements

Ideally nutrition requirements of an individual are measured via indirect calorimetry and where this is not possible a predictive equation or formula should be utilised.[27, 28, 30] Within the critically ill population, guidelines recommend that enteral and parenteral nutrition are prescribed using these methods, with an emphasis on avoidance of both under- and over-feeding.[26, 31]

Table 22: Recommendations for identifying nutritional requirements for a patient

Recommendations	Source
Nutrition requirements for a patient with a tracheostomy should ideally be measured using indirect calorimetry to ensure adequate nutrition is provided.	Working group consensus
In the absence of indirect calorimetry, nutrition requirements should be determined via an appropriate predictive equation: • A protein target of 1.3g/kg-2.0g/kg should be the aim during critical illness in non-obese patients with ongoing evaluation of adequacy of protein intake. Obese patients should have their protein requirements guided by lean body mass measures or urinary nitrogen losses, or be fed 2.0-2.5g/kg ideal body weight.	Singer, Blaser, Berger, et al. 2019[26] McClave, Taylor, Martindale, et al. 2016[27]
Nutrition support should be provided accordingly.	Working group consensus

Commencement of nutrition

Enteral nutrition

Critically ill patients with a functioning gastrointestinal tract, who are not expected to be on an oral diet within three days, should start enteral tube feeding within 24-48 hours of admission using a standard polymeric enteral formula.[26, 27, 32-34]

Enteral tube feeding should use the gastric route in the first instance.[27]

In the acute post-operative period, tube feeding using a standard polymeric enteral formula can minimise weight loss.[24] Where the patient is thought to be at high risk for aspiration, post pyloric feeding could be considered.[26, 27]

Total parenteral nutrition (TPN)

Total parenteral nutrition (TPN) should be provided within three to seven days where enteral tube feeding or oral diet is contraindicated, except when patients are severely malnourished or at high nutritional risk.

Severely malnourished patients or patients at high nutritional risk should receive early and progressive TPN as soon as possible after intensive care admission.[26, 27]

No increase in infectious complications have been found with the use of TPN commenced within 24 hours of intensive care admission in patients with a relative contraindication to enteral feeding commencement.[35]

Oral nutrition

Most people will return to oral intake after having a tracheostomy inserted.

Refeeding syndrome

Refeeding syndrome is a potentially fatal shift in electrolytes and fluid which may occur when reintroducing nutrition after a period of starvation or severe malnourishment.[36] It is more likely to occur when people are enterally or parenterally fed but can occur with any route of feeding.

The hallmark biochemical feature is hypophosphataemia, however the syndrome may also result in hypokalaemia, hypomagnesaemia, thiamine deficiency, abnormal sodium and fluid balance, and changes to glucose, protein and fat metabolism.[36]

In intensive care, 34% of patients who had not received nutritional support for at least 48 hours were found to have refeeding hypophosphatemia. This defined as a phosphate drop of more than 0.16mmol/L to below 0.65mmo/L after the initiation of enteral or parenteral feeding.[27] Suggested management plans have been published for patients at risk of refeeding syndrome.[26, 35-37]

Nutrition monitoring

Monitoring of nutrition status and outcomes should be individualised to suit the clinical condition and nutrition care plan. Monitoring may include review of nutrient intake, body weight and other anthropometry, nutrition knowledge and biochemistry.

Monitoring of the nutritional status of long-term ventilator patients should occur at least weekly.[38]

Patient perspective on eating while critically ill

Issues such as hunger, thirst, dry mouth, weight loss, nausea and loss of appetite have been rated as moderate to severe symptom burdens causing physical and psychological distress in long term mechanically ventilated patients with a tracheostomy.[39] Consideration should also be given to the importance of eating for social and psychological wellbeing and should be considered as soon as the patient's clinical condition allows.

Impact of clinical interventions on nutrition

It has been identified in the mechanically ventilated patient that a component of failure to achieve adequate energy intake (<80% of estimated energy requirement) can be attributed to procedures, which includes those for airway management, e.g. tracheostomy insertion and tube change. These procedures should be planned in order to minimise disruption to the delivery of nutrition.[40]

Long term enteral tube feeding

Guidelines vary in recommendations as to when PEG insertion should occur with consideration that PEG feeding should be considered if the patient's nutritional intake is likely to be compromised for >2 weeks or if enteral feeding is required for more than four weeks.[25, 41]

Clinical conditions, together with quality of life and patient wishes, need to be considered when looking at timing of long-term feeding placement.[41]

Table 23: Recommendations for ensuring that nutritional requirements are met

Recommendations	Source
Nutrition in the form of oral intake, enteral tube feeding or parenteral nutrition should be provided to a patient with a tracheostomy as soon as it is clinically appropriate.	Working group consensus
Hydration requirements for a patient with a tracheostomy should be assessed based on the clinical condition of the patient and their associated comorbidities, and documented in the health record.	Working group consensus
Monitoring of the nutritional status and progress of a patient with a tracheostomy should occur daily whilst in the acute care setting.	Working group consensus
Clinical interventions should be planned to minimise disruption to nutrition delivery.	Working group consensus
Patients with a tracheostomy who are expected to require prolonged enteral tube feeding, should be considered for the insertion of a gastrostomy tube for feeding. This should take into account the patient's clinical status, prognosis, quality of life and the patient's wishes.	Working group consensus
In patients who are diagnosed as being malnourished, monitoring for refeeding syndrome must be considered a priority.	Singer, Blaser, Berger, et al. 2019[26] Mehanna, Moledina, Travis. 2008[36] National Institute for Health and Care Excellence. 2017[37] Doig, Simpson, Heighes, et al. 2015[35]

Communication

Clinicians should not underestimate the impact that loss of normal voice, following a tracheostomy, may have on patients and their families.[42] The most distressing symptom of loss of voice following a tracheostomy is communication difficulty, which leads to anxiety, panic, anger, frustration, sleeplessness and low mood.[42]

Developing alternative means of communication is a vital part of care and, where possible, clinicians must seek to prepare patients and their families preoperatively where able.[42, 43]

Factors which influence the ability to perform a communication assessment, what type of communication is appropriate and its success for the patient include:

- patient's clinical condition, for example respiratory function, level of alertness, cognitive status, upper airway and laryngeal anatomy, physical dexterity and comorbidities
- environmental factors, e.g. staffing limitations and skills
- patient preferences
- patient's spoken language and cultural background
- whether or not the patient is ventilated
- whether the patient can tolerate cuff deflation.

The following tables outline methods of achieving verbal communication depending on the type of tube or device the patient has.

Achieving speech with cuff deflation in ventilated patients

Verbal communication should be facilitated where possible as non-verbal methods can be misinterpreted.

Table 24: Methods of achieving speech with cuff deflation in ventilated patients

Method	Description	Considerations
Leak speech	• Speech using partial or full cuff deflation • Intelligibility may be improved using a one-way speaking valve or by modifying ventilator settings.	• Quality of speech may be impacted by patency of the upper airway and ventilation mode or settings • Speech only occurs on the inspiratory cycle of the ventilator resulting in varying loudness, large periods of pause and labored speech.
Speaking valve (one-way valve) use within the ventilator circuit	• One-way valve re-directs the entire expiratory airflow up and around the tracheostomy tube, through the larynx and out the mouth and nose.	• Patient's tracheostomy cuff must be deflated and have a patent airway prior to use • The valve must be used according to manufacturer's recommendations[44] • Allows speech in both inspiration and expiratory ventilation cycle • Inline speaking valves may reduce the amount of CO_2 expelled – must closely monitor a patient's CO_2 levels during use, particularly in those who are CO_2 retainers[45] • Active humidification should be used when using a speaking valve in a ventilator circuit • Cases of subcutaneous emphysema have occurred following speaking valve use after head and neck cancer – consider use carefully with this cohort.
Modification of ventilation settings	• Increasing positive end expiratory pressure (PEEP) has been shown to improve speech in chronically ventilated tracheostomy patients when the cuff is deflated[46-48] • Increasing PEEP allows increased airflow to bypass the tracheostomy, satisfying the normal expiration pressure and producing more airflow through the vocal folds.	• Risks include increase in respiratory rate and hypotension • Limited research to date • May be useful in a specific population with neuromuscular disorders and spinal cord injuries.[46]

Table 25: Recommendations for achieving speech with cuff deflation in ventilated patients

Recommendations	Source
Communication assessment should be considered by the multidisciplinary team and occur as soon as clinically possible with engagement of the patient and caregiver.	Working group consensus
Speech should be used where possible.	Working group consensus
Where speech is not possible, alternative communication strategies should be implemented.	Working group consensus
Individual patient assessment should guide selection of speech method and ongoing monitoring of efficacy of the selected method must occur. Recommendations and a management plan for the chosen speech method must be documented in the health record.	Working group consensus
Medical clearance must be obtained: • prior to cuff deflation to achieve leak speech • before modification of a patient's ventilation settings • before a one-way valve is placed in the ventilator circuit. Cuff deflation should be assessed and conducted with an understanding of the potential risks of aspiration.	Working group consensus
One-way valves should be considered in ventilated patients to promote speech. They should only be used in patients who are deemed medically stable by the managing medical team, and in accordance with the manufacturer's guidelines.	Freeman-Sanderson, Togher, Elkins, et al. 2016[44] Sutt, Cornwell, Mullany, et al. 2016[45]
Patients with one-way valves in situ must have CO_2 monitoring.	Working group consensus

Achieving speech without cuff deflation in ventilated patients

Table 26: Methods of achieving speech without cuff deflation in ventilated patients

Method	Description	Considerations
Tracheostomy tube with speaking inner canula	• Tracheostomy tubes with inner cannula that enables speech allows the patient to vocalise without cuff deflation or modification to ventilator settings.[49, 50]	• Patients with copious secretions have poor success with these tubes as secretions block speech canula • Requires tracheostomy tube change • Requires consideration of the patient's clinical condition.
Speaking or talking tracheostomy tubes	• A small flow of pressurised air, above the level of the tracheostomy cuff through the vocal folds, to allow phonation without cuff deflation.	• Limited data available on effectiveness.[49,51]
Using subglottic suction aid tracheostomy tubes to achieve speech (above cuff vocalisation)	• Tracheostomy tubes with subglottic suction aids may be utilised to facilitate speech • Similar design and technique of generating speech as speaking or talking tracheostomy tubes.	• Speech achieved by these patients is often poor as dry air is directed through the vocal folds • Use for short periods with patient's tolerance and comfort monitored • These become ineffective due to accumulation of oral or pharyngeal secretions • Not for speech with a fresh stoma due to risk of subcutaneous emphysema.

Table 27: Recommendations for achieving speech without cuff deflation in ventilated patients

Recommendations	Source
Tracheostomy tubes with a speaking inner cannula may be considered in ventilated patients unable to tolerate cuff deflation.	Kunduk, Appel, Tunc, et al. 2010[50] Leder, Ross. 2010[49]
Subglottic suction aid tracheostomies, with air redirection, may be considered in ventilated patients unable to tolerate cuff deflation.	Working group consensus
Tracheostomy review team approval must be obtained prior to using subglottic suction aid tubes with air direction for speech.	Working group consensus

Achieving speech in non-ventilated patients

When using these methods, humidification and filtering systems should be considered.

Table 28: Method of achieving speech in non-ventilated patients

Method	Description	Considerations
Cuff deflation with no occlusion of the tube	• Cuff deflation allows air to pass around the tracheostomy tube to the vocal folds to achieve speech • May not be effective if there is any upper airway obstruction, the tracheostomy tube is too large, or there is any vocal fold pathology.	• For adequate speech, the patient requires respiratory forces to move the vocal folds • Speech is often breathy and low in volume due to air being directed out of tracheostomy tube • If speech is not achieved on full cuff deflation, further assessment or change in management e.g. downsizing the tracheostomy, is needed.
Intermittent finger occlusion (with full deflation)	Used in clinical practice to increase airflow to the vocal folds to facilitate verbal speech for patients without a patent airway and therefore an inability to wear a speaking valve.	• Patients must be taught the importance of cleaning their hands before and after touching the tracheostomy • HMEs are available that can be depressed intermittently to facilitate speech via finger occlusion.
Fenestrated tracheostomy, downsizing or use of cuffless tubes	Fenestrated tracheostomy tube allows air to pass through the centre of the tube on expiration through the vocal folds.	• Indicated if there is insufficient space around the tracheostomy tube (following cuff deflation or with a cuffless tracheostomy tube) to allow adequate airflow to produce voice • Fenestrated tubes can be associated with granulation tissue • If the fenestration rests against the tracheal mucosa, there will be no benefit to phonation • Caution needs to be used when suctioning a tracheostomy tube which is fenestrated; a non-fenestrated inner cannula needs to be inserted prior to suctioning to prevent tracheal damage.
Speaking valve (one-way valve)	Patients who have poor speech with cuff deflation alone but can achieve improved voicing with finger occlusion, may be a candidate for a one-way speaking valve.	• There are risks of barotrauma, respiratory arrest and death if the valve is placed on the tube with a non-deflated cuff as the patient cannot exhale • Active humidification should be applied where a speaking valve is in place for longer than 30 minutes for a spontaneously breathing patient to reduce the risk of sputum plugging.
Suction aid tracheostomy or speaking tracheostomy tube when unable to deflate cuff	In patients who have a cuffed suction aid tracheostomy may be appropriate for a trial of air redirection via the suction port to achieve verbal speech.	• Success in this population is often limited due to the high volume of secretions making clear speech difficult • See achieving speech without cuff deflation in ventilated patients for further information.

Table 29: Recommendations to achieve speech in non-ventilated patients

Recommendations	Source
Cuff deflation in a non-ventilated patient should be assessed and conducted with an understanding of the potential risks of aspiration, using a team approach with appropriate parameters and contingency plans in place to monitor changes in patient's clinical condition.	Working group consensus
Insertion of a fenestrated tracheostomy (or inner cannula), downsizing a tracheostomy tube, or inserting a cuffless tracheostomy tube may be considered as methods to facilitate or improve speech with less respiratory effort.	Working group consensus
A one-way valve should be considered in an acute and chronic, non-ventilated population to promote phonation. Manufacturers' guidelines must be adhered to.	Working group consensus
Active humidification should be applied where a speaking valve is in place for longer than 30 minutes.	Working group consensus

Alternative communication methods when speech is not possible

For patients with a tracheostomy who are unable to achieve speech through the methods described, there are a number of communication options available. These include:

- mouthing
- gesture
- indicating yes or no by head movement or an alternative motor activity e.g. eye blinking
- picture and letter boards (that patients point to or use eye gaze)
- writing or drawing
- use of an electro larynx
- electronic communication devices e.g. tablets and apps, voice output devices electronic eye gaze devices.

Table 30: Recommendations for communication methods when speech is not possible

Recommendations	Source
Pre-operative communication assessment is recommended for all patients when speech is likely to be temporarily lost or impaired to improve psychological and communication success post-surgery. Assessment should include the choice of appropriate augmentative communication system(s).	Working group consensus
All conscious patients without speech should always have access to alternative communication systems e.g. pen and paper, whiteboard, communication board.	Working group consensus
Where simple alternative communication methods are not effective, the patient is distressed with their communication or anticipated to have protracted communication difficulty, speech pathologist referral should occur.	Working group consensus
A variety of communication methods should be available during a communication assessment to ensure individual patient needs are met.	Working group consensus
The effectiveness of communication methods should be evaluated on an ongoing basis, in accordance with the patient's preferences and clinical status.	Working group consensus

Swallowing

Patients who have undergone prolonged mechanical ventilation and/or have a tracheostomy in situ may have a greater incidence of swallowing dysfunction. The cause of this dysfunction was originally thought to be secondary to anchoring of the larynx, a reduction in the anterior and superior movement of the hyo-laryngeal structures and a loss of expired air via the upper airway, resulting in reduced pharyngeal sensation and increased aspiration risk.

More recent research has not found a direct causal relationship between the presence of a tracheostomy and swallow dysfunction. Rather the underlying clinical condition and comorbidities are most likely to be the primary cause of dysphagia.[52, 53]

Table 31: Recommendations for swallowing assessments

Recommendations	Sources
Patients should undergo a swallowing assessment by a speech pathologist prior to commencing oral intake.	Working group consensus
The presence of a tracheostomy tube should not preclude an assessment of swallowing.	Working group consensus

Swallowing assessment procedures

Historically blue food dye assessments, for example the Modified Evan's Blue Dye Test (MEBDT), have been used to detect the presence of aspiration at the bedside in patients with tracheostomy.[53] Research has shown high rates of false negatives, while a smaller number have also shown false positives. The variation in blue dye protocols was also highlighted as a potential factor affecting the accuracy of results.[54] These results suggest that blue dye tests should be used with caution as part of a comprehensive swallowing assessment by a speech pathologist detecting the presence or absence of aspiration.

Swallow assessments for all patients with a tracheostomy should be part of the comprehensive patient assessment as the existence of silent aspiration appears to high in these patients.[55]

There are two instrumental assessments of swallowing, for patients with tracheostomy:

- Videofluroscopy swallow study (VFSS): allows for assessment of physiological swallowing parameters and unequivocal evidence of silent aspiration. This assessment can also be used as a trial swallow strategy to improve swallow safety and to identify specific swallowing breakdown which may guide rehabilitation. The videofluroscopy swallow study (VFSS) is sometimes referred to as a modified barium swallow (MBS).
- Flexible endoscopic assessment of swallow (FEES): appears to be a far more sensitive assessment than a clinical examination alone and is useful in the ICU setting, or where a VFSS is unable to be performed. This assessment also provides the ability to observe how well the patient can tolerate oral pharyngeal secretions and direct view of the airway.

Cuff status

There is considerable debate regarding whether swallowing with the cuff inflated increases the risk of aspiration. There are no randomised controlled trials in this area, and while some research has suggested subtle increases in aspiration risk when feeding with the cuff up,[54] the evidence is inconclusive. Perceived risks of cuff up feeding have been reported, such as anchoring of the larynx and the absence of airflow to the upper airway, resulting in reduced sensation to the pharynx and larynx and inability to protect the airway through cough.

Swallow assessment in patients with an inflated cuff should be considered on an individual basis. A comprehensive bedside swallowing assessment with the cuff inflated is impossible due to the absence of the airway protective mechanisms (vocal fold function and cough). Therefore, where the cuff is unable to be deflated for assessment, the patient should require instrumental or objective assessment tools (e.g. Modified Barium Swallow (MBS) or FEES) in addition to bedside speech pathology swallowing assessment.

Table 32: Recommendations for swallowing assessment procedures

Recommendations	Source
• A VFSS should be considered to objectively assess swallowing function when sufficient information is not gained from the clinical examination. • VFSS should be used if silent aspiration is suspected or to trial the effectiveness of therapeutic manoeuvres.	Working group consensus
A FEES should be considered as alternative objective assessment to a VFSS if unavailable.	Goff, Patterson. 2018[54]
Use of blue food dye assessments to detect the presence or absence of aspiration is not recommended due to poor test validity and only used where instrumental assessment is not available.	Goff, Patterson. 2018[54]
A swallowing assessment by a speech pathologist should be considered following changes to tracheostomy tube status (cuff up or down, tube occlusion, use of speaking valve).	Working group consensus
Planning and management of cuff deflation should occur within a multidisciplinary team approach considering potential risk and changes in the patient's clinical condition.	Working group consensus
Patients should not be denied a swallowing assessment or oral intake on the basis of an inflated cuff alone and should be referred to speech pathology for an individualised assessment.	Working group consensus
If not cleared medically for cuff deflation, or unable to tolerate cuff deflation the patient should have an instrumental swallowing assessment prior to commencing oral intake.	Working group consensus

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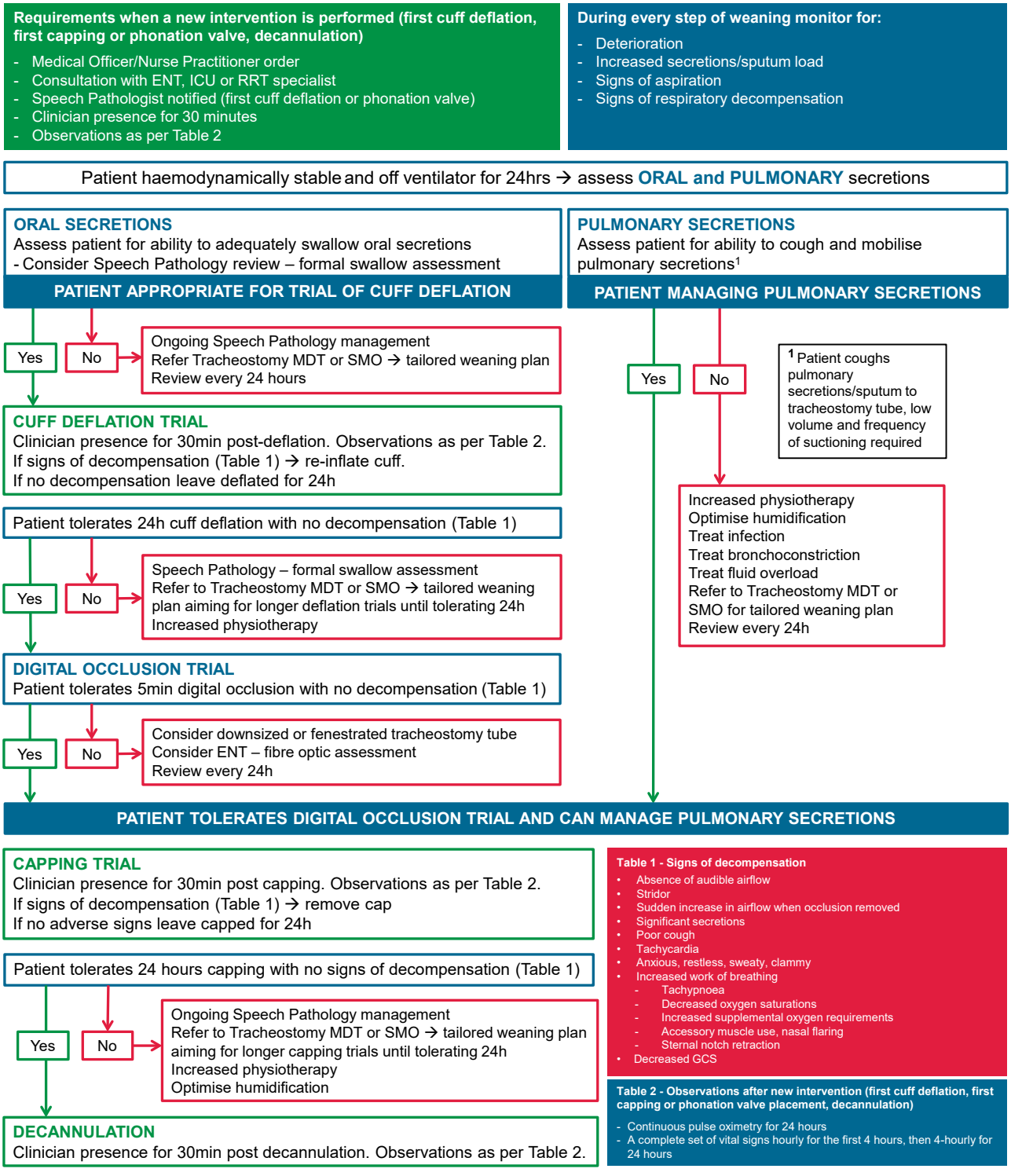
Appendix 1: Weaning and decannulation flow chart

This is an example of a weaning and decannulation flowchart, that can be used by your hospital or LHD. You should follow your local approved procedure and guidelines that are in place.

Northern Sydney Local Health District Tracheostomy weaning and decannulation guideline

This guideline should be used to support decisions to wean and remove a tracheostomy tube unless otherwise ordered by a Senior Medical Officer (SMO)



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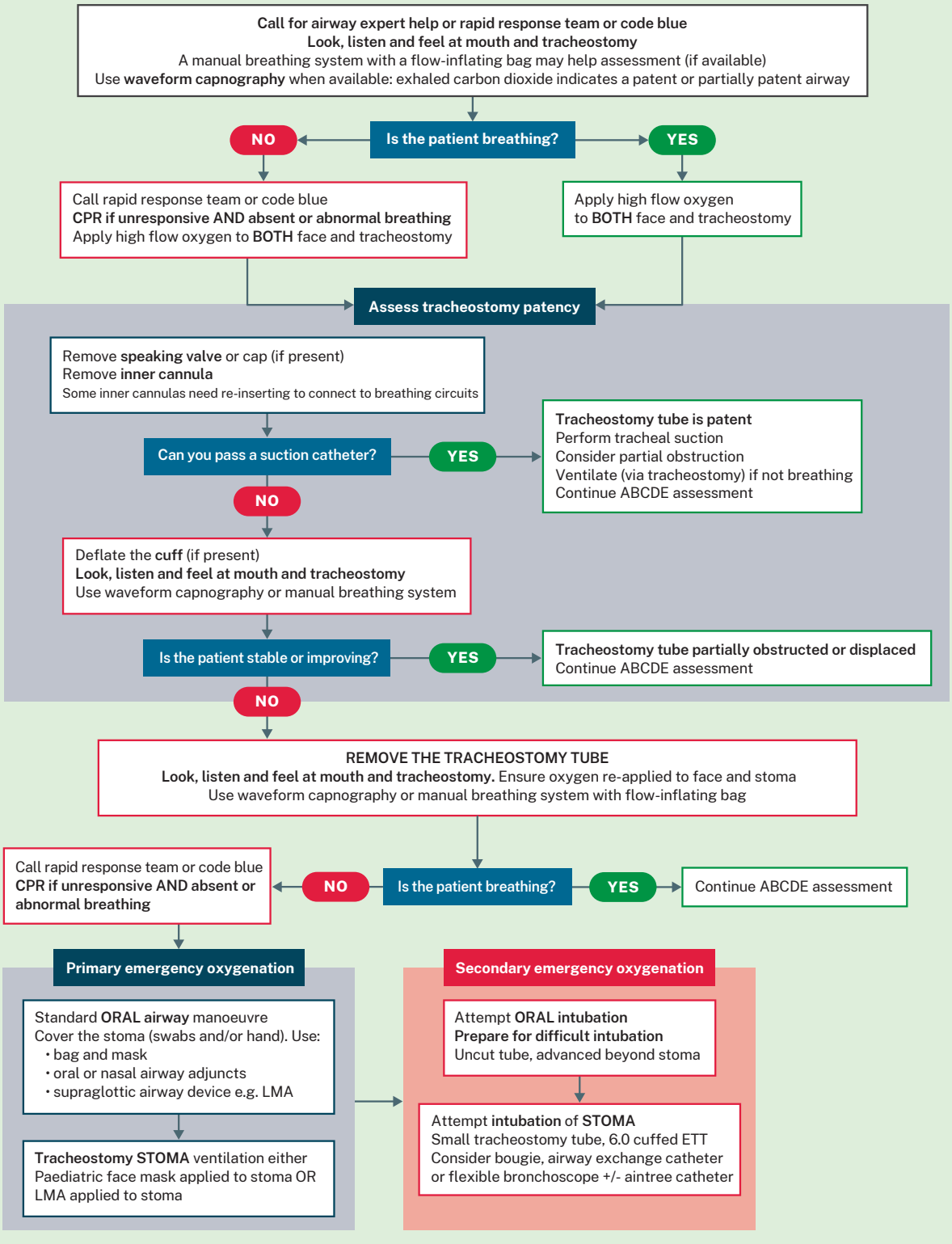
Note: not all sites undertake a capping trial prior to decannulation.

Appendix 2: Emergency tracheostomy algorithm – patent upper airway



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Based on UK National Tracheostomy Safety Project.
www.tracheostomy.org.uk

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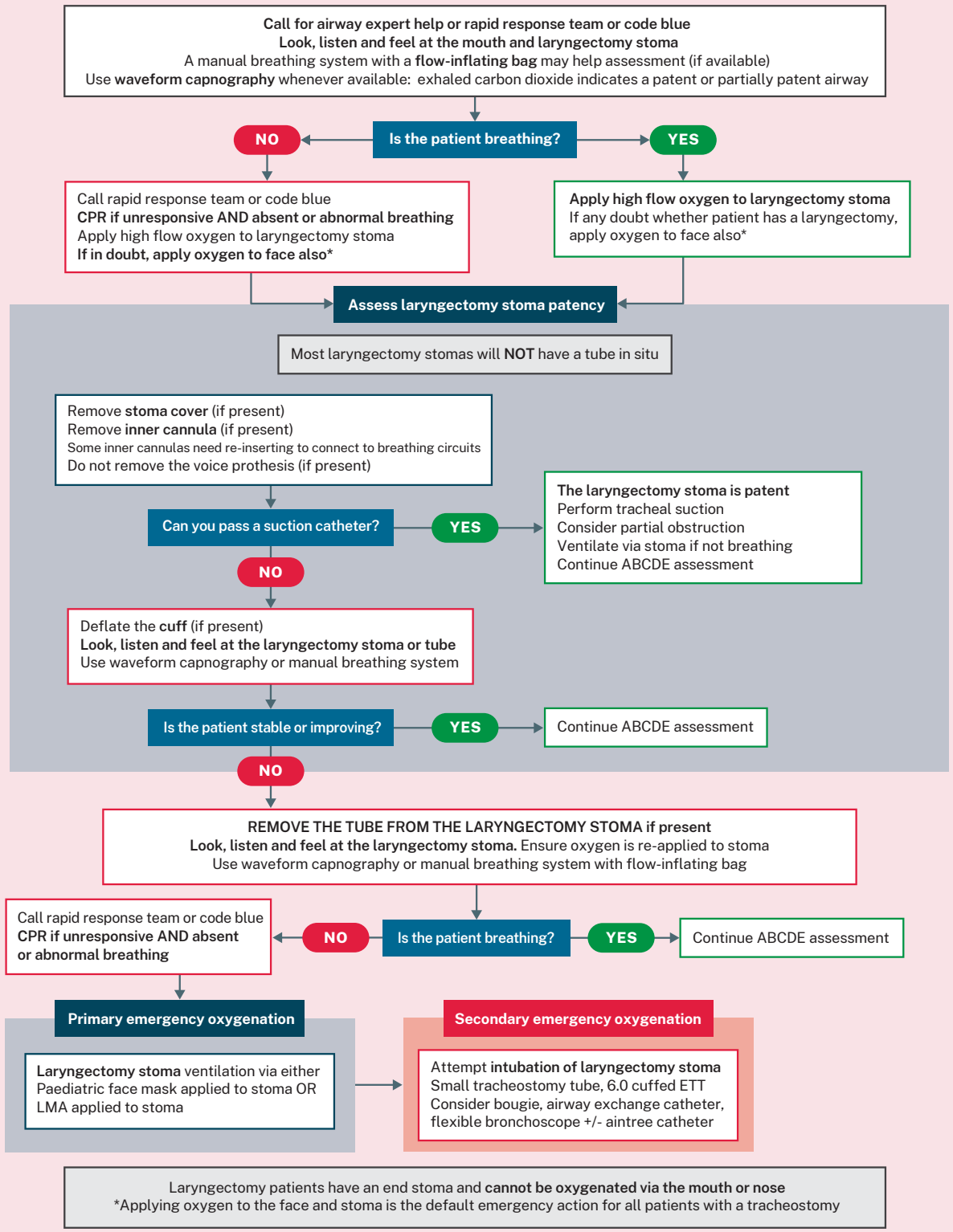
Appendix 3: Emergency laryngectomy algorithm



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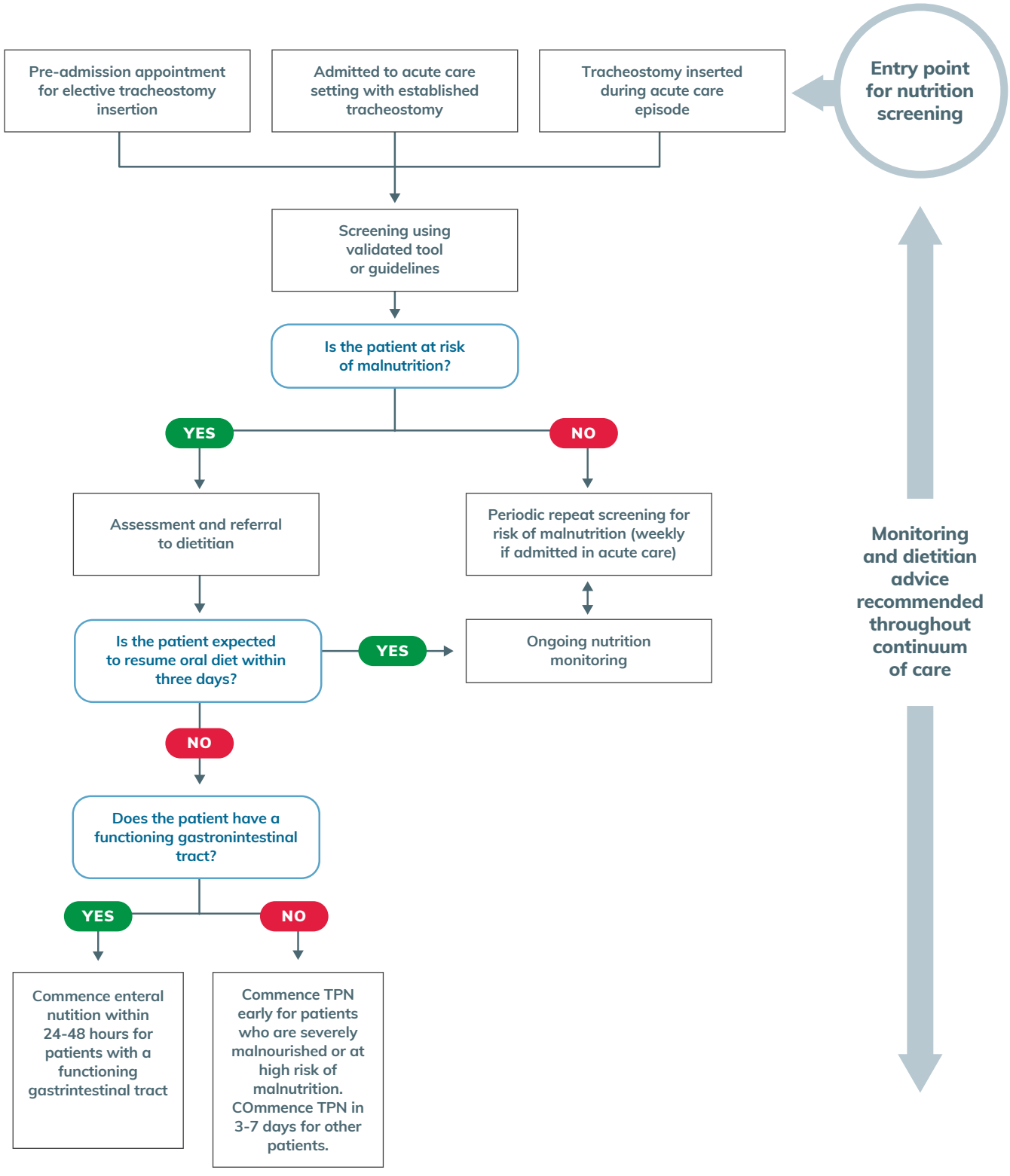
Appendix 4: Nutrition screening, assessment and recommencement of feeding flowchart



Appendix 5: Evidence review

Introduction

The search for literature to inform this guideline update and review was undertaken within the context of the 2013 *Care of Adult patients in Acute Care Facilitates with a Tracheostomy - Clinical Practice Guideline*. Initially a bibliography citation search was conducted using keywords: "tracheostomy" and "adult intensive care patients". Animal, laryngectomy and trauma studies were excluded. Following this, a structured search of databases was conducted and outlined below. Paediatric studies were not considered in this review. There were three reviews of the literature, a commissioned literature review in 2017, an evidence synthesis website search in November 2018 and a follow-up review in July 2020 for any further evidence.

Search strategy

Databases:	PubMed, Medline, Cochrane, Joanne Briggs, Embase, Cinahl, ProQuest and Science Direct
Key words:	Tracheostomy + intensive care/critical care (+ guidelines/clinical practice/assessment/ care/suctioning/nutrition/humidification/communication/ nursing/emergency/ environment/plan of care/equipment/education/)
Publication years:	2012-2019 and then 2019-2020
Other search filters:	Meshing of terms, and combined searches included in strategy Tracheostomy [MeSH] AND (randomized controlled trial[pt] OR randomized[tiab] OR placebo[tiab] OR meta analysis[pt] OR meta analysis[tiab] OR meta analysis[mh] OR review[pt] OR search*[tiab] OR (systematic[tiab] AND review[tiab])
English language only	
Adult	39, 81 and 20

Commissioned review search terms for each domain of tracheostomy care:

1. System of care – "*tracheostomy*", "*environment*", "*plan of care*", "*equipment*", "*transport*", "*transfer*", "*scope of practice*".
2. Patient preparation - "*tracheostomy*", "*preparation*", "*education*".
3. Maintaining patient airway - "*tracheostomy*", "*maintenance*", "*airway maintenance*", "*patent airway*", "*management*", "*tube position*", "*cuff management*", "*humidification*", "*suction*", "*inner cannulae*", "*suction process*".
4. Prevention of infection - "*tracheostomy*", "*infection*", "*prevention*", "*oral hygiene*", "*stoma care*".
5. Swallowing - "*tracheostomy*", "*swallowing*", "*swallowing assessment*", "*speaking*".
6. Facilitating communication - "*tracheostomy*", "*communication*", "*ventilated*", "*non-ventilated*", "*speech*", "*communication methods*".
7. Weaning and decannulating - "*tracheostomy*", "*decannulation*", "*weaning*".
8. Complications and emergencies - "*tracheostomy*", "*emergency*", "*complications*", "*management*", "*transfer*" "*tube displacement*", "*blocked*".
9. Nutrition - "*tracheostomy*", "*nutrition*", "*requirements*", "*monitoring*", "*tube feeding*", "*long term*".
10. Education - "*tracheostomy*", "*education*", "*patient education*", "*carer education*", "*clinician education*", "*clinical education*", "*nurse education*".
11. Transfer of care - "*tracheostomy*", "*transfer*", "*transfer of care*".

Process:

A literature review was conducted using the above databases including publications from 2012 to March 2019 and then a further rapid review was conducted from 2019 to July 2020 to capture any new publications since the commissioned review. A supplementary evidence review was undertaken by clinicians in the working groups for subsections of the guides, using search terms particular to their areas.

This guide was reviewed formally in 2020 by a working group including 29 expert medical, nursing and allied health representatives from a range of LHDs across NSW. Sub-working groups were formed to work on individual sections of the guide and met via teleconference weekly for four weeks. The whole working group met twice for six-hour face-to-face workshops and twice for two-hourly teleconference meetings. These meetings were held to reach consensus on recommendation statements. Consensus was reached on all recommendations included within this guide.

Glossary

CPR	Cardiopulmonary
Cutaneo-tracheal tract	The tract created by the opening in the neck into the trachea which matures over time
Decannulation	The direct removal of the tracheostomy tube
ENT	Ear nose throat
ETT	Endotracheal tube
FACEM	Fellow of the Australasian College for Emergency Medicine
FEES	Flexible endoscopic assessment of swallow
FiO_2	Fraction of inspired oxygen
GCS	Glasgow Coma Scale
HME	Heat and moisture exchanger
ICU	Intensive care unit
Laryngectomies	A patient with a total laryngectomy will not have a patent upper airway. Laryngectomies are out of scope for this guide with the exception of a mention within the section on emergency care.
LHD	Local health district
MDT	Multidisciplinary team
PAC	Pressure area care
PEEP	Positive end expiratory pressure
PEG	Percutaneous endoscopic gastrostomy
PPE	Personal protective equipment
RRT	Rapid response team
SpO_2	Oxygen saturation
SMO	Senior medical officer
TEP	Tracheoesophageal puncture
TPN	Total parenteral nutrition
Tracheostomy	An artificial opening into the trachea, which may be temporary or permanent.
Weaning	A systematic approach for the safe removal of the tracheostomy.
VFSS	Videofluroscopy swallow study

Acknowledgements

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The swallowing and communication content was originally written by Klint Goers and Dr Julia Maclean (SESLHD) as part of the original guideline expert panel in 2013.

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