

LEEDS TEACHING HOSPITALS TRUST

GUIDELINES FOR THE CARE AND MANAGEMENT OF ADULT PATIENTS WITH A TRACHEOSTOMY at LTHT

Guideline Detail

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Summary of Guideline

These guidelines have been developed and updated to provide guidance for staff caring for patients with a tracheostomy within the Leeds Teaching Hospitals NHS Trust. These guidelines are intended to support and inform practitioners caring for adults with tracheostomies within the acute in-patient setting to improve care and safety. There are supporting teaching packages, competencies, care plan and algorithms in addition to the guidelines. These guidelines include information about procedures, consent, management, emergency care, decannulation and tube changes. Patients with tracheostomies should only be cared for in clinical areas where staff are competent in caring for them.

Aims

That patients with a tracheostomy receive up to date efficient care based on their assessed needs and delivered by trained staff who have been assessed as competent in this skill.

Scope

These guidelines relate to all adult patients who have a tracheostomy tube in situ cared for within the Leeds Teaching Hospitals NHS Trust. They are aimed at all practitioners caring for the patient with a tracheostomy tube.

Objectives

That all patients or relatives receive information about the needs for a Tracheostomy.
That all patients within the LTH with a tracheostomy tube will have their care needs

assessed and delivered as per agreed plan of care.

Care will be performed in a safe and timely manner according to the patient's individual plan with any deviations to planned care accurately documented.

Care will be documented and evaluated.

The guidelines and competencies will be available to all staff to aid their safe practice.

Background

Following the NCEPOD study and report (2014) and review of the Intensive Care society's standards for the care of adult patients with a temporary Tracheostomy (2014) , these guidelines have been reviewed and updated to reflect best practice in caring for patients with a tracheostomy.

Consent

Most patients will be able to give informed consent for an elective procedure, for those that are critically ill attempts should be made to seek their understanding and approval if this is possible. The role of the next of kin in healthcare decision making is increasingly formalised under the Mental Capacity Act (England and Wales) and the Adults with Incapacity Act (Scotland). It is considered good practice to inform relatives of the clinical decision and involve them in the planned care.

Current directives from the GMC and Department of Health specify their involvement using Consent Form 4; '*Form for Adults who are Unable to Consent to Investigation or Treatment*'. This process requires provision of information on the nature of the procedure, proposed benefits, potential hazards and alternatives, ideally written and with visual aids in the first instance.

Nevertheless it is the responsibility of medical staff to act in the best interests of patients lacking capacity, rather than pass the responsibility for consent to the next of kin.

It should be emphasised that, like all surgical interventions, this procedure is not undertaken lightly and is not risk-free, however nor is prolonged translaryngeal intubation.

Treatment / Management

1. Tracheostomy

There are two techniques for creating a tracheostomy.

Regardless of which technique is chosen, clinicians must be prepared for the possibility of losing the airway during insertion and difficulties in re-securing it.

A comprehensive dedicated 'difficult airway' trolley must be available on the ICU. The contents of the trolley should include a range of tracheal tubes, laryngoscopes, bougies, airway exchange catheters, laryngeal mask airways, paediatric facemasks, and cricothyroid needles/cannulae for emergency oxygen insufflation.

1.1. The Standard Surgical Technique (performed in theatres)

This surgical technique involves the dissection and transfixion of the thyroid isthmus and formation of an opening in the trachea at the level of the second and third tracheal rings. After this procedure a tract forms between the trachea and the skin over a period of 5-6 days (Webb et al 1999).

1.2. Percutaneous Dilatational Tracheostomy (PDT)(usually performed within critical care)

The procedure is performed by the introduction of a guide wire percutaneously into the trachea, followed by dilation of the tract formed to enable the insertion of a tracheostomy tube (Carrillo et al, 1997). After this procedure a tract forms between the trachea and the skin over a period of 5-6 days (Webb et al 1999). For further details please refer to Intensive Care society's standards for the care of adult patients with a temporary Tracheostomy (2014). See Appendix 1 for insertion form documentation.

2. Laryngectomy

A laryngectomy creates a permanent stoma. The larynx is resected and the trachea is brought to the surface of the skin and sutured to the neck wall to form a stoma. Thus the lungs are completely disconnected from the nose and mouth. The rigid rings of cartilage of which the trachea is comprised prevent the stoma from closing.

Staff must be aware of the differences between tracheostomy and laryngectomy especially in emergency situations (NPSA 2005).

In emergency situations, patients with a laryngectomy have an end stoma and **cannot be intubated or ventilated via the mouth**. Call for expert help - Anaesthetics/ITU and ENT/Max Fax. If bleeding from the laryngectomy, await expert advice before deflating the cuff.

3. Psychological considerations

Patients with a tracheostomy will have no voice whilst the cuff is inflated, this can limit their ability to communicate. In the absence of an appropriate speaking valve, aids such as pen and paper or picture charts can facilitate communication. "Closed" questions, requiring a yes/no response should be used where possible.

Psychological support for patients with a tracheostomy is important both pre and post procedure. In some circumstances the procedure is elective and patients can be prepared in some way for the potential difficulties. Unconscious patients however, will not receive preparation and may need extra psychological support when they begin to recover. Due to an altered body image the patient should have careful pre-operative explanation. If this is not possible the patient must receive explanation and support post-operatively and an information leaflet provided.

Clear explanations of what is going to happen, and why, should be given to the patient

before any procedures such as suction or changing of tubes takes place.

4. Infection control

The presence of a tracheostomy tube, the resultant secretions and stoma site in an already debilitated and possibly immuno-compromised patient all increase the risk of infection.

Hand washing is essential before and after all procedures.

Gloves must be worn and contaminated gloves changed between procedures.

Aprons must be worn for all procedures.

Eye protection should be worn where there is a risk a patient may cough secretions towards the carer.

Closed suction should be used whilst patient is ventilated.

Any infections must be clearly documented and communicated and Trust isolation procedures adhered to.

Hand Hygiene Policy -LTHT:

<http://nww.lhp.leedsth.nhs.uk/common/guidelines/detail.aspx?ID=673>

Standard Infection Prevention and Control Precautions Policy

<http://nww.lhp.leedsth.nhs.uk/common/guidelines/detail.aspx?ID=671>

Source Isolation Policy

<http://nww.lhp.leedsth.nhs.uk/common/guidelines/detail.aspx?ID=678>

5. Tracheostomy tube and stoma care

All nurses caring for patients with tracheostomies should adhere to the nursing care standard (see Appendix 2)

5.1. Types of tracheostomy tubes

The type of tracheostomy tube used within The Leeds Teaching Hospitals NHS Trust will vary according to the needs of the individual patient (see Appendix 3).

Documentation and communication of the type and size of tube is essential, including a record of the date of insertion.

The tubes may be cuffed or uncuffed, these may have an inner cannula, and in addition they may be fenestrated or non-fenestrated. Fenestrated tracheostomy tubes may help the patient breath with a tracheostomy tube in situ. Provided the inner cannula (if not fenestrated) is removed, the work of breathing may be reduced. However, fenestrated tubes result in increased risk of complications eg. Granuloma, surgical emphysema (Shrivastava et al 2003; Powell et al 2011) and ICS standards for the care of patients with a tracheostomy advise they should be used with caution (ICSS, 2014)

Obese patients, or those with abnormal anatomy, or a low tracheostomy stoma may require a longer adjustable flange tube or a tube with a fixed extended distal or proximal portion.

Patients must not be discharged from critical care unless a tracheostomy tube with an inner liner tube is in situ.

Tracheostomy tubes may also have subglottic drainage ports to help reduce the incidence of Ventilator acquired pneumonia (VAP).

The type of tube that is in placed should be clearly documented.

An emergency pack containing a tube of the same size and a size below must be available at the bedside.

5.2. Cleaning a tracheostomy stoma

Until the stoma site is established, the site and surrounding skin should be cleaned as often as required with sterile sodium chloride 0.9%, using an aseptic non touch technique. A clean dry stoma site will facilitate wound healing. The condition of the skin around the stoma should be assessed regularly for signs of infection and delayed healing. This should be documented in the critical care nursing plan or LTH tracheostomy care plan. The routine use of dressings around the stoma site is unnecessary and should only be used if clinically indicated.

Once the stoma site has healed, responsibility for cleaning it can be negotiated between the patient and the team caring for them. It is then possible to care for the stoma adopting a clean procedure using sterile water or cooled previously boiled water. A skin barrier cream can be applied if indicated.

5.3. Securing the tube

Ties should be changed when soiled. The tube should be secure without impeding venous return (Docherty and Bench 2002). Velcro tracheostomy ties with a soft backing should be used as these are more comfortable for the patient. It is recommended that this procedure is done with 2 people, particularly with restless or confused patients.

5.4. Cleaning tracheostomy inner tubes (see Appendix 4).

Where a tracheostomy tube is in situ the inner cannula should be removed and cleaned at a maximum interval of 4 hourly in a patient with a productive chest, and at least 8 hourly in all cases being conscious of the patient's need for rest and sleep.

Repeated ventilator disconnection to change and clean the inner tube may result in derecruitment, especially in patients receiving high levels of PEEP and / or inspiratory pressures, and increase the risk of VAP/infection. The risks and benefits of using inner cannulae should be considered.

It is recommended that inner tubes are cleaned with sterile sodium chloride 0.9% or

sterile water using cleaning swabs where required. Tracheostomy cleaning solution, which is a non-foaming biological detergent which breaks down sputum and cleans tubes well, may also be used (available from NHS supplies). Home patients may use cooled boiled water / cleaning solutions made up with cooled boiled water. Bedside sinks should not be used for cleaning tracheostomies; these are only for hand washing (DoH 2010). A container with a sealed lid should be used for the storage of cleaned spare inner tubes.

5.5. Changing tracheostomy tubes

After the initial formation of a tracheostomy, the tube should ideally remain in place for at least five to six days to allow a tract to form between the trachea and skin. Tubes should be changed according to patient need and/or as per manufacturers' guidelines, at least every 30 days.

Tracheostomy tubes without an inner cannula should only remain in situ for up to seven days. Should a tracheostomy be required for a longer period, then a tube with an inner cannula should be considered.

All practitioners must hold an appropriate professional qualification and the procedure must be within their scope of practice. Where this is an extended scope of practice the practitioner must have undertaken training appropriate to their profession and be deemed competent. (See Appendix 5).

All patients should be pre-oxygenated prior to tracheostomy tube change. Consider changing the tube in theatre with capnography and endoscopy available if any difficulty is anticipated. It is essential that if the new tube cannot be inserted or is misplaced, there is an agreed procedure for managing the situation, with the appropriate equipment and drugs available.

Where the tracheostomy stoma is well established and previous changes uneventful there may be no need to pre-oxygenate. Oxygen must be administered as per prescription.

5.6. Monitoring

Waveform capnography is mandatory for any acutely ventilator dependent tracheostomy patient.

5.7. Cuff pressures

Cuff manometers should be used to measure cuff pressures and they should be recorded on the observation chart at least 4 hourly, and maintained ideally around 25cm H₂O. (Jaillette et al, 2014). Maintaining an appropriate inflation pressure of the tracheal cuff is important, since under inflation (< 20cm H₂O) of the tracheal cuff is associated with ventilator acquired pneumonia (VAP) through microaspiration. Over inflation (>30cm H₂O) is also harmful and contributes to long term tracheal damage (DoH 2011). Pressures above 30cm H₂O have been shown to cause ischaemia, tracheal wall necrosis and cartilage destruction (Bernhard et al, 1985). Anaesthetic gases can increase cuff pressures (Stanley and Liu 1975). If an air leak occurs with

the cuff pressure at maximum recommended, the tracheostomy tube may have become displaced or may require changing: medical or other professionals who are competent in tracheostomy management should review the patient (ICS, 2014). Cuff pressure should not exceed 25 cm H₂O. Cuff deflation should be a 2 person technique; as one deflates the cuff the second performs tracheal suction to prevent aspiration. Following cuff deflation, expiratory noises may be heard, the patient should be reassured that this is normal. If a subglottic tube is used the subglottic port should be aspirated prior to cuff deflation.

6. Suctioning Please refer to LTHT suctioning guidelines (2012)
<http://nww.lhp.leedsth.nhs.uk/common/guidelines/detail.aspx?ID=3152>

Always encourage patients to expectorate their secretions where possible. An upright position will facilitate clearance of secretions.

Tracheal suction should be performed following assessment of the patient and only performed if needed. Following suction further assessment should be made. Results of the procedure and any adverse effects should be documented.

When receiving oxygen, pre-oxygenation with high flow or a higher percentage oxygen may help to reduce hypoxia during the procedure. The oxygen should be prescribed on the prescription chart with a dose and target oxygen specified if being cared for out of the critical care environment.

Tracheal suction is performed using an aseptic non touch technique. An appropriate sized, multi-eyed suction catheter should be used. The suction pressure used should not exceed 120mmHg. The pressure should only be applied during removal of the suction catheter. The procedure should last no longer than 10 seconds.

It is advised that a visor be worn if closed suction is not being used.

If a subglottic tube is in use please refer to the SOP for subglottic aspiration
<http://nww.lhp.leedsth.nhs.uk/common/guidelines/detail.aspx?ID=5299>

7. Humidification

Additional humidification is necessary to maintain the relative humidity of the inspired gases and prevent secretions drying and blocking the tracheostomy tube. It is essential that patients with a tracheostomy receive adequate humidification in order to prevent tracheal secretions becoming hard and crusty thus preventing consolidation, obstruction and atelectasis.

Where oxygen is not required, humidification via a heat & moisture exchanger (HME) (often known as Swedish nose), or bibs should be considered. HME's can be dislodged by strong coughing (Shelley 1996) and become clogged with secretions, leading to infection risk. They should never be used overnight and are not suitable for patients with

copious secretions. HME's should be changed at least every 24 hours but more often if required due to secretions.

Buchanan/ Hydrolux bibs/protectors may be more comfortable, and are appropriate to be used overnight. For hospital patients, these should be changed every 24 hours. If secretions increase in viscosity then alternative methods of humidification should be used. Regular (4-6 hourly) nebulised sodium chloride 0.9% 5mls (Prescribed) can be considered to augment clearance of thick secretions (Conway 1992, Sutton 1998) but should be used in addition to and not in place of other methods of humidification.

Bolus Sodium chloride 0.9% up to 2-3ml instillation into the tube may be useful to loosen and remove thick secretions in certain patients but should never be a routine procedure (Hess 1999). Assessment of hydration, humidification and the nature of secretions should be carried out by an experienced practitioner who should make the decision to use sodium chloride 0.9% instillation (Hudak 1996). The most important method of maintaining humidification is to ensure the patient has adequate hydration.

In patients with thick, difficult to clear secretions, a mucolytic may be considered. Physiotherapy or outreach teams can give advice on the most appropriate method of humidification for specific patients

Monitoring & Review:

Humidification, observations and NEWS score are monitored from the graded response chart. Fluid balance is monitored on a fluid balance chart

8. Swallowing assessment

Any patient with a tracheostomy tube should be considered at risk of aspiration (Dikeman & Kazandjian 1995, Tippett 2000). Before commencing eating and drinking, all patients should be assessed, by a speech and language therapist (SLT) All patients with a tracheostomy should be referred to SLT when the decision to wean from the ventilator has been made and the sedation hold has started (GPICS, 2016) A blue dye test is no longer recommended by SLT. Fiberoptic Endoscopic Evaluation of Swallowing (FEES) is the gold standard assessment for swallowing in tracheostomy as it allows assessment of saliva management as well as oral intake and can be carried out at the bedside.

Although it is possible for patients to eat and drink with the tracheostomy cuff inflated, they are at much greater risk of aspiration, and any aspiration will be silent. Therefore, FEES is required to establish safety before a patient can eat and drink with the cuff inflated.

Signs of dysphagia to be aware of after assessment/during oral intake are (NTSP, 2013):

- Coughing or choking
- Increased work of breathing
- Fatigue
- Change in voice quality e.g. sounds wet
- Noteworthy decrease in O₂ saturation levels and or change in skin pallor

- Deteriorating chest status
- Increase in frequency of suctioning required
- Evidence of aspirated material on suctioning
- Loss of saliva or food/fluid from the mouth
- Holding of saliva or food/fluid in the mouth
- Patient reports difficulty in swallowing

Laryngectomy patients will have consultant led input around the need for contrast swallow test.

9. Passy Muir Valves (see Appendix 6)

Passy Muir valves (PMV) are a closed diaphragm speaking valve, designed for use with tracheostomies, which diverts all air to pass through the upper airway on expiration in comparison to previous speaking valves which only partially close on expiration. Therefore the PMV allows, amongst other things, improved laryngeal excursion, improved airway protection and restoration of subglottic pressure. They have been shown to improve weaning and therefore decannulation. If you are considering the use of a PMV with your patient please refer to Physiotherapy for assessment and guidance. If there are signs that your patient is struggling to swallow their saliva, liaise with SLT for advice on cuff deflation, saliva management and swallow rehabilitation. If a **speaking valve is in use the cuff must be fully deflated** at all times with an adequate leak past the tube.

Refer to SOP on Leeds Health Pathways

<http://nww.lhp.leedsth.nhs.uk/common/guidelines/detail.aspx?ID=5636>

10. Above Cuff Vocalisation

Above Cuff Vocalisation (ACV) uses the sub-glottic port to apply a flow of air through the glottis to allow vocalisation and resensitisation of the larynx and pharynx. ACV is only carried out when the cuff is inflated and can be used when patients are on any type or level of ventilation. Please refer to SLT if you think that your patient is suitable for ACV. See the ACV SOP for more details regarding the use of ACV.

11. Safety and emergency care

See link below for algorithms from National Tracheostomy Safety Project, NTSP, for detailed guidance <http://www.tracheostomy.org.uk/Templates/Algorithms.html>

Patients with tracheostomies need access to appropriate equipment (see Appendix 8) and to staff with the skills capable of caring for and managing them. This equipment should be checked daily as part of the tracheostomy standard (See Appendix 2). Respiratory difficulty should lead to urgent assessment of the airway, and to consider whether the tube has become displaced (inside or outside the trachea), or blocked. Every ward looking after patients with a tracheostomy must have a clear procedure for emergencies.

11.1 EXPERIENCED PERSONNEL

Acute Anaesthetist:-

SJUH: Bleep 80 5011

LGI: Bleep (ICU general) 80 3451, (ICU neuro) 80 2752

ICU: SJUH 69154/64584

ICU: LGI 27403/25768

Outreach:-

SJUH: 66367, Bleep 80 6425

BEXLEY WING: 67637, Bleep 80 5781

LGI: 28179, Bleep 80 1450

Physiotherapists:-

SJUH: 80 4334/6250/1088

LGI: 80 2981/2844

Speech and Language Therapists:-

SJUH: 64087

LGI: 23897

Bleeps: 80 4609/4610

Emergencies, Common Complications and their Management

This section is taken from section 6 common complications and emergency management in “Standards for the care of adult patients with a temporary tracheostomy (ICS, 2014).

The main life threatening complications associated with a tracheostomy are blockage, dislodgement and bleeding.

All staff working in clinical locations where tracheostomy patients are managed must be competent to assess and initiate management in the event of an airway emergency occurring. These complications may occur at any time or location. They may be life threatening and may be challenging for patients and staff.

Complications associated with a tracheostomy

Complications can be divided into those associated with insertion of the tracheostomy (surgical or percutaneous), those which arise following the procedure (usually blocked or displaced tracheostomy tubes) or later complications. These can be serious and sometimes fatal. These complications may coexist and are usually grouped as follows:

11.2. Immediate Complications (peri-procedural period)

- Haemorrhage (this is usually minor, but can be severe if thyroid or major paratracheal blood vessels are damaged).
- Primary misplacement of tube - within tissues around trachea or to main bronchus, or secondary displacement e.g. after severe coughing on emergence.
- Pneumothorax.
- Tube occlusion.
- Surgical emphysema.
- Loss of the upper airway.

11.3. Delayed Complications (post-operative period < 7 days)

- Tube blockage with secretions or blood. May be sudden or gradual.
- Partial or complete tube displacement.
- Infection of the stoma site.
- Infection of the bronchial tree (pneumonia).
- Ulceration, and/or necrosis of trachea.
- Mucosal ulceration by tube migration (due to loose tapes or patient intervention).
- Risk of occlusion of the tracheostomy tube in obese or fatigued patients who have difficulty extending their neck.
- Tracheo-oesophageal fistula formation
- Haemorrhage (local tissue trauma or erosion through blood vessels).

11.4. Late Complications (late post-operative period >7 days)

- Granulomata of the trachea may cause respiratory difficulty when the tracheostomy tube is removed.
- Tracheal dilation, stenosis, persistent sinus or collapse (tracheomalacia).
- Scar formation-requiring revision.
- Blocked tubes may occur at any time, especially if secretions become thick, the secretions are not managed appropriately (suction) and humidification is not used.
- Haemorrhage.

11.5 Blocked Tracheostomy

Inserting a tracheostomy tube bypasses the natural warming and humidification mechanisms of the upper airway. Patients may have reduced ability to cough or clear secretions, which may be increased or purulent if infected, or thickened if the patient is dehydrated. The risks of blocked tracheostomy tubes can be minimised by careful humidification, tracheal suction and inner tube care. Prevention is better than cure.

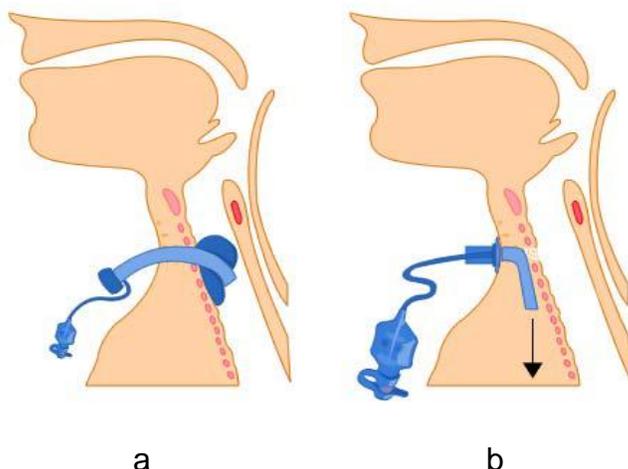
Staff treating patients with a tracheostomy in an emergency situation need to be aware: that 'bag and mask' ventilation via the mouth and nose is not possible with a cuffed tracheostomy tube in situ.

11.6 Displaced Tracheostomy Tube

The tracheostomy tubes can become partially or completely displaced, can migrate out of the stoma or into the soft tissue of the neck. The tube may become displaced by coughing, the weight of the tube and breathing circuits, or by patient interference. Partial tube displacement is more dangerous as it is not always obvious that there is a problem with the tube.

To assist in keeping tracheostomy tubes in position, tubes must be carefully selected and inserted, secured carefully and monitored.

Waveform capnography is mandatory for any acutely ventilator dependent tracheostomy patient.



Legend to figure

- a. Tracheostomy tube migrating outwards with cuff distortion.
- b. Tracheostomy tube in pre-tracheal tissues

If an air leak occurs with the cuff pressure at the maximum recommended, the tracheostomy may have become displaced or may require changing: medical or other professionals who are competent in tracheostomy management should review the patient. (ICSS, 2014)

11.7 Haemorrhage

It is common for some bleeding to occur after a tracheostomy has been performed. This usually settles within a few days. Bleeding can occasionally be significant or even catastrophic resulting in death. Bleeding can be from the trachea, stoma or surrounding tissues and can be due to direct trauma of the tissues, puncture, infection or injury to adjacent blood vessels or the tube or cuff eroding into surrounding tissues or vessels over time. Bleeding can also come from the lungs themselves and become evident through tracheal suction. These problems are compounded in the presence of a coagulopathy.

If airway obstruction occurs due to blood clot in the airway (identify if possible with an

endoscope) then direct suction on the tracheal tube with suction tubing may be required to remove it.

Large clots will not pass through a suction catheter or a fibre optic scope suction channel. Suction may need to be applied directly to the tracheal tube and/or the tube removed with suction applied.

Do not make repeated attempts at suctioning with conventional catheters, as delay in removing a blocked tracheostomy tube may cause hypoxia, which may lead to significant morbidity or may even be fatal. At this stage, the tracheostomy tube must be removed. The stoma can be suctioned directly once the tube is removed.

Direct endobronchial intubation, (under fibre optic guidance) with an uncut endotracheal tube and with suction then applied directly to the endotracheal tube may be needed to try to remove obstructing clots. It may be necessary to repeat this procedure and it may be necessary to apply suction in this manner to both main bronchi.

A tracheo-arterial fistula can occur if the tube erodes into the brachiocephalic artery.

This is a rare complication but is associated with lower placement of the tube in the trachea. There may be a warning or 'sentinel' bleed. Any haemorrhage should prompt a fibre optic inspection of the trachea.

If an arterial bleed is suspected, this examination should occur immediately with an experienced surgeon and resuscitating measures available. Arterial haemorrhage can become rapidly fatal. Hyperinflation of the tracheostomy tube cuff or an endotracheal tube cuff, or digital pressure in the stoma may help to tamponade the bleeding point, prior to definitive surgical management.

11.8 Tracheostomy Red Flags

Tracheostomy 'Red Flags' are used as a warning signal that a problem has, or is about to occur and need to be acted upon. Prompt assessment by someone competent to do so is required and a fibre optic inspection of the position of the tracheostomy tube to confirm correct placement within the trachea may be indicated. All staff caring for patients with tracheostomies should be familiar with these warning signs. As with all assessments of the acutely unwell patient, an ABCDE assessment includes ensuring the airway is patent, including assessment of the tracheostomy tube if present.

Red flags include:

1. Airway

- a. A suction catheter not passing easily into the trachea
- b. A changing, inadequate or absent capnograph trace
- c. The patient with a cuffed tracheostomy tube suddenly being able to talk or noises or bubbles coming from the upper airways (implying gas escaping proximally and the cuff no longer 'sealing' the trachea)
- d. Frequent requirement for (excessive) inflation of the cuff to prevent air leak
- e. Pain at the tracheostomy site
- f. Visibly displaced tracheostomy tube. If this is an adjustable flange tube, check to

see where (at what length?) it was last positioned

g. Active bleeding from the tube or stoma

2. Breathing

a. Increasing ventilator support or increasing oxygen requirements

b. Respiratory distress

c. Surgical (subcutaneous) emphysema (gas in the soft tissues)

d. The patient complaining that they cannot breathe or have difficulties in breathing

e. Suspicion of aspiration (feed aspirated on tracheal toilet – suggests that the cuff is not functioning adequately)

3. Circulation or any other general clinical deterioration

a. An airway emergency may lead to cardiovascular collapse.

b. Anxiety, restlessness, agitation and confusion may also be due to an airway problem.

11.9 Other complications following tracheostomy

Local Infection

The stoma is an open surgical wound and routine wound care is covered above. Colonisation with respiratory flora is inevitable and occasionally more serious local site infection may develop which can progress to spreading cellulitis or mediastinitis. This is more common with open surgical procedures due to the greater surgical exposure and dissection. Systemic antibiotics and occasional surgical debridement are required.

Tracheal Damage/Mucosal Ischaemia

Cuff pressure above 20cm H₂O risks ischaemic damage to the tracheal mucosa. Modern tracheostomy tubes have low-pressure cuffs, which extend over a greater surface area; however over-inflation should still be avoided. The pressure in the cuff should be just adequate to prevent air leakage and seal the airway against aspiration

Direct mucosal damage can also occur by poor tracheal suctioning techniques, ill-fitting tubes, or excessive movement of the tube within the trachea. Such problems may be manifest by the development of granuloma and stenosis above or below the tracheostomy stoma.

11.10 Emergency airway management of the patient with a Tracheostomy or Laryngectomy. (See Appendix 7 and links below for algorithms)

The management of tracheostomy (and laryngectomy) related emergencies is summarised in Multidisciplinary guidelines for the management of tracheostomy and laryngectomy airway emergencies. [Anaesthesia 2012; 67:1025-41.](#)

The algorithms are coupled with bed-head signs, allowing essential information to be clearly displayed and immediately available to responders in an emergency, including key details regarding the nature and date of the tracheostomy, method of forming the

stoma and the function of any 'stay sutures.' Separate, colour-coded algorithms and bed-head signs are available for patients with a potentially patent upper airway and those with a laryngectomy.

Two key principles

- Oxygenation of the patient takes priority (not necessarily securing the airway immediately and definitively, unless required for oxygenation)
- Skilled assistance should be sought early.

The generic algorithms cover the majority of common and easily reversible clinical situations that arise. Even in complicated scenarios, key airway management principles should be followed.

The primary responder (typically a nurse, junior doctor or allied health professional) needs to detect airway problems, to assess tracheostomy and airway patency and to provide basic emergency oxygenation.

The secondary responder (typically an anaesthetist, intensivist, head and neck surgeon or specialist practitioner) will have skills in conventional airway management and will also be guided to use skills in managing the tracheostomy or stoma. These skills would include oro-nasal intubation techniques (including difficult intubations), ability to use fibre optic endoscope to assess or replace tracheostomy tubes and the ability to perform and manage an emergency surgical airway or tracheostomy.

The algorithms are applicable for any urgent or emergency situation that develops in a patient with a tracheostomy or laryngectomy.

Interactive algorithms with video links to each of the key steps are available from the website www.tracheostomy.org.uk, in Smart Phone applications (NTSP) and explained in the associated e-learning resources. The website also includes details of in-house training for staff, links to training courses and the freely available NTSP Manual 2013. Sample algorithms and bedhead signs see below; Reproduced from McGrath BA, Bates L, Atkinson D, Moore JA. Multidisciplinary guidelines for the management of tracheostomy and laryngectomy airway emergencies. *Anaesthesia*. 2012 Jun 26. doi: 10.1111/j.1365-2044.2012.07217, with permission from the Association of Anaesthetists of Great Britain & Ireland/Blackwell Publishing Ltd.

11.11 Special considerations

Tracheostomy emergencies in ICU patients usually involve displacement of a tube that is likely to have been placed percutaneously.

Percutaneous stomas do not usually become established tracts for 7-10 days after initial insertion. This may make early reinsertion of a displaced tube difficult or impossible. Bedside details of the nature and date of tracheostomy should guide the responders.

Conventional upper airway management is likely to be safer and easier when managing a recently formed, percutaneous, displaced tracheostomy tube. For patients with a known, difficult upper airway (including the absent upper airway of the laryngectomy patient) emergency management plans should be made in advance, communicated and recorded where they are readily accessible

12. Weaning

The decision to start weaning a patient is done on an individualised basis following assessment by the MDT and making a clear plan prior to the process. This will be continuously re-evaluated and updated based on the individual needs of the patient. The patient must be involved in the process and given full explanations and reassurance about the procedures.

A tracheostomy tube should be removed as soon as it is no longer required. It must be clear which person or team is responsible for management of the tracheostomy, especially if it is not the speciality with primary responsibility for the patient's care.

Reviewing the need for a tracheostomy and planning weaning should be part of the daily assessment. Some patients may tolerate rapid decannulation, especially if their ventilation period has been short or if they do not suffer significant lung or airway pathology or neuromuscular problems. Others, particularly those with underlying cardiopulmonary disease, muscle weakness, neurological deficits, upper airway oedema or problems managing airway secretions, will take much longer to wean and it is important that the process is both planned and sequential.

A checklist to use prior to commencing weaning should ascertain:

- Is the upper airway patent? (may require endoscopic assessment)
- Can the patient maintain and protect their airway spontaneously?
- Are they free from ventilatory support?*
- Are they haemodynamically stable?
- Are they absent of fever or active infection?
- Is the patient consistently alert?
- Do they have a strong consistent cough (able to cough out of tube or into mouth)?
- Do they have control of saliva with or without a competent swallow?
- Are there any planned procedures requiring anaesthesia within next 7-10 days?
- Is this patient causing concern to any healthcare practitioner?
- Can we safely support the weaning process in the patient's current clinical environment? Under specialist supervision, it is possible to decannulate some patients who will need on-going non-invasive respiratory support via a face or nasal mask." (ICS 2014)

13. Decannulation

Care should be taken when deflating a tracheostomy tube cuff as secretions may have pooled above the cuff. Prior to performing the procedure explanations should be given to the patient. If there is a subglottal drainage port, secretions should be aspirated prior to cuff deflation. Cuff deflation should be a 2 person technique; as one deflates the cuff the second performs tracheal suction to prevent aspiration. Following cuff deflation, expiratory noises may be heard, the patient should be reassured that this is normal. The decision to attempt decannulation should be made with the MDT caring for the patient. Each area should follow their protocol for decannulation.

The decannulation process should be commenced in the morning to allow a full period of assessment when the MDT is available.

14. Discharge to community with tracheostomy tube

Effective discharge planning based on individual assessment of the patient needs will help facilitate a smooth transition from hospital into the community. The patient and any additional carers should be trained and confident in performing all aspects of tracheostomy tube care prior to discharge. Tracheostomy passports are available as a communication aid.

Audit and Monitoring Compliance

This guideline will be audited with the audit tool in appendix 9
Audit results will be presented to the critical care clinical governance audit meeting, which will agree actions arising from the recommendations, and monitor the progress of the actions.

Provenance:

Author name: Sheelah Ainsworth Senior Sister Adult Critical Care / including major sections from ICS guidelines

Clinical condition: Patients requiring tracheostomy for airway management

Target patient group: Patients requiring tracheostomy for airway management

Target professional group (clinical competence): All healthcare professionals managing the care of adult patients with tracheostomies including: Nursing staff, physiotherapists, speech and language therapists, anaesthetists, respiratory physicians, ENT surgeons.

Evidence Base:

References :

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If printed, this document is valid only on 19/11/2020

APPENDIX 1 Tracheostomy insertion document



LTH2368 Invasive
Devices Checklist v2.1

APPENDIX 2

Nursing Care Standard: Tracheostomy

References: Guidelines for the care and management of adult patients with tracheostomy at LTHT (2015), Tracheostomy guidelines. St Georges Healthcare NHS Trust. <https://www.stgeorges.nhs.uk/gps-and-clinicians/clinical-resources/tracheostomy-guidelines/>
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DoH (2011) Reducing healthcare associated infections <http://hcai.dh.gov.uk/whatdoido/high-impact-interventions/>

Patients who have a tracheostomy must be cared in an area where staff are competent in caring for patients with a tracheostomy. (see local area for competency, if not available - check with outreach)

- All tracheostomy patients must have emergency equipment available for use including contact numbers of emergency teams.
- All patients need to be assessed as to their respiratory needs and if respiration is a problem then a full respiratory assessment should be carried out by a competent practitioner.
- The need for tracheostomy will be documented, and discussed daily, and advice sought if needed from the medical team if indication continues.
- The inner tube must be checked for patency a minimum of 4 times a day – if needed more frequently, document in the care plan. Inner tubes must be cleaned according to LTHT tracheostomy guidelines.
- The tracheostomy tube cuff pressures must be checked 4 hourly and maintained at 25 cm H₂O or 2 cm above peak inspiratory pressure.
- Suctioning must be performed using aseptic non touch technique (ANTT) as clinically indicated and documented on observation charts and care plan.
- All tracheostomy patients should have their humidification needs assessed and documented by a competent practitioner. If receiving oxygen therapy, heated humidification systems must be used. If oxygen therapy is not in use consider alternatives eg. Heat moisture exchangers (HMEs) bibs and document. Ensure the patient has an adequate fluid intake.
- Assess swallowing as per local guidelines refer to speech and language if required.
- If the patient is eating and drinking observe patient for signs of aspiration at all times eg. Pyrexia, increase in secretions, colour of secretions, cough.
- Sputum samples will only be obtained if there are clinical indications and must be obtained using ANTT, and the date and the results documented on the tracheostomy care plan.
- Observe and report any soreness around the stoma daily and document in the care plan. Change the tapes and dressings if soiled/as required at least every 24 hours. If the stoma requires wound care the LTHT wound care plan must be used.
- All tracheostomy patients must be provided with means of communication and psychological support, eg. Communication boards, pen and paper.

- Tracheostomy tubes should not be changed as routine within the first week of stoma formation. Tracheostomy tubes must be changed as per manufacturer instructions. They must be changed by a **competent** practitioner.
- **For emergency care see LTHT tracheostomy guidelines and algorithms on www.tracheostomy.org.uk**

APPENDIX 3

- Anatomy of a tracheostomy tube

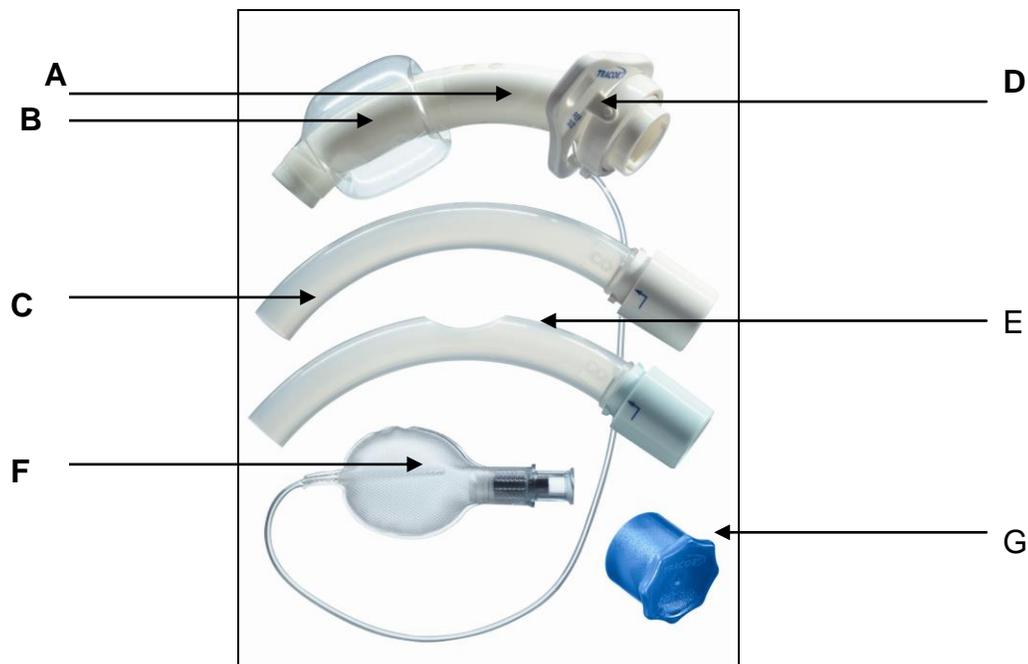


Fig 1: A Twist 301 cuffed double lumen tube © Tracoe.

A) Outer cannula or tube: This is the main part of the tracheostomy tube, which sits in the trachea. It remains in situ for the lifespan of the tracheostomy tube. The outer diameter (OD) measurement refers to the diameter of the outside of this cannula in mm, usually at the widest point but not including the cuff. The inner diameter (ID) refers to the internal diameter of this cannula in mm; usually the size of a tracheostomy tube refers to the ID but not always.

Outer cannulae may end proximally with a standard 15mm anaesthetic connector, a flush fitting or with a twist lock (as in Fig 1) to enable placement of an inner cannula.

B) Cuff: This is a balloon at the distal end of the outer cannula. It can be inflated to create an airtight seal in the trachea to allow ventilation. Modern cuffs are low pressure and high volume with a large contact area to reduce pressure on the wall of the trachea; this prevents tracheal dilatation, mucosal necrosis and tracheal stenosis. Ideally cuffs should only be inflated to a pressure of between 20 & 25cm H₂O using a cuff pressure manometer [2, 3].



Fig 2: A cuff pressure manometer © Teleflex Medical.

Un-cuffed tubes tend to be used primarily in children where often a snug fit is achieved without the need of a cuff; and in adults who are spontaneously breathing and can clear their own secretions, enabling them to speak and swallow.

C) Pilot balloon: This is connected to the cuff via a small pipe, in all tracheostomy tubes. A Luer connection with a valve allows a syringe or cuff pressure manometer to be connected to add or remove air.

D) Flange: The flat plate on the proximal end of the outer cannula, which provides an anchoring point for the tapes that hold the tracheostomy tube in situ. It also prevents the tracheostomy tube from migrating down the trachea. The size, style or code of tube is often displayed on the flange.



Fig 3: A GOS Tube © Teleflex Medical showing V shaped flange.

Specialist tracheostomy tube may have an adjustable flange, which can be moved along the shaft of the tracheostomy tube to allow longer insertion into the trachea or to accommodate larger necks in the morbidly obese or swelling in post surgery or burns.

E) Inner cannula or tube: This tube sits inside the outer cannula. Not all tubes have an inner tube. Various styles of inner tube are available including reusable, disposable, fenestrated, and non-fenestrated, plain or flush ended, 15mm ended and those with a speaking valve.

The inner tube has to be the correct size to fit the outer cannula. It is also important to note that inner tubes are manufacturer specific and are not interchangeable between different makes of tube, though some can be used across a manufacturer's specific range of tracheostomy tubes.

Tubes with inner tubes have advantages over single lumen tubes, as the use of an inner tube allows the outer cannula to remain in place for up to 30 days, single lumen tubes have to be replaced more frequently usually every 7 to 10 days.

F) Fenestration: This is an opening or window on the superior curve of the outer cannula of the tracheostomy tube. The fenestration may have a single or multiple opening and is designed to increase airflow up through the larynx to improve speech, swallowing and coughing. A non-fenestrated inner cannula must be used during suctioning as there is a risk that the suction catheter could pass through the fenestration and hit the posterior tracheal wall

G) Occlusion cap: this allows the tracheostomy tube to be blocked completely. Some as illustrated fit over the 15mm anaesthetic connection, others fit into the twist lock in place of an inner cannula.

If a cuffed tracheostomy tube is used then it is vital to deflate the cuff before using an occlusion cap. Failure to deflate the cuff will lead to the airway being completely obstructed! The use of an occlusion cap allows re-establishment of the normal airway and is an aid to weaning from tracheostomy.

Speaking or one way valve: This may be part of an inner cannula or a separate item. It provides a one-way valve that allows inhalation via the tracheostomy tube but diverts the exhaled air up through the larynx and into the upper airway to allow speech. Like the occlusion cap when a speaking valve is used then the cuff must be deflated to allow the air to pass into the upper airway.

Cough cap: Teleflex Medical produces a cap that creates some expiratory resistance to aid coughing.

Fig 4: A cough cap © Teleflex Medical.



Cuffed suctionable tubes such as Suctionaid (Smiths Medical) and Twist 306 (Tracoe) have a small extra lumen that exits proximal (above) to the cuff. Externally this extra lumen can be connected to a suction supply or a syringe to allow removal of secretions that lodge above the inflated cuff. This helps to prevent aspiration.

Fig 6: A Twist 306 cuffed tube with suction line © Tracoe



Suppliers Details

Boston Medical Products www.bosmed.com
117 Flanders Road. Westborough, MA 01581 USA

Kapitex Healthcare Ltd www.kapitex.com
Kapitex House 1 Sandbeck Way. Wetherby. West Yorkshire. LS22 7GH UK
(UK distributors for Boston Medical Products & Tracoe Medical)

Smiths Medical International Ltd www.smiths-medical.com
Military Road. Hythe. Kent. CT21 5BN UK

Teleflex Medical www.ruesch.de
High Wycombe. Bucks. HP12 3ST UK

Tracoe Medical GmbH www.tracoe.com
Reichsforststr. 32, D60528 Frankfurt/Main Germany

Tyco Healthcare Group LP www.nellcor.com
Nellcor Puritan Bennett Division. Pleasanton, CA USA

APPENDIX 4

Guideline for cleaning Tracheostomy inner cannula

Equipment required

Disposable gloves	Bottle of sterile water
Tracheostomy cleaning swabs	Spare inner cannula
Receptacle	Storage container

• <u>Nursing Intervention</u>	• <u>Rationale</u>
Check equipment, Wash Hands Place sterile water in a disposable bowl	Reduce risk of cross infection
Wear non sterile gloves and Apron	To reduce the risk of cross infection
Remove inner cannula	To maintain a patent airway
Clean with tracheostomy swabs Use a syringe to flush water through if secretions are tenacious. Do not leave inner cannula to soak Dry with clean swabs/ or air dry	To reduce infection risk To reduce infection risk
Store spare tube in an airtight container	Reduce infection risk
Destroy bowl and water in the sluice	Prevent cross contamination

APPENDIX 5

Competency Assessment Tool for Tracheostomy Decannulation and Changes

Introduction

This competency package includes:-

- Tracheostomy competencies - Theory
- Tracheostomy competencies - Practical
- The ICS (Intensive Care Society) Standards for care of adult patients with temporary tracheostomies (2007)
- Anatomy and Physiology teaching pack
- Anaesthetic Equipment - visual aid pack
- Airway management and Ventilatory support - Skills Identified
- Algorithm for tracheostomy weaning

It has been designed for use for practitioners who have the appropriate knowledge and skills to undertake this practice

It is up to the individual to maintain their own competence. If for any reason the practitioner feels they are no longer competent (e.g. post maternity leave or a period of longer than 6 months without practice) it is essential that they are re-assessed.

As part of the assessment process the criteria laid down in the tracheostomy competencies section must be achieved and signed off by the appropriate assessor before unsupervised practice takes place.

It is recommended that there are at least two operators to perform the procedure one of whom **MUST** be a competent practitioner.

Precautionary Note

Ensure that resuscitation and suction equipment is functional and available prior to the start of the procedure

Discussion must have taken place with an appropriate anaesthetist prior to the procedure and must be informed when the procedure is going to take place

Adapted from St Georges Healthcare NHS trust - Guidelines for the care of Patients with Tracheostomy Tubes

Tracheostomy Competencies - Theory

Criteria	Objectives	Date Achieved	Assessed by
Anatomy/ Physiology	<ul style="list-style-type: none"> • To accurately discuss upper airway anatomy • To be able to identify appropriate surface anatomy • To show an understanding of the physiological effects of having a tracheostomy in situ • (see late complications following decannulation)) 		
Tracheostomy change	<ul style="list-style-type: none"> • Can accurately state indications for tracheostomy changes • Be able to accurately produce equipment required for tracheostomy change • Can accurately identify risk factors • Be aware of medico-legal guidance for change 		
Tracheostomy change complications	<ul style="list-style-type: none"> • Can state what procedures should be activated if the following occur: <ul style="list-style-type: none"> -Tube inserted incorrectly - Tube cannot be reinserted - Excessive bleeding - Airway collapse - Excessive coughing - Laryngeal spasm -Tracheal stenosis -Tracheoesophageal fistula -Tracheocutaneous fistula -Tracheo-innominate artery fistula -Cellulitis -Stoma Site infection 		
Decannulation	<ul style="list-style-type: none"> • Can accurately state indications for decannulation • Can accurately gather equipment for decannulation • Can identify when decannulation is not appropriate 		

<p>Decannulation complications</p>	<ul style="list-style-type: none"> • Can state what procedures should occur if the patient exhibits • Immediate: <ul style="list-style-type: none"> - Airway collapse - Panic / Distress - Stridor - Dyspnoea - Increased respiratory rate - Increased heart rate - Oxygen desaturation • Late: <ul style="list-style-type: none"> -Ineffective cough -Fatigue -Aspiration -Excessive use of Accessory muscles -Diaphragmatic Respiration -Agitation 		
<p>Airway Rescue</p>	<ul style="list-style-type: none"> • To accurately discuss the rationale for the use of: <ul style="list-style-type: none"> - Bag and mask - Laryngeal mask airway - Guedel airway - Emergency oxygenation 		
<p>Tracheostomy Tubes</p>	<ul style="list-style-type: none"> • Can accurately discuss the rationale for use of: <ul style="list-style-type: none"> - Non fenestrated tubes - Fenestrated tubes - Double lumen tracheostomies - Speaking Valves - Dimensions 		
<p>Contraindications / Precautions</p>	<ul style="list-style-type: none"> • Can accurately state what potential problems may occur with: <ul style="list-style-type: none"> -Ventilator dependant patients -Cardiovascular issues -Age of stoma -Failed decannulation -Cellulitis -Grading of intubation -Bulbar Problems 		

Tracheostomy Competencies - Practical

Decannulation Assessment Date	Observed by	Competent (Y/N)	Date
1.Mandatory			
2. Mandatory			
3. Mandatory			
Tracheostomy Change Assessment Date	Observed by	Competent (Y/N)	Date
1.Mandatory			
2. Mandatory			
3. Mandatory			
Airway Rescue	Observed by	Competent (Y/N)	Date
a. Bag and Mask b. Laryngeal mask airway c. Guedel Airway d. Emergency oxygenation			

LATE COMPLICATIONS FOLLOWING DECANNULATION

- **EXCESSIVE USE OF ACCESSORY MUSCLES -**
Indicates ineffective breathing pattern that will probably not be sustainable
Ascertain cause of pattern
(If patient is spinal cord injury patient then management will differ)
Interventions to try
Increase respiratory support e.g. Hi flow O₂, CPAP etc
Use positioning to more functionally advantageous posture
Consider tracheostomy replacement
- **PARADOXICAL BREATHING**
I.e. inward movement of the abdomen on inspiration due to weakness, fatigue and /or overload of the diaphragm
Ascertain cause of breathing pattern
Interventions to try
Positive pressure support
Abdominal support (if appropriate)
Positioning to assist diaphragmatic excursion
Low threshold for re cannulation as the patient will fatigue quickly
- **AGITATION**
Likely to be linked to a significant cause
? Change in neurological status
? Hypoxemia
? Side effects of medical management/withdrawal
? Difficulty with maintaining adequate respiratory function
Interventions to try
Supportive therapy while ascertaining cause
Discussion re tracheostomy tube replacement if risk of respiratory complications occurring
- **INEFFECTIVE COUGH**
Often seen:-
Audible secretions
Deterioration in SaO₂
Signs of respiratory distress (changes in respiratory pattern and rate etc)
Interventions to try:-
Manual techniques
Yanker suction
Nasal or oral airway insertion for deeper suction
Cough assist
Increase O₂
Improve oxygen delivery to support respiratory system
Discussion re tracheostomy replacement with anaesthetist
- **FATIGUE**
Often seen:-
Deterioration in SaO₂

Change in respiratory pattern and or rate

Weakened cough

Increased PaCO₂ - difficult to rouse, slow respiratory rate, decrease pupil size

Inability to rehab as too fatigued

Intervention to try:-

Increase O₂

Positioning

Change in respiratory support (assess re non-invasive positive pressure vent)

Suction

Discussion re tracheostomy replacement

- **ASPIRATION**

Often seen:-

Increase temperature

Change in respiratory pattern or rate

Deterioration in SaO₂

CXR changes

Signs of general deterioration in condition

Intervention to try:-

Increase O₂

Use positioning to optimise VQ matching

Use of positive pressure support if appropriate

Trial of cough assist

Assess risk of further aspiration and patient's ability to cope/discuss with SLT

Discussion re tracheostomy replacement

CONTRAINDICATIONS/CAUTIONS TO DECANNULATION

- VENTILATOR DEPENDANT PATIENTS;
Pre oxygenate prior to changing tube.
Have water circuit set up for use while ventilator disconnected.
If decannulation appropriate ensure non-invasive form of ventilation set up prior to decannulation.
- CVS ISSUES:
Decannulation or tracheostomy change maybe contraindicated if evidence of CVS instability. Need to ensure medical staff are aware of this instability.
- AGE OF STOMA;
If less than 2 weeks then an anaesthetist needs to be present during tracheostomy change.
If for decannulation be aware of increased risks and discuss with anaesthetic staff.
- FAILED PREVIOUS DECANNULATION;
Increased risk of failing decannulation if limited change in condition
Need to assess carefully for tracheostomy change being aware of reason for failing
- CELLULITIS;

Tracheostomy change and decannulation may prove more difficult due to tissue changes and probable pain, if severe then the procedures would be contraindicated. Therefore anaesthetic input required for decision making and medical management needed prior to the procedure.

- **GRADING OF INTUBATION;**
Need to be aware of this and discuss with anaesthetic staff prior to making decisions re decannulation and tracheostomy changes.
- **BULBAR PROBLEMS;**
Increased risk of failing decannulation. Usually would need some drug intervention to assist salivary control and careful timing to optimise chances of succeeding.

May be a candidate for a longer period of time with cuff deflated or downsizing of tracheostomy tube. Assessment with occlusion during rehab can also prove useful for further information to chance of success.

APPENDIX 6

PASSY-MUIR SPEAKING VALVE (PMV)

Contraindications for use of the Passy-Muir Speaking Valve

1. Unconscious and/or Comatose Patients
2. Inflated Tracheostomy Tube Cuff
3. Severe Risk for Aspiration
4. Severe Medical Instability
5. Severe Airway Obstruction
6. Unmanageable, Thick Secretions
7. Severely Reduced Lung Elasticity lungs with altered compliance.
8. PMV usage may be limited to short periods of time monitor to avoid complications associated with air trapping
9. This device is not intended for use with endotracheal tubes
10. Do not use during sleep

Further information

Passy Muir Valve (PMV) 007 (Aqua) Tracheostomy and Ventilator Speaking Valve

The PMV closed position “no leak” valve

The valves are designed in a biased-closed position i.e. the PMV opens on inspiration with less than .05cmH₂O and close completely at end of inhalation with no air leak.

- Restores a “closed respiratory system”
- Restores positive subglottic air pressure
- Restores laryngeal/pharyngeal sensation
- Reduces the “anchoring” effect of the tracheostomy tube due to the need for cuff deflation

Clinical Benefits

1. Improved Voice/Speech Production
 - better vocal quality and increased volume
2. Improved Swallow/Reduced Aspiration
3. Facilitates Secretion Management
 - Stronger more effective cough with oral expectoration
 - Restores airflow through upper airway
 - May reduce suctioning frequency
4. Restored Positive Airway Pressure
 - Promotes restoration of physiologic Positive End Expiratory Pressure (PEEP)
 - Facilitates increased oxygenation
5. Facilitates Weaning
 - Physiological benefits
 - a. Re-establishes physiologic PEEP
 - b. More effective cough

- c. Restores a more normal breathing pattern
 - d. Improved assessment capabilities
 - e. Improved secretion management
 - Psychological Benefits
 - a. Patient confidence
 - b. Communication and socialization
 - c. Motivation and independence
6. Reduces Decannulation Time
- Interim step in the decannulation process
 - Adjusting to a more normal breathing pattern
 - Improved ability to assess the airway
 - Builds patient confidence
 - Vocal cord stimulation due to airflow through the oronasopharynx
7. Improved Olfaction
- Improved sense of smell by re-establishing airflow through the oral/nasal cavities which may stimulate appetite.
8. Quality of Life
- Improved communication
 - More normal voice/speech production
 - Facilitates more active interaction.

Assessment

- Discuss with MDT
- The PMV may be placed 48 to 72 hours after the tracheostomy is performed if tracheal oedema and/or secretions from the procedure have decreased. If the tracheostomy tube has been changed, PMV placement may need to be delayed 48-72 hours.

- **Patient Assessment**

The patient should be assessed before, during and after PMV placement

1. **Cognitive status**

Awake, responsive, attempting to communicate

2. **Medical/Pulmonary Status**

The patient should be medically stable.

3. **Positioning**

position comfortably at a 45° angle or sitting position to facilitate proper diaphragmatic movement and maintenance of a patent airway.

4. **Cuff Deflation**

Cuff deflation is mandatory when utilizing the PMV in order to allow expired air to pass around the tracheostomy tube and through the oronasopharynx.

Assess for secretions, tracheal and oral suction if required

Slow deflation of the cuff to facilitates adjustment to the feeling of airflow in the upper airway and secretions being dislodged in trachea.

5. **Airway patency**

- Patient should be able to exhale efficiently and completely around the tracheostomy tube and through the upper airway

- Check history for diagnosis of airway obstruction (i.e. severe stenosis, traumatic intubation, etc.)
- Tracheostomy tube cuff (even when deflated) may create bulk in the airway causing obstruction to exhaled airflow.

Assessment for airway patency

1. Check tracheostomy tube cuff deflated
2. Instruct the patient to inhale through open tracheostomy tube
3. Manually finger occlude during exhalation
4. Encourage oral exhalation and voice
Vocalisation may be heard.

6. During placement of PMV

- Observe the PMV to ensure that the diaphragm of the PMV opens during inspiration and remains closed during expiration.

Monitor to ensure adequate airflow around the tracheostomy tube

- a. Monitor baseline measurements.
- b. If signs of respiratory distress, remove the PMV immediately and reassess

7. Use of Warning Labels

Attach warning labels provided with PMV to the pilot line of tracheostomy tube

8. Secretion Management.

In-line Suction Systems

The PMV should be connected to the side port to prevent the suction catheter from obstructing or damaging the PMV.

9. Swallowing Status

PMV can improve efficiency of swallow and may reduce aspiration, assess the presence and/or risk of aspiration to determine appropriate use of the PMV for swallow.

10. Lung Compliance

- a. Altered compliance due to loss of lung elasticity requires careful assessment to prevent air trapping
- b. Prolonged exhalation potentially causing complications associated with air trapping
- c. PMV use may be limited to short periods of time

11. Oxygen:

- a. Oxygen administration with PMV via tracheostomy mask, T-piece along with appropriate humidification.
- b. Heat moisture exchange filter (HME) performance may be reduced with the PMV as no expiration through the filter to enable moisture collection. If an HME is used, it is important that it be placed between the PMV and the patient so that some moisture may be gained.

12. Facilitating Voice/Speech

If PMV tolerated encourage vocalization. Speech may be immediately possible.

13. Nebulisers

Remove PMV prior to nebulizer treatments.

If the PMV is inadvertently used during nebulizer treatment it should be removed immediately and cleaned to remove medication residue as some medications may adversely affect the PMV diaphragm.

Duration of use

Dependant on toleration and can vary from few minutes to full day. Constant reassessment required to prevent respiratory distress/tiring due to fluctuating respiratory status (e.g. presence of infection, thick secretions, etc) tolerance of the PMV can vary.

Care and lifetime of the PMV

The PMVs are packaged in single units and are single patient use.

The PMV should be cleaned daily after wearing.

1. Cleaning Procedure

- Swish PMV in soapy, warm water (not hot water.) Rinse thoroughly with warm water. Allow PMV to air dry thoroughly before placing in storage container. Do not apply heat to dry PMV.
- DO NOT use hot water

2. Lifetime of the PMV

Each PMV is guaranteed to last for a minimum of two months. Lifetime cannot be guaranteed if cleaned or used improperly.

The PMV can continue to be used as long as it does not exhibit stickiness, noise, vibration, increased resistance on inspiration or any other difficulties.

Please refer to SoP for using a Passy Muir Valve with a Maquet Servo-U Ventilator on Adult patient within Adult Critical Care

<http://www.lhp.leedsth.nhs.uk/common/guidelines/detail.aspx?ID=5636>

A label must be placed on the pilot balloon highlighting cuff must be deflated when Passy Muir valve in use. A notice should also placed at the bed space to highlight when it is use.

Passy Muir Valve Competencies

The numbers outlined in this document are not absolute - you may be deemed to be competent with fewer than the numbers below, or you may need more.

Knowledge required	Evidence	Signature & date
Demonstrates an understanding of how a PMV works		
Demonstrates an understanding of the risk to patients if a PMV is inserted incorrectly		
Able to explain the PMV insertion and removal procedure		
Able to explain what alterations to the ventilator need to be made when the PMV is in situ		
Understands the purpose of sub-glottic aspiration vs simultaneous suctioning when deflating cuff		
Able to identify errors in placement of PMV in training video		

Skills required	Evidence/KSF	Signature & date
Able to advise patient about the effects of cuff deflation	Observed in 5 patients 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/>	
Able to aspirate the sub-glottic port and deflate the cuff appropriately	Observed in 5 patients 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/>	
When the tracheostomy does not have a sub-glottic port they are able to deflate cuff with simultaneous suction by another member of the MDT	Observed in 5 patients 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/>	
Able to place Passy Muir Valve (PMV) in-line with ventilator with the connector piece	Observed in 5 patients 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/>	
Able to remove the PMV and re-inflate cuff appropriately using a manometer to check cuff pressure	Observed in 5 patients 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/>	
Able to correctly change the ventilator settings to NIV mode when the PMV is in situ	Observed in 5 patients 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/>	
Able to halt PMV trials based on patient presentation	Observed in 5 patients 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/>	

Leeds Teaching Hospitals NHS Trust 2018 (Adapted from Royal Free Hospital Ventilator Competencies)

APPENDIX 7

For emergency algorithms and further information click on the following link and see below.

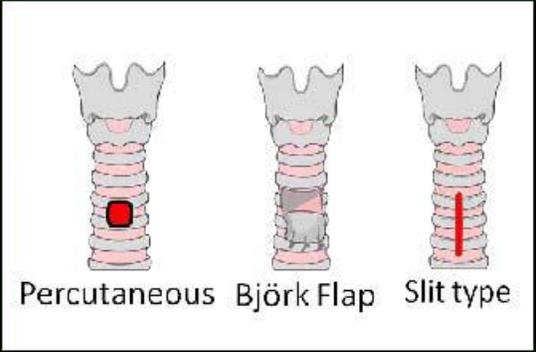
<http://www.tracheostomy.org.uk/Tracheostomy/New%20Blue%20Trachy%20Webpages/New%20Resources.htm>

This patient has a

TRACHEOSTOMY

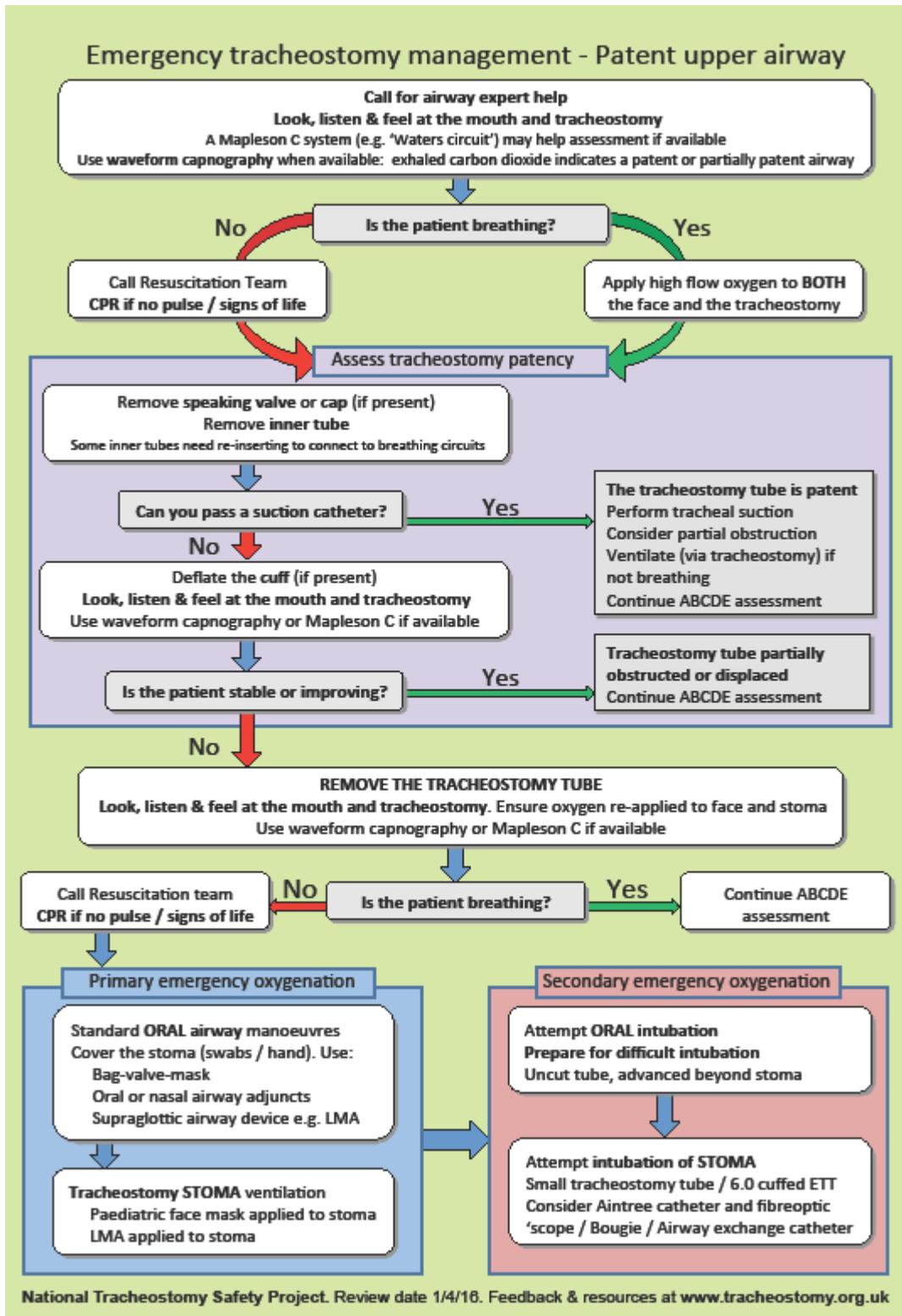
There is a potentially patent upper airway (Intubation may be difficult)

Surgical / Percutaneous

<p>Performed on (date)</p> <p>Tracheostomy tube size (if present)</p> <p>Hospital / NHS number</p>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"><p>Notes: Indicate tracheostomy type by circling the relevant figure. Indicate location and function of any sutures. Laryngoscopy grade and notes on upper airway management. Any problems with this tracheostomy.</p></div> <div style="text-align: center;"><p>Percutaneous Björk Flap Slit type</p></div>
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Emergency Call: Anaesthesia ICU ENT MaxFax Emergency Team

www.tracheostomy.org.uk



This patient has a
LARYNGECTOMY

and CANNOT be intubated or oxygenated via the mouth

Follow the LARYNGECTOMY algorithm of breathing difficulties

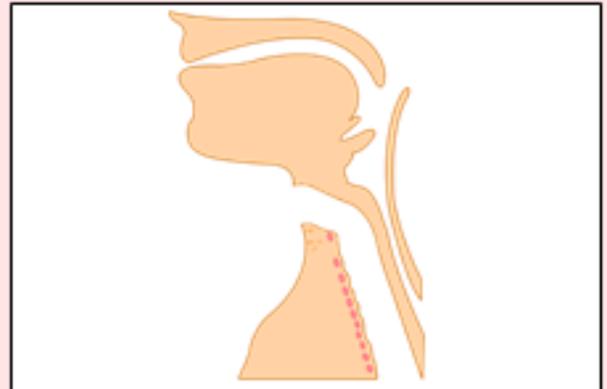
Performed on (date)

Tracheostomy tube size (if present)

Hospital / NHS number

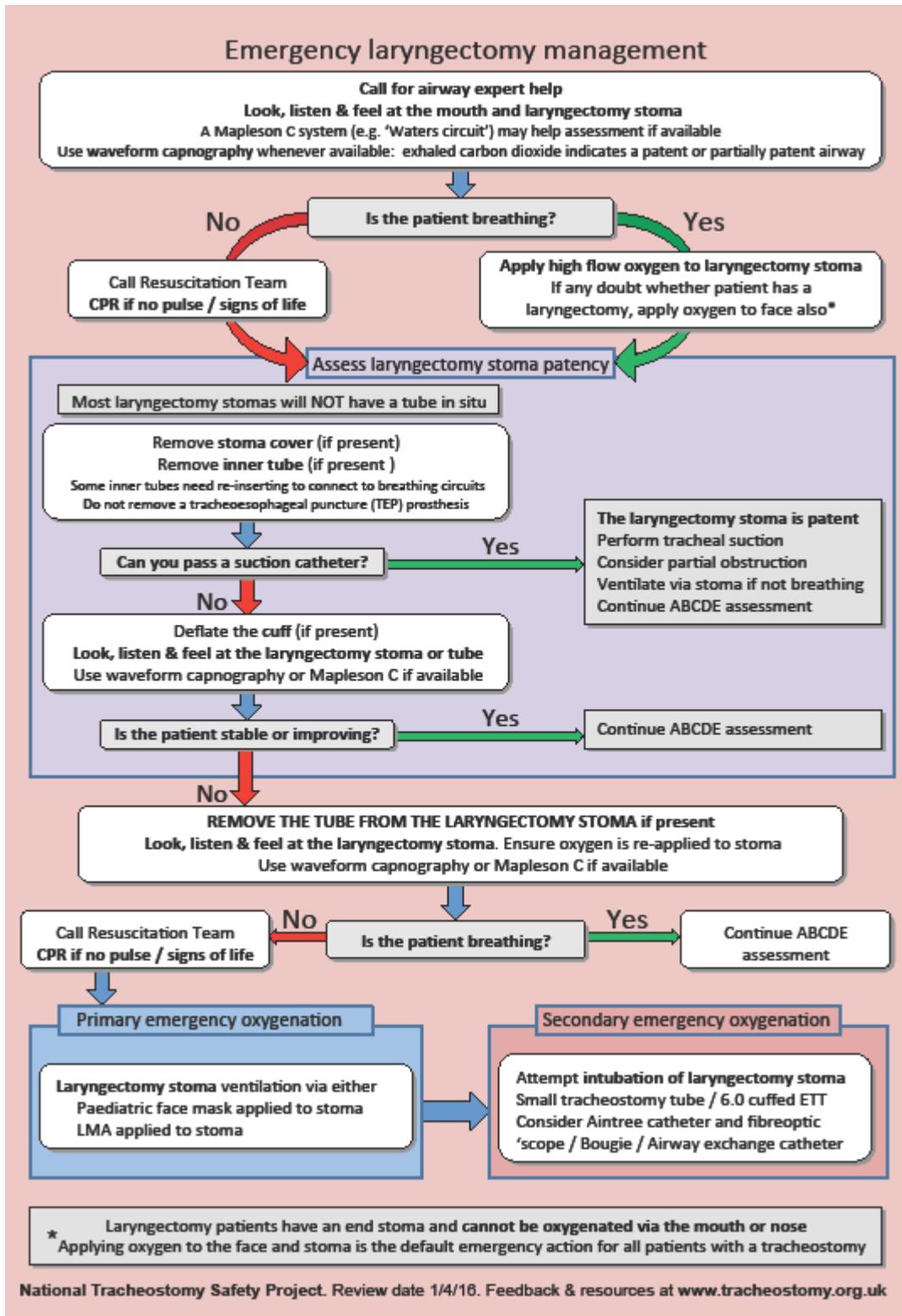
Notes:

There may not be a tube in the stoma.
The trachea (wind pipe) ends at the neck stoma



Emergency Call: Anaesthesia ICU ENT MaxFax Emergency Team

www.tracheostomy.org.uk



APPENDIX 8

Essential bedside equipment

Essential equipment to be with a tracheostomised patient at all times.

Tracheostomy pack	
1	Tracheostomy tubes: same sized tube and one a size smaller
2	Tracheostomy tube holder/ties
3	Tracheal dilators
4	10ml syringe
5	Tracheostomy disconnection wedge
6	Spare tracheostomy inner tubes
7	Lubricating gel
8	Stitch cutter

Tracheostomy pack
Oxygen
Oxygen saturation monitor
Re-breathe bag and tubing
Tracheostomy mask
Cuff pressure gauge
Humidification - discussion with physiotherapist
Tracheostomy tapes
Suction unit and suction tubing
Closed circuit suction / open suction catheters
Bottle of sterile water
Tracheostomy cleaning swabs
Storage container for inner cannula
Disposable gloves
Aprons
Eye protection
Communication aid
Tracheostomy dressing / Buchanen bib - if used

APPENDIX 9

Audit tool

Tracheostomy guidelines audit (standard of achievement 100%)			
	Yes	No	N/A
Consent was obtained for tracheostomy procedure			
The tracheostomy insertion document was used			
Emergency equipment is available			
Suctioning is recorded on the observation chart			
Cuff pressures are recorded on the observation chart 4 hourly and maintained between 20-25cm H2O			
Sub glottic port is aspirated according to SOP			
Appropriate humidification is provided			
Swallow assessment has been performed (if applicable)			
Inner tube has been checked for patency 4 times daily and recorded on the observation chart			
Care of tracheostomy site is documented in the care plan			
Communication aid is available			