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Many nurses lack essential training to manage blocked or dislodged tracheostomy tubes. This article provides information on the care of patients with a tracheostomy

TRACHEOSTOMY: PART 1 OF 4

Caring for patients with a tracheostomy

In this article...

- Consequences of poor tracheostomy care
- Guide to tracheostomy equipment
- Principles of nursing care

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Abstract Everitt E (2016) Tracheostomy 1: caring for patients with a tracheostomy. *Nursing Times*; 112: 19, 16-20.
The National Confidential Enquiry into Patient Outcome and Death in 2014 concluded that tracheostomy care fell below what is safe and reasonable to expect, and that staff needed training in this essential skill. This article, the first of a four-part series on all aspects of tracheostomy management, discusses the principles of tracheostomy care.

5 key points

1. A tracheostomy is a temporary or permanent artificial opening in the trachea
2. Patients with a tracheostomy follow a complex pathway through critical care to general wards
3. Half of tracheostomy-related deaths are due to displacement of tubes
4. All patients with a tracheostomy should have a bed-head label with information about their tube and airway management
5. An emergency tracheostomy box should accompany patients on transfer

Although an average of 12,000 tracheostomies are performed each year in the United Kingdom (National Confidential Enquiry into Patient Outcome and Death, 2014), tracheostomy care often fails to meet safe standards (NCEPOD, 2014; Intensive Care Society, 2014). It is estimated that 50% of tracheostomy-related deaths were due to displacement/dislodgement of the tracheostomy tube (Royal College of Anaesthetists and The Difficult Airway Society (2011). However, NCEPOD (2014) found that 28% of hospitals did not train staff to deal with blocked and/or displaced tracheostomy tubes. The report highlighted the urgent need for mandatory training programmes in all hospitals caring for this patient group.

Many patients with a tracheostomy follow a complex care pathway through critical care units to general wards, and a small proportion are discharged to the community. Most hospitals will have some wards that routinely care for patients with tracheostomies (NCEPOD, 2014).

Outside of critical care units, patients and staff should be supported by critical care outreach teams and specialist tracheostomy nurses. A multidisciplinary team should also be available, consisting of an ear, nose and throat consultant, anaesthetic consultant, specialist tracheostomy nurse (if available), critical care outreach nurse, speech and language therapist, and physiotherapist, who will routinely see the patient (National Tracheostomy Safety Project, 2013).

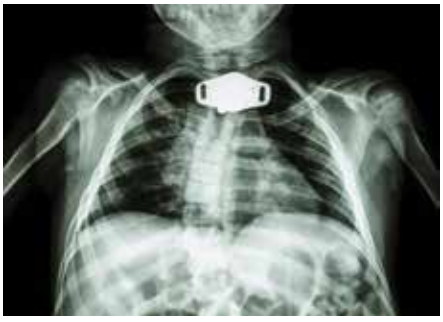
Caring for patients with a tracheostomy can be time-consuming, and staffing levels and skill mix should be considered when a patient with a tracheostomy is nursed on a general ward (National Institute for Health and Care Excellence, 2014). Ideally, wards should be given 24 hours' notice to ensure they are appropriately staffed (NTSP, 2014).

What is a tracheostomy?

A tracheostomy is a temporary or permanent artificial opening (stoma) made into the trachea; a tracheostomy tube is inserted to maintain the patency of the stoma and the procedure can be performed either surgically or percutaneously. Box 1 lists the most common indications for tracheostomy insertion.

Surgical insertion is performed in theatre under general or local anaesthetic depending on the patient's condition.

An opening is made into the anterior wall of the trachea, usually through the second-to-third or the third-to-fourth tracheal rings. A tracheostomy tube is then



An x-ray of a child with a tracheostomy tube inserted due to respiratory failure

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BOX 1. INDICATIONS FOR TRACHEOSTOMY

- Facilitate the removal of bronchial secretions
- Secure airway in patients with major facial injuries
- Secure airway following head and neck surgery
- Secure airway in respiratory-tract obstruction due to, for example, a tumour or foreign body
- Patients who are at high risk of aspiration, for example, patients with brain injuries
- Enable long-term ventilation, for example, patients following spinal injury
- Facilitate weaning from ventilator
- Secure airway in head injury/ stroke patients

Adapted from National Tracheostomy Safety Project, 2013

inserted to keep the stoma patent and the tube secured with sutures and/or tracheostomy collar.

Percutaneous insertion is performed in critical care units under sedation and local anaesthetic (NTSP, 2013). A needle is inserted through the neck into the trachea, then a guide wire is fed through the needle. The needle is removed and tract made bigger by dilators fed over the guide wire. When the stoma is large enough, the tracheostomy tube is fitted over the guide wire into the trachea, then the guide wire is removed and the tracheostomy tube secured with sutures and/or tracheostomy collar (Durbin, 2005).

Nurses caring for patients with tracheostomies must be aware of the insertion technique in case they are required to perform an emergency tube change; percutaneous guide wires should be available in the emergency tracheostomy box at the bedside.

It is important to know whether a tracheostomy is temporary (weanable) or permanent (non-weanable), as this will affect the plan of care. Nurses will provide regular tracheostomy care for patients with temporary tracheostomies, but patients with a permanent tracheostomy will also require education and training to manage their airway independently, where possible.

Tube types

Tracheostomy tubes are either single or double cannula (with an outer and inner cannula). The ICS (2014) notes that tracheostomy tubes with an inner cannula are inherently safer and are normally preferred. The double cannula allows routine inspection and clearance of secretions to prevent blockage of the tube, making it safer and easier to care for in a ward environment. Patients can be shown how to remove their own inner tube, and clean and replace it.

The outer diameter of the tracheostomy tube should be two-thirds to three-quarters of the tracheal diameter (NTSP, 2013). An adult female can accommodate a tube up to 10mm and an adult male up to 11mm.

Ideally the tube tip should be a few centimetres above the carina (a ridge at the base of the trachea separating the openings of the right and left main bronchi), and placement should be checked with an endoscope. If the tube is too short, there is a high risk of accidental decannulation and partial obstruction due to poor positioning; if it is too long, it can rub on or near to the carina, causing ulceration, continuous irritation and coughing. The diameters and lengths of tubes vary between manufacturers and although most hospitals tend to use one type of tube, it is prudent to have a variety available in case a model is inappropriate for a particular patient. In certain circumstances, a tracheostomy tube may need to be made specifically for patients whose needs cannot be met by standard tubes.

A connector at the opening of the tracheostomy tube enables airway equipment to be attached, such as catheter mount or bag valve mask.

Cuffed and uncuffed tubes

Uncuffed tubes are used for patients who can protect their own airway and have an effective cough, and can clear secretions independently. Cuffed tubes are used to seal the trachea when positive pressure ventilation is used, and to reduce the risk of aspiration of secretions in patients who cannot protect their own airway, for example, due to vocal-cord palsy, swallowing dysfunction or brain injury. The cuffs are air-filled, low-pressure and soft to prevent trauma to the trachea (Fig 1).

Cuff-pressure manometer

A cuff-pressure manometer should be used to assess patency and effectiveness of cuffed tubes; this hand-held gauge can add or remove air as necessary (Fig 2). Pressure should be maintained between 25-34cmH2O (ICS, 2008); it should be checked at least twice a day (St George's Healthcare Trust, 2012). The pressure should be recorded on a daily tracheostomy care chart; any evidence of significant

FIG 1. **CUFFED TUBE (CUFF DEFLATED)**

FIG 2. **CUFF-PRESSURE MANOMETER**

FIG 3. **SUBGLOTTIC SUCTION PORT TRACHEOSTOMY TUBE (CUFF DEFLATED)**

FIG 4. **EMERGENCY BOX SHOULD BE AVAILABLE WITH THE PATIENT AT ALL TIMES**

FIG 5. **VELCRO TWO-PIECE TRACHEOSTOMY TUBE COLLAR**

FIG 6. **CENTIMETRE-MARKED SUCTION CATHETER**

FIG 7. **EXAMPLES OF HEAT MOISTURE EXCHANGERS**

deflation (below 25 cmH2O) may indicate a problem with the tube and should be reported, and the tube changed by a competent practitioner if required. Likewise, overinflation of the cuff can cause tracheal wall damage and should also be reported and resolved as soon as possible.

A device, the Mallinckrodt Evac, enables the constant removal of secretions above the cuff and the constant monitoring of cuff pressure.

Fenestrated tubes

These have either a single hole or multiple holes in the arc of the inner and outer tube to facilitate airflow up into the larynx, and improve voice quality. Many manufacturers make the inner fenestrated cannula coloured, usually red or green, to highlight its use. It should always be removed and replaced with a plain inner cannula with no fenestration holes prior to suctioning to prevent suction catheters passing through the holes and causing trauma to the trachea.

These tubes can cause hyper granulation of the posterior wall of the trachea, making removal and reinsertion of the inner tubes and routine tube changes difficult (St George's University Hospitals Foundation Trust, 2015).

Sub-glottic aspiration port

Some tubes have a small aspiration port running along the outside of the tube to just above the cuff (Fig 3). A syringe attached to the port can be used to remove aspirated secretions and reduce the risk of ventilator-associated pneumonia (VAP) and aspiration pneumonia. The amount aspirated over a 24-hour period should be recorded and used to decide on further management interventions to dry up respiratory and oral secretions, and to improve patient comfort and aid tracheostomy weaning trials (weaning is discussed in part 2 of this series).

Other devices

Some tubes have an adjustable flange that can be moved manually to increase/decrease the proximal length to accommodate deep-set tracheas, distorted anatomy due to tumours, inflammation, oedema or obesity.

Mini-tracheostomy uncuffed tubes with a diameter of 4mm are available to aid secretion removal and are inserted under local anaesthetic for conditions such as bronchiectasis.

Tracheostomy care

Nurses need to understand all aspects of tracheostomy care, including routine and emergency airway management, safe decannulation, weaning and safe discharge into the community. The patient's airway requires close monitoring 24 hours a day using a tracheostomy care chart to record care.

Equipment and signage

The NTSP (2013) recommends that all patients with a tracheostomy have a bed-head label with information regarding their tube and airway, including whether it is surgical or percutaneous, the tube type, size and suction-catheter size, patency of the upper airway and whether the tracheostomy is temporary, permanent or involves a laryngectomy (removal of the larynx). Bed-head labels are available at www.tracheostomy.org.uk.

Individual patients should have an emergency tracheostomy box, which should accompany them on transfer and on discharge into the community, and contain an appropriate tube size/type (Fig 4). The box contains equipment to insert a new tube in the event of dislodgement or blockage. Other equipment required at the bedside includes lubricating gel to aid insertion, cuff-pressure manometer, spare tracheostomy dressings and collars, Tilley

BOX 2. **HUMIDIFICATION**

Heated humidification

Ensures that inspired gas is delivered fully saturated and at core body temperature; the most effective system when secretions are tenacious and dry.

Cold humidification

Only delivers approximately 50% humidity to inspired gas, therefore less effective than heated systems. However, significantly more cost-effective than heated systems for short-term use.

- **Sodium chloride 0.9% nebuliser:** A nebuliser turns sodium chloride 0.9% into supersaturated aerosol of liquid droplets. These droplets penetrate the lungs, moistening the airways. A dose of 5mls of sodium chloride 0.9% every two-to-four hours, and as required, should be prescribed for every tracheostomy patient (National Tracheostomy Safety Project, 2013).
- **Heat moisture exchanger devices:** These attach directly onto the tracheostomy tube. Inspired gas passes through the device and is filtered, moistened and heated (Fig 7). The expired gas provides the device with the heat and moisture. These should be changed at least every 24 hours, or as needed, to prevent accumulation of secretions.
- **Stoma bibs:** These foam bibs absorb moisture from the expired air, filter and moisten inspired air. Patients like them, as they cover the tracheostomy tube. This is particularly important when the tracheostomy is permanent, and there are issues with body image and social reintegration. The bib can be moistened with a water spray.

Cuffed tubes reduce the risk of aspiration of secretions in patients who cannot protect their own airway, such as those with brain injury

forceps and a pen torch (McGrath et al, 2012). Equipment should be checked daily.

Securing the tube

A tracheostomy tube can be held in place by several different methods. At initial insertion, the tracheostomy will be held in place by suture and, in addition, a collar or twill ties may also be used. Once the sutures are removed, the tracheostomy must be secured in place by a Velcro collar or twill ties.

Securement devices should be checked once a shift, or more frequently, if a patient is at risk of pulling on the collar/ties, for example, confused patients; ensure that they are not too tight or too loose – as a guide, two fingers should be able to fit down one side of the collar/twill ties.

The edges of the tracheostomy flange may cause small ulcerations if the collar/twill ties that hold the tracheostomy tube in place are too tight, or where the flange sits on the collar bone.

It is important to check the back and sides of the neck frequently for reddening or pressure ulcers caused by the securement device. Soft Velcro collars with adjustable tabs can help to reduce this risk (Fig 5).

Cotton twill ties are recommended for patients who are at risk of self-decannulating; twill and foam collars combine the softness of a Velcro collar with the robustness of the twill, enabling them to be tied and knotted into place through the flange, and hold the tracheostomy tube securely.

Inner-cannula care

When a double lumen tube is used, the inner cannula should be removed and cleaned every 2-4 hours depending on the quantity and tenacity of secretions; if these are copious, the inner cannula will require more frequent checks and cleaning, which should be done using the manufacturer's cleaning aids. Some inner cannulas are single-use only and should be replaced at each check. When using reusable tubes, a clean tube must be available at all times at the bedside to ensure that a "one in, one out" system is used, so that an inner cannula is in-situ at all times. Dirty inner tubes should be cleaned according to local infection-prevention guidance.

Stoma care

Patients with a tracheostomy are particularly susceptible to respiratory and stoma infections. Leakage of respiratory track secretions around the stoma site causes a damp, moist environment that harbours bacteria, and colonisation of the site is common. Skin can also become macerated and excoriated.

The stoma site should be checked at least once a day, or more frequently if required, and this requires two nurses: one to hold the tube and one to clean the stoma site. The site should be cleaned using a tracheostomy wipe or with 0.9% sodium chloride solution, and dried thoroughly. It should be monitored for any signs of infection such as offensive-smelling exudate, redness, pain and swelling, and the patient monitored for systemic signs such as pyrexia and feeling unwell. Evidence of infection should be documented and microbiology swabs sent for culture (McGrath et al, 2012) to ensure appropriate antibiotics are prescribed.

Specifically designed tracheostomy stoma dressings, placed under the flange and around the stoma site, should absorb secretions and provide a buffer to the flange edges to prevent ulcers. However, bulky foam dressings should be avoided, as they increase the risk of tube dislodgement.

A film-forming acrylate barrier, such as Cavilon No Sting Barrier Film, can be applied to broken skin; it helps to protect

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BOX 3. INDICATIONS FOR SUCTIONING

- Noisy breathing, audible secretion sounds
- Ineffective, spontaneous cough
- Aspiration of gastric or upper-airway secretions
- Increased work of breathing (rate, rhythm and effort). May be due to difficulty tolerating speaking valve (see part 2), or a blocked tube.
- Pulmonary atelectasis (lung collapse), or consolidation due to secretion retention
- Low oxygen saturation could indicate blockage, displacement or a respiratory problem such as a chest infection
- During synchronised cuff deflation (see part 2)
- At patient's request

the stoma site from wet secretions and reduces the risk of maceration.

Humidification

As air passes through the mouth and the nose, it is warmed, filtered and moistened. Breathing via a tracheostomy bypasses the nose and mouth, so artificial humidification is crucial to keep the tracheostomy tube patent; humidification methods are outlined in Box 2.

Suctioning

Suction should only be used for patients who are unable to clear their own secretions into their tracheostomy tube (Box 3) (Pryor and Prasad, 2008).

It is essential to encourage patients to cough and clear their own secretions. Staff should be competent in using suction to remove secretions from the tracheostomy tube, as well as deep suctioning – which may be required for patients who are desensitised and require stimulation to expectorate secretions, or who have a poor cough and struggle to clear secretions to the level of the tracheostomy tube.

Face protection in the form of a fluid shield mask or a separate goggles/mask combination should be worn when performing suctioning, and a non-touch aseptic technique should be used.

The suction unit should be set to no more than 20kpa/120mmHg for an adult (NTSP, 2013). Those with high oxygen requirements may need pre-oxygenation to minimise the risk of acute hypoxia during the procedure (Dougherty and Lister, 2015).

Suction should be given for no more than 10 seconds to reduce the risk of hypoxia, cardiac arrhythmia and bronchospasm/constriction. It should only be applied on withdrawal of the suction catheter to reduce the risk of mucosal irritation and damage (McGrath et al, 2012). Suction catheters are a sterile, invasive piece of equipment and should therefore be discarded after single use.

The use of centimetre-marked suction catheters allows the catheter to be passed to a predetermined depth, thereby reducing the risk of tracheal and bronchial mucosal damage (Fig 6).

Deep suctioning should be avoided where possible to reduce the risk of mucosal damage and inflammation.

The size of the suction catheter required can be worked out by using a simple equation (there are others); for example:

Tube size - 2 x 2 = suction catheter FG
EXAMPLE: 8-2 = 6 x 2 =12 FG

Suction should be given no more than three times consecutively to reduce the chance of hypoxia, cardiac arrhythmia, pulmonary atelectasis, bronchoconstriction/spasm, elevated intracranial pressure, hyper/hypotension, cardiac or respiratory arrest (Higgins, 2009; ICS, 2014).

Local policies and procedures should be followed when using suction and all interventions should be recorded along with sputum tenacity, viscosity, colour and odour. A sputum trap can be used to send a sample if concerns arise.

Any difficulty in passing a suction catheter requires immediate attention to assess if the tube is blocked or has been displaced (ICS, 2014).

Hydration and oral hygiene

Hydration is an important part of tracheostomy care, as dehydration can result in secretions becoming thick and dry, increasing the risk of a blocked tube.

The majority of patients with a tracheostomy will be nil by mouth, and regular mouth care is essential in preventing problems, such as mouth ulcers and oral thrush. Poor oral hygiene is also associated with VAP and daily use of 0.12% chlorhexidine gluconate mouthwash or gel is recommended (Conley et al, 2013).

Contaminated tracheal secretions can leak past the inflated tracheal cuff and into the lungs, causing aspiration pneumonia.

Conclusion

Training is essential in all acute and community care settings to ensure that patients with tracheostomies receive appropriate care.

Cohorting of tracheostomy patients reduces the number of staff needing training and enables staff to maintain their skills and confidence.

Ward areas should have appropriate equipment to ensure safe and effective tracheostomy care

Patients should have a bed-head sign and relevant algorithms available for use in an emergency.

An emergency tracheostomy box should be available for all patients with tracheostomies on critical care units, wards or at home. **NT**

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ARTICLES IN THE SERIES

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- Part 4: Care of people following a laryngectomy, 1 June