

Cuff management, vocalisation and speaking valves

Tracheostomies may be only a short term requirement for patients and should be removed as soon as they are no longer needed. Judging the timing of removal of the tube (decannulation) can be difficult, and the patient may need to spend several days or even weeks progressing towards this step. The best way to reduce complications from having a tracheostomy tube in situ is often to remove the tube as soon as it is safe to do so.

The term 'weaning' can mean either a reduction in support from mechanical ventilation (or assisted spontaneous breathing modes), a generic term for the period of time as the patient progresses towards decannulation, or the term is sometimes applied to a reduction in the size of the tracheostomy tubes. The latter term is referred to as 'down-sizing' in this manual.

Within the hospital setting, patients will be in with one of three different categories with their tracheostomy: permanent tracheostomy (non-weanable), long-term (weanable with difficult or under specialist supervision) or temporary (weanable). Tracheostomy tubes may cause permanent anatomical or physiological damage to the airway and related structures and therefore timely weaning, where indicated, is advantageous.

Prior to the removal of a temporary tracheostomy tube, there must be multidisciplinary team agreement that the indication for the tracheostomy has now been resolved sufficiently. The weaning process must be clearly led by individuals who are competent to do so, as the process is not without risk. This same team should remain the main point of contact for at least 48 hours post decannulation. If patient location prevents this being a viable option, care should be formally handed over to someone able to provide adequate advice and interventions.

A tracheostomy MDT will regularly include:

- Ward Nurse
- Physiotherapist
- Speech and language therapist
- Specialist Nurse (Tracheostomy, ENT or Critical Care e.g. Outreach)
- Respiratory physician
- Head & Neck surgeon
- Anaesthetist or Intensivist
- The patient and/or their carer may be valuable team members with considerable knowledge. The patient will be included in any relevant discussions if possible.

The team must have a thorough knowledge of the individual patient's condition including indication for tracheostomy, established indicators for decannulation and plan of further any future assessments or interventions.

Practitioners caring for the patient through the decannulation process must have a sound understanding of the signs of deterioration during or post-decannulation and must be able to take necessary actions in the event of an emergency.

For some short-term conditions requiring a tracheostomy (e.g. facilitating a straight-forward wean from mechanical ventilation or covering extensive oral surgery) the original tracheostomy tube may suffice for the whole weaning process, prior to removal. In more complex situation, a smaller tube, a different type of tube (e.g. minitrach), a fenestrated tube or a variety of speaking valves or decannulation caps may be required.

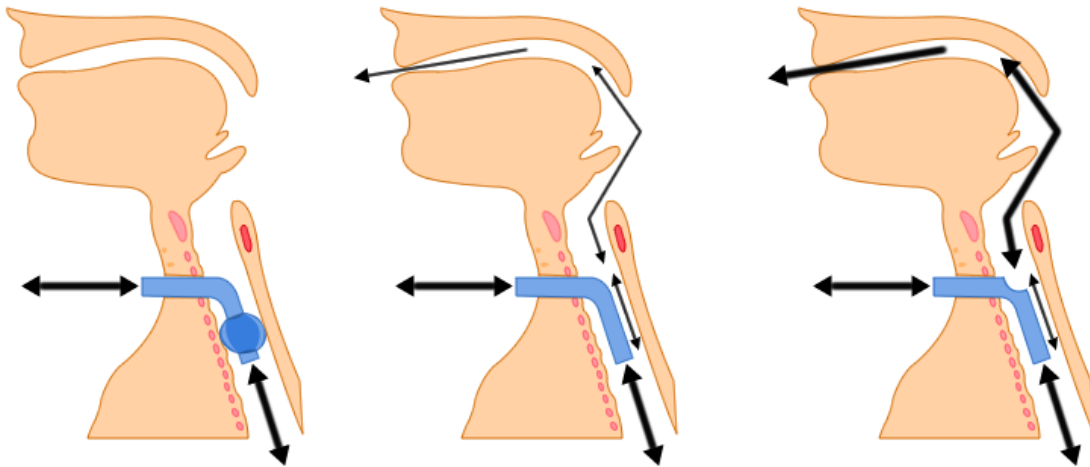


Image above demonstrates expected airflows with cuffed tube (left), un-cuffed tube (centre) and an un-cuffed, fenestrated tube (right).

Patient assessment

In assessing whether a patient is a suitable candidate to attempt weaning with an aim of decannulation, it must first be clarified whether the reason for the tracheostomy has now been resolved. This may require assessment by endoscopy to assess patency of upper airway and movement of vocal cords. This can be carried out by anyone competent to do so, but may involve head & neck surgical teams, anaesthetists, intensivists or SALT teams who are usually more experienced with endoscopy. A more general assessment of the patient is also required to ascertain whether the patient is well enough to endure the remove of the tracheostomy within the coming days.

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 into mouth)?
- Do they have control of saliva + / - a competent swallow
- Are there any planned procedures requiring anaesthesia within next 7-10 days?
- Is this patient causing us concern?
- 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.

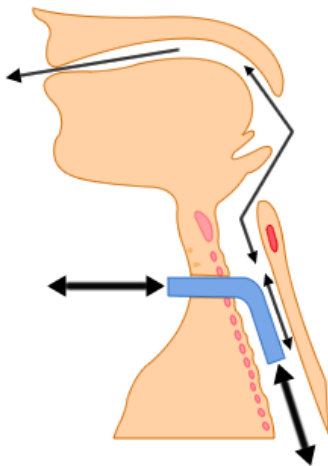
The principles of weaning involve gradually returning the airflow patterns in the upper airways back towards 'normal' thus restoring normal physiological functions. This process will only succeed if the tracheostomy tube in situ is of an appropriate size to allow sufficient airflow around and/or through the tube to the upper airways.

The process

There are many variations on decannulation protocols described in the literature. It is not clear which of these is 'the best' or whether some work better in certain situations. If your institution has a protocol which works for your patients, then you are probably just as well continuing to working with it. We have attempted to explain here the principles behind the various strategies that may be employed.

The first step after determining suitability is to deflate a tracheostomy tube cuff, if present. This is in order to ensure the patency of the upper airway and to ensure that the patient can manage their upper airway secretions. Deflation of a cuff is explained in detail elsewhere in this manual. In summary, it involves prior subglottic and pharyngeal suctioning (or suction of a dedicated subglottic suction port) prior to cuff deflation with simultaneous suctioning.

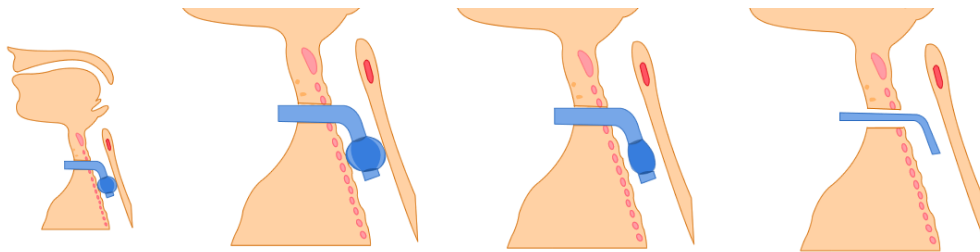
If a patient has had a cuffed tracheostomy tube in situ for some time, then deflation and the subsequent flow of air through the upper airways can cause some initial coughing or distress. The cuff may have to be deflated on a number of occasions for increasing time periods. If the patient is breathing significantly through the upper airways, then consideration should be given to the inspired oxygen concentration. Room air (21% oxygen) will be mixed with the concentration inspired via the tracheostomy and the oxygen concentration delivered to the lungs will be lower than that delivered. If the patient is oxygen dependant, this could lead to hypoxaemia. The oxygen concentration delivered to the tracheostomy can be increased, supplemental oxygen may need to be given by



facemask or the cuff may need to be re-inflated. Hypoxia usually indicates that the patient is not ready to proceed beyond short trials of cuff deflation.

If the patient can tolerate cuff deflation, we will have established that they have a patent upper airway and that they can manage their oral secretions. Cough effort and swallowing can also be assessed at this point. If a patient has had a tracheostomy tube in situ for a prolonged period of time, cuff deflation should normally be tolerated for around 24 hours prior to attempting further interventions and proceeding with the decannulation plan. Patients who are relatively well or who have had a short-term tube in situ may be able to progress rapidly if each step is well tolerated.

Occlusion of the end of the tracheostomy tube will mean that the patient has to breathe solely through the upper airways and all airflow in the trachea will have to be *around* the tube and not *through* it. With the tracheostomy tube and deflated cuff sitting in the airway, this offers a significant resistance to airflow, associated with an increase in the work of breathing. The image below shows the different amounts of space available to breathe around a tracheostomy tube sited in the trachea.



Digital occlusion with a gloved finger is a simple way to assess whether the patient is able to tolerate further attempts at weaning with the current tube in situ. If the patient can breathe adequately past the tube, in and out via the nose and mouth without any signs of respiratory distress, then weaning could reasonably progress with the same sized tube. If the patient cannot breathe adequately via the upper airways, then the tube may be too large and down-sizing to a smaller tube (as shown in the right-hand image above) may allow more gas to bypass the tube to the upper airways. This will offer less resistance to gas flow in the trachea. The largest tubes that will be tolerated for weaning in this way are usually 7.5mm ID for males and 6.5 mm ID for females. Failure to tolerate brief tube occlusion must raise the possibility of upper airway obstruction, which should warrant fiberoptic inspection.

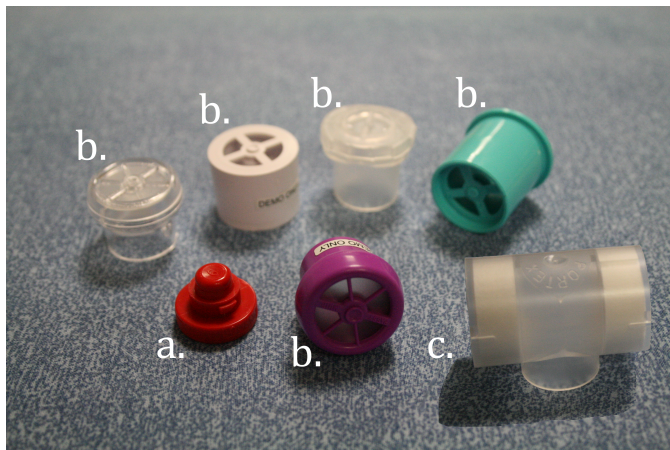
A fenestrated tube (with single or multiple holes on outer curvature of tube) may be useful for weaning, especially for patients who do not cope well with down-sizing or when down-sizing is not possible. They are used as appropriate and caution must be taken as the fenestrations may cause the formation of granulation tissue within the trachea and/or allow trauma to the posterior tracheal wall if suctioned through inadvertently.

The choice of whether to leave a cuffed tube in situ or change to an un-cuffed tube will depend on the patient and the circumstances. If the patient is only tolerating short periods of cuff deflation or if intermittent or nocturnal ventilation may still be required, a cuffed tube will need to remain. Otherwise, an un-cuffed tube will offer less resistance to flow to the upper airways.

When a patient is known to have a complex airway (e.g. requiring an adjustable flange tracheostomy) or has a previously documented difficult intubation extra caution is taken throughout the whole process. In these cases, it is essential to liaise closely with the relevant parent team with responsibility for the tracheostomy.

Speaking valves and caps

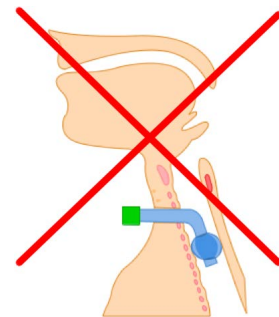
Speaking valves and occlusion caps are advocated by many and can be used prior to tube removal. The speaking valves (labelled 'b' in the image) are one way valves, allowing gas to be inspired via the tracheostomy tube.



The valve closes in expiration, forcing gas through the upper airways. A decannulation cap (labelled 'a' in the image) blocks all airflow via the tracheostomy tube. Both of these systems cause an increase in the resistance to airflow through

the trachea, as the tube is still present in the lumen of the trachea. Some patients will therefore tire even after a few minutes of this sort of intermittent or permanent occlusion and need the valve or cap removing. Monitor all of these trials carefully as if a brittle patient become fatigued, the weaning process may be delayed by several days while that patient recovers. They may not always be required if the patient has had a relatively short-term tracheostomy in situ.

One of the most important points to remember when using speaking valves or caps is that they must never be used with a cuffed tube with the cuff inflated. Outside of specialist areas, it is probably safer to stipulate that these devices should simply not be used with cuffed tubes at all, as even the potential to inflate the cuff with these devices attached can be fatal. The patient cannot exhale through the tracheostomy tube when a speaking valve is attached, and if the only alternative means of exhalation (via the upper airways) is blocked with an inflated cuff, the patient will suffocate. Both inhalation and exhalation



via the tube are

impossible when a cap is used. Videos explaining the use of speaking valves can be found [here](#), with a narrated Captivate presentation available [here](#).

Speaking valves can be used in breathing circuits with ventilators in some circumstances. Normally, ventilator-dependant patients do not tolerate attempts at speech as this comes at the expense of oxygenation and appropriate ventilation. However, for some patients who are weaning from mechanical respiratory support slowly, or those who require long-term ventilatory support, attempts at speech may be appropriate. It is important to deflate any cuff that is used prior to inserting the speaking valve. The ventilator will usually have to be set to deliver larger tidal volumes. The subsequent loss of gas from the upper airways as it is exhaled via the larynx will cause most ventilators to assume that a significant circuit leak is occurring and the alarms but be set appropriately.

When the patient can tolerate a deflated cuff, manage their oral secretions, protect their airway and breathe adequately through their upper airways (usually following some sort of tube occlusion trial) then they are ready to have the tube removed.

Weaning documentation

The standardised weaning and subsequent decannulation practices must be locally agreed and supported by multi disciplinary guidelines and documentation.

Local guidelines and practice must ensure that:

- The team taking responsibility for a patients' tracheostomy wean review the patient regularly
- Their assessment, interventions and plan is clearly documented to guide the ward MDT
- Observation charts include tracheostomy and respiratory observations are accurately maintained
- The ward MDT have written guidance of how to access expert help in an emergency at any time (Bedhead signs)