

Tracheostomy Troubleshooting Guide for ICU Providers

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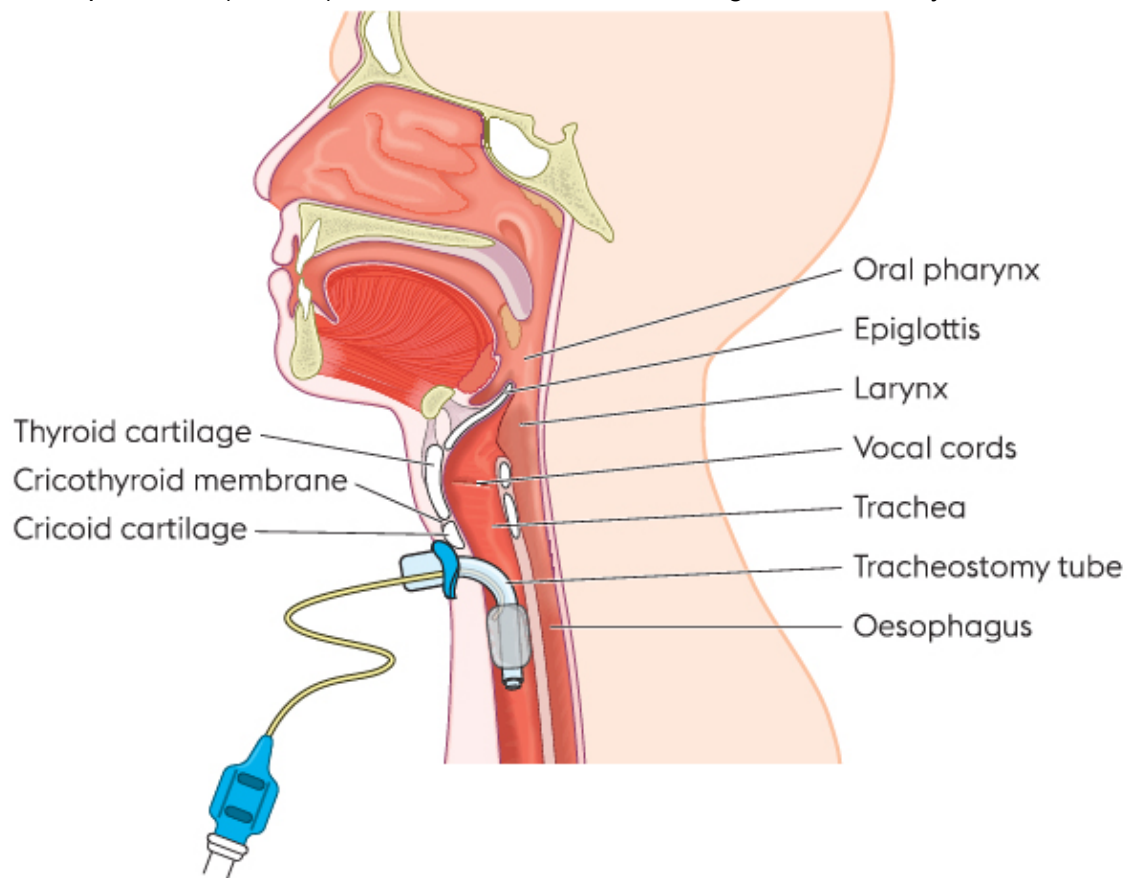
Stomal Dehiscence/ Wound Breakdown

Routine Tracheostomy Care

Tracheostomy Decannulation

BASIC TRACHEOSTOMY ANATOMY

- Tube inserted through the soft tissues of the neck into the trachea
- Larynx is superior, lungs are inferior
- Air can move via mouth/ larynx around tracheostomy into the lungs
 - Requires cuff (balloon) to be deflated and small enough tracheostomy tube



- Tracheostomy components
 - Tracheostomy tube: outer tube that inserts directly into the airway
 - Inner cannula: exchangeable inner tube that can be inserted or removed from outer plastic tube
 - Allows easier cleaning of tracheostomy lumen
 - Safety measure in the event of mucus plugging

- Cuff: inflatable balloon that keeps air from moving around tracheostomy
 - Necessary for positive pressure ventilation
 - Protects airway from upper airway secretions, bleeding
- Flange: baseplate for attaching ties or sutures to neck
- Speaking valve: can be attached to inner cannula- one-way valve that directs exhaled air through the mouth/ larynx

Bedside equipment

- Humidification equipment
- Suction with selection of appropriate suction catheters
- Spare tracheostomy tubes
 - One the same size
 - One tube one size smaller
- Scissors
- Water soluble lubricating jelly
- Sterile dressing pack
- Tracheostomy dressings
- Tracheostomy ties
- Personal protective equipment (gloves, aprons, eye protection)
- Sterile gloves for performing deep suction
- Nurse call bell: the patient may be unable to call for help verbally
- Communication aids: the patient may not be able to verbalise
- Bedside equipment checklist

Emergency equipment

- Basic airway equipment – oxygen masks, self inflating bags, oral and nasal airways
- Advanced airway equipment – laryngeal mask airways and laryngoscopes with appropriate tubes
- Capnography
- Fiberoptic scope
- Tracheal dilators
- Bougies

TRACHEOSTOMY AIRWAY EMERGENCIES

A – Airway

- Approach the patient according to standard guidelines such as BLS/ACLS.
- Assess the patient's tracheostomy:^{3,4}

- Does the tube appear overtly dislodged?
- Is there is a pilot balloon, suggesting the presence of a cuff?

B – Breathing (at both the mouth and stoma)

- Look and listen to assess the patient's breathing.
- Provide oxygen via the MOUTH.
 - Most patients with a tracheostomy often have patent upper airways and can therefore be oxygenated via the oral-nasal route.
 - **Note:** Patients with a laryngectomy will not improve with oral oxygenation attempts, because the upper airway is no longer connected to the trachea. These patients will rely on the stoma for oxygenation. If there is any doubt as to whether a patient has a laryngectomy, administer oxygen via the mouth because there is minimal harm.
- Provide oxygen via the STOMA.
 - Administer high flow oxygen to the tracheostomy. If there is no tracheostomy tube in place, apply a laryngeal mask airway or pediatric face mask to oxygenate via the stoma.
- Assess ventilation with end-tidal CO₂ capnography.^{3,5}
- **Caution:** Do not manually bag the tracheostomy tube if there is any concern for malposition.^{3,5}

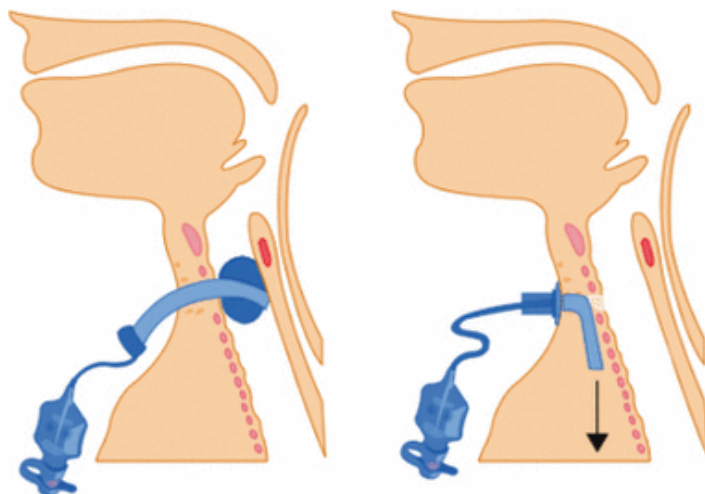
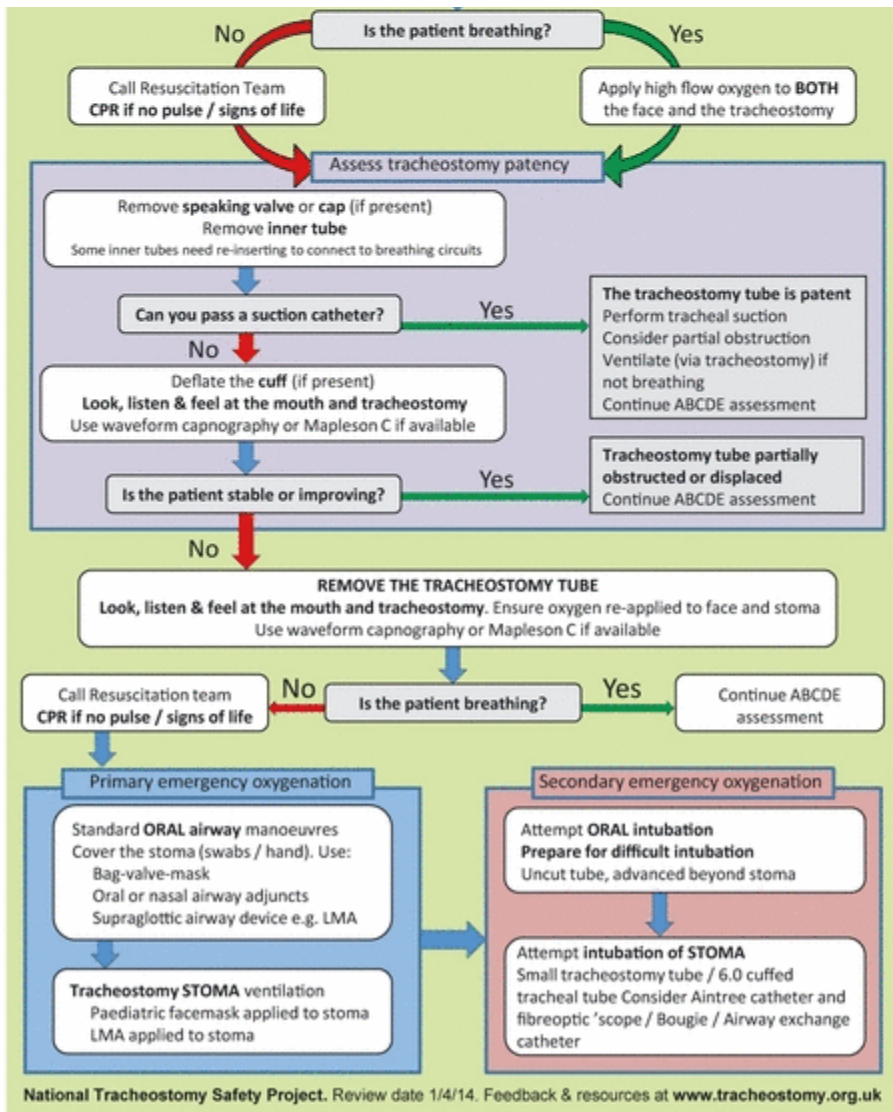
C – Core Actions

- **C** annula
 - Remove the inner cannula or cap/speaking valve of the tracheostomy tube as this may resolve an obstruction (e.g., from debris or secretions) and is necessary prior to inserting a suction catheter.
 - Do not throw this piece away. Depending on the manufacturer you may need it to connect to the ventilator or BVM later on.^{5,6}
 - **Caution:** Laryngectomy patients may not have a tracheostomy tube in place but may have other devices, such as tracheoesophageal valves (image below), which can be identified by their location along the posterior wall of the trachea. These should not be removed.^{3,7}

- **C**atheter
 - Pass a suction catheter through the tracheostomy tube. This will allow you to both assess patency and allow therapeutic suctioning.
 - Catheter does not advance: The tube may be clogged or displaced. Continue with additional troubleshooting steps below.
 - Catheter advances freely and to an appropriate depth: The tracheostomy/airway is patent.
 - **Caution:** Do not use a bougie as a surrogate catheter because it is stiff and if the tube is displaced there is the risk for creating a false tract.³
- **C**uff
 - Deflate the tracheostomy cuff because this may relieve a partial obstruction and aid in airflow.

T – Tube

- **T**rumped by oxygen status
 - Assess if the patient is oxygenating and improving with your previous maneuvers. Oxygenation is the priority.^{3,4,8}
 - Oxygenation is adequate: You have time to assess the patient's non-airway issues.
 - Oxygenation is NOT adequate: Ensure that a cricothyrotomy setup available, and proceed with the more aggressive airway troubleshooting steps below.^{3,15}
- **T**ake out the tracheostomy tube
 - Removing the tracheostomy tube can be a life-saving step in decompensating patients refractory your initial stabilization maneuvers. It may be causing an obstruction.
 - Upon tube removal, ensure that the patient is being oxygenated via the mouth and stoma.³
- **T**ube from above
 - Visualize the vocal cords using video or fiberoptic laryngoscopy under ketamine to determine if oro/nasotracheal intubation is a viable option. This is analogous to the concept of an awake intubation. If you have a good view, consider adding a paralytic and passing an endotracheal tube, which should advance past the stoma.^{3,9-12}
- **T**ube from below
 - If the patient is not improving after maximal oxygenation attempts and can not be intubated from above, you will need to intubate the stoma ideally using a fiberoptic device. Blind attempts are less preferred, because of the risk for creating a false passage.^{3,13,14} If a fiberoptic device is unavailable, consider utilizing a bougie to help guide tube passage.



TRACHEOSTOMY BLEEDING

- Differential diagnosis influenced by timing, location, and severity of bleeds
- Timing of bleed:
 - Within 72 hours of surgery:
 - Inadequate surgical hemostasis/ bleeding from surgical bed
 - Coagulopathy
 - Suction trauma/ tracheal wall injury
 - Pulmonary hemorrhage/ pulmonic pathology
 - After 72 hours, within 3 weeks
 - Coagulopathy
 - Pulmonic disease
 - Suction trauma/ tracheal wall injury
 - Vascular fistulae (especially tracheoinnominate fistula)
 - Granulation tissue
- Location of bleed:
 - ***Since anatomical regions are connected, bleeding from any orifice (i.e. the mouth) can result in bleeding from any other orifice (i.e. the tracheostoma), and vice versa***
 - Stomal (visible oozing from tracheostomy surgical bed):
 - Coagulopathy
 - Postsurgical bleeding
 - Granulation tissue
 - Luminal (Bleeding through stoma, but not at stoma-- perform bronchoscopy when equivocal)
 - Tracheal trauma
 - Pulmonic pathology
 - Tracheoinnominate fistula
- Severity of bleed:
 - Low-flow, steady:
 - Surgical site bleeding
 - Coagulopathy
 - Granulation tissue
 - Tracheal injury
 - Pulmonic bleeding
 - Brisk bleeding:
 - Surgical site bleeding
 - Tracheoinnominate fistula
 - ***Brisk, self-limited bleeding may be a sentinel bleed for impending TI fistula rupture***
- Assessment of bleeding:
 - Examine stoma. For severe bleeds, cutting trach ties may be necessary.
 - Perform bronchoscopy. Can identify lower airway sources of bleeding.
 - Perform flexible fiber optic nasolaryngoscopy (if no other sources identified)

- General principles of bleeding management:
 - Ensure a secure airway.
 - Large-volume bleeding may require suction, lavages, and/or bronchoscopy
 - Apply pressure for hemostasis where possible.
 - Includes manual pressure and wound packing.
 - Contact the **performing surgical team** for refractory bleeding
- Surgical site bleeding:
 - Generally can be addressed by packing the wound with hemostatic agents.
 - For small bleeds, stomal packing with Surgicel is effective.
 - Combat gauze may be useful for larger bleeds.
 - Bleeding refractory to packing requires discussion with the surgical team
- Stomal granulation tissue bleeding: cauterize with silver nitrate
- Tracheoinnominate fistula:
 - Characterized by brisk, large-volume bleeding, typically 3 or more days after trach insertion
 - If sentinel bleed is suspected, **overinflate tracheostomy tube cuff to tamponade wound**
 - For sustained brisk bleeding, **activate a code, and orotracheally intubate**
 - **Use a finger inserted into the tracheostoma to pull pressure anteriorly and tamponade the bleeding vessel**
 - Rapidly contact both ENT *and* CT surgery for acute operative management

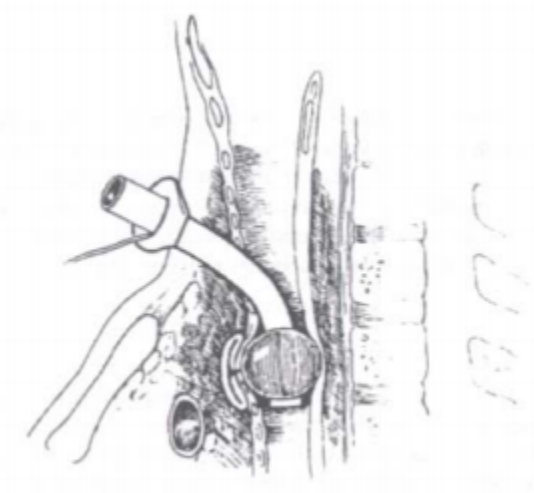


Figure 1: Overinflation of balloon

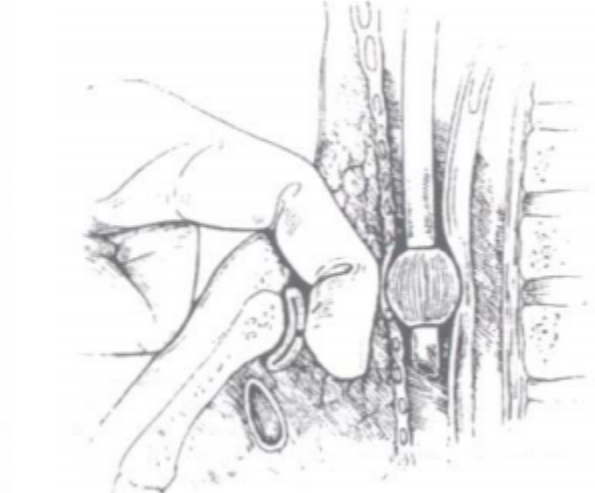


Figure 2: Manual compression of fistula

STOMAL DEHISCENCE AND PRESSURE ULCERS

- Tracheostomy pressure wounds are best addressed with prevention
 - Tracheostomy sutures should be removed within 5-7 days of surgery. This allows adequate time for stomal maturation.
 - Stomal site should be kept clean with at least BID inspection, suctioning, and gentle scrubbing with peroxide-water mix
 - Absorbent dressings such as mepilex should be inserted underneath the flange daily
- Cleanliness becomes doubly important in the event of skin breakdown
 - Keep the area clear of secretions, and dry enough to heal
 - Wound ostomy care consultation should be discussed with the performing surgical team in the event that pressure ulcers are identified

ROUTINE TRACHEOSTOMY CARE:

- Yankauer suction should be available to patient at all times
- Flexible deep suctioning should be performed when patient has audible secretions, requests suctioning, or cannot clear secretions by coughing
 - Insert the flexible catheter into the tracheostomy 10-15cm, then finger-occlude the suction port upon withdrawal
- Scheduled suctioning should take place Q2H for the first 24 hours after tracheostomy placement, then Q4H thereafter
- Disposable inner cannulae should be cleaned or disposed of daily, and PRN for obstruction
- Routine tracheostomy site wound care to prevent pressure ulceration

TRACHEOSTOMY DECANNULATION SEQUENCE:

1. Patient demonstrates independence from ventilatory support (i.e. passes trach collar trial)
2. Patient's tracheostomy has been allowed to mature (3-7 days with initial tracheostomy sutured in place)
3. Patient tolerates secretions with cuff deflated
4. Exchange to cuffless tracheostomy has been performed (patient must tolerate secretions and have no positive-pressure ventilatory requirements)
5. Patient has been cleared by speech for Passey-Muir Valve use at all times.
6. Patient has used PMV continuously for 24 hours.
7. Trach has been capped for 24 hours continuously.
8. Decannulation: removal of tracheostomy and placement of occlusive dressing over stoma. Instruct patient to press on stoma when coughing, speaking, or eating/drinking.

Code cart contents:

| Code Bag Checklist | | |
|----------------------|---|------------------------------------|
| Left pocket | Upper center Pocket | Right Pocket |
| 1 partial rebreather | 1 Laryngoscope handle | oral airways 60, 80, 100 mm 1 each |
| 1 nasal cannula | 1 10ml syringe | nasalpharyngeal tubes 22-36 f |
| 1 o2 tubing | 1 mac blade size 3 | 2 suction catheters |
| | 1 phillips blade | |
| | 1 Stylet | |
| | 1 can of adhesive spray | |
| | 1 roll of wetproof white tape | |
| | 1 easy cap ET/CO2 detector | |
| | adult Magill Forceps | |
| | Middle Center Pocket | |
| | In Draw String Bag | |
| | 1 Laryngoscope Handle | |
| | 1 10ml Syringe | |
| | 1 Mac blade size 4 | |
| | 1 stylet | |
| | 1 easy cap ET/CO2 detector | |
| | 1 Yankaur | |
| | 1 roll of wetproof white tape | |
| | size 8.0 ET tube | |
| | In Open Middle Pocket | |
| | 1 of ea. Size ET tube 6.0, 6.5, 7.0, 7.5, 8.0, 8.5 | |
| | 1 stylet | |
| | Lower Middle Pocket | |
| | 1 Adult Resuscitation Bag | |
| | Adult mask | |
| | Small Adult Mask | |
| | Peep Valve | |
| | Hollister Tube Holder in outside Middle Pocket | |

Orange Airway Box

*The content of this box is specific to the Adult Intensive Care Units.
Two airway boxes will be stored on the low and high sides of the
intensive care units.*

Respiratory Care maintains responsibility of this box.

*These boxes will be checked at the beginning of each shift per
departmental standards.*

Contents

- Drawer 1: Miller 2,3 Mac 3,4
 - 2 Adult handles
 - Oral/Nasal age airways
 - Hollister, wetproof tape
- Drawer 2: Ready ET Tubes 7.5,8.0
- Bottom: ET Tubes 6.0 through 8.0 (banded)
 - 2 Adult stylets
 - 2 10 cc Syringes
 - 1 O2 Tubing
 - 1 Partial Rebreathing Mask
 - 1 Adult Capnostat
 - 1 Adult BVM unit

**This box is not intended to supply all necessary equipment for emergent patient
management. For emergencies outside of the ICU, the **RCS Code Bag** will be utilized.*

Drawer # 3 – Airway Management/Dressings

| | |
|------------------------------------|---------|
| 4x4 Sterile Gauze Sponges (2 Pack) | 10 Each |
| 2 3/8" x 2 3/4" Tegaderm Dressing | 2 Each |
| Scapel (safety), Disposable # 11 | 1 Each |
| Scissors, Disposable, Sharp/Blunt | 1 Pair |
| Hemostat, Disposable, Curved | 1 Each |
| 4x4 Tegaderm Dressing | 2 Each |

Masks and Airways

| | |
|--|--------|
| Adult CPR Bag | 1 Each |
| Child CPR Bag | 1 Each |
| Neonatal CPR Bag | 1 Each |
| Pediatric Rebreather Mask | 1 Each |
| Adult Rebreather Mask | 1 Each |
| Pediatric Resuscitation Mask | 1 Each |
| Neonatal Resuscitation Mask | 1 Each |
| Adult Resuscitation Mask | 1 Each |
| Oral Airways: (Sizes 60mm, 80mm, and 100mm) (one of each size) | |

Miscellaneous

| | |
|---|--------|
| Oxygen Tubing | 1 Each |
| Oxygen Flowmeter | 1 Each |
| Wingnut (if not attached to Flowmeter) | 1 Each |
| Disposable Face Masks | 5 Each |
| Adult-Pediatric CO ₂ Sampling Line and Airway Adapter | 1 Each |

References:

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