

Tracheotomy Procedure Guideline in Mechanically Ventilated Patients with COVID-19

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Timing, location, personnel, PPE, equipment and specific techniques of tracheostomy and postoperative management should be considered within the resources available at each UPHS hospital entity and these guidelines may evolve further as more data becomes available

A. Summary of key recommendations:

- Tracheostomy may be considered in patients with prolonged periods of intubation, defined as greater than 10-14 days. Most patients with prolonged periods of intubation, such as those undergoing 14 days or more of MV without anticipated extubation in the next 5-7 days are eligible if they have a reasonable expectation for recovery.
- Earlier tracheostomy can be considered for selected patients
 - ECMO
 - Difficult airway
 - Laryngeal edema
 - Difficult intubation
 - Secretion management
 - Neurological impairment
 - Critical care team request
- Both open and percutaneous tracheostomy procedures are acceptable in COVID patients
 - Both open and percutaneous tracheostomy are acceptable. The proceduralist at each entity will determine the technique. For open procedure, the cuff will be placed distal to the trach entry site. For percutaneous (PDT), bronchoscopy will be used and ultrasound may be used as well. Either a “distal cuff” or “proximal cuff” technique is acceptable for percutaneous at the discretion of the person performing the procedure. Paralysis should be used during the procedure.
 - The procedure should be done at the bedside in a negative pressure room. We recommend PAPR to be used by all present in the room. Minimum HCP number is 2 for open trach, 3 for percutaneous trach. HCP may choose to wear N-95 mask covered by a surgical mask and face shield if desired rather than PAPR.

- Trach collar trials can be safely done in negative pressure, aerosol protective environments with appropriate PPE.

B. Determining candidacy for tracheotomy

Patients with COVID-19 severe acute respiratory syndrome often require endotracheal intubation and mechanical ventilation. While the prognosis of intubated patients is poor based on currently available data, some studies demonstrate a subset of patients requiring prolonged periods of invasive mechanical ventilation. Tracheotomy should be considered at 10-14 days of mechanical ventilation.

A multidisciplinary discussion of the patient's goals of care, overall prognosis, and expected benefits of tracheotomy is a critical part of the decision-making process. If tracheotomy is performed, specific measures to mitigate the risk of transmission to healthcare personnel must be enforced.

1. Tracheotomy may be considered in patients with prolonged periods of intubation, defined as greater than 10-14 days, who are otherwise without significant comorbidities and would be expected to have a good prognosis if recovery is achieved.
 - a. A multidisciplinary discussion should be held between the primary team, procedure team, and family to establish the goals of care, overall prognosis, and expected benefits of tracheotomy.
 - b. At each hospital entity, a single individual will serve as the primary point of contact for all COVID-19 tracheotomy consults. This person may in turn consult with the multidisciplinary tracheotomy working group as needed.
2. Other indications for tracheotomy in COVID-19 patients should be considered on a case-by-case basis, such as patients with a known difficult airway.
3. Due to the substantial number of pre-, minimally-, or asymptomatic patients with COVID-19, all patients for which a tracheotomy consult is placed should be ruled out for COVID-19 in whatever fashion is appropriate for that institution (e.g. PCR testing, chest CT, etc.) prior to the procedure.

If a tracheotomy is deemed necessary in a COVID-19 patient, an open surgical tracheotomy or percutaneous dilational tracheotomy (PDT) with measures taken to ensure the minimization of aerosol generation. The technique will depend on the person performing the procedure and a huddle will occur with all providers involved prior to the procedure to discuss the technical details.

1. Location

The procedure should be performed at bedside in a negative pressure room to minimize the risk of transmission during patient transport, if feasible. Under rare circumstances, the procedure may be performed in the operating room, in a specifically designated negative pressure room.

2. Personnel

- Team members in the room should be kept to the minimal critical number, and preferably with highly experienced personnel.
 - o If open surgical tracheotomy is performed, two to three people should be present (two highly experienced surgeons, one to manage ventilator/endotracheal tube (ETT)). An

additional HCP may be required if the tracheostomy is deemed challenging due to anatomical factors.

- If percutaneous dilational tracheotomy is performed, 3 people should be present and bronchoscopy should be utilized
- Proper donning and doffing of PPE for each person in the room is essential.
 - As a tracheotomy is considered an aerosol-generating procedure, airborne and droplet precautions should be followed.
 - Each person should wear a head covering, a powered air-purifying respirator (PAPR), gown, and gloves. A properly fitted N95 mask, closed eye protection, and a face shield could also be used instead of a PAPR.

3. Procedure

Minimizing aerosolization during the procedure itself is critical. A non-fenestrated cuffed tracheotomy tube with a disposable inner cannula should be used.

a. Open surgical tracheotomy:

- The patient should be fully paralyzed to minimize cough reflex during airway entry.
- In addition to standard surgical instruments used for tracheotomy, electrosurgical equipment should be set up in the room while minimizing contamination of the electrosurgical generator
- The ETT cuff should be advanced distal to the tracheotomy site to the level of the carina.
 - When the tube position is adjusted, ventilation should be held before the cuff is deflated until it is fully reinflated.
 - Confirmation of the ETT position should be performed by palpation of the tube and cuff through the anterior tracheal wall immediately before the trachea is incised.
- Ventilation should be held prior to incision of the trachea.
 - If ventilation needs to be resumed via the ETT after the trachea is incised, the cuff should be inflated. Prior to resuming ventilation, the cuff should be assessed for rupture. If ruptured, ventilation should remain held.
 - Ventilation should again be held as the ETT is withdrawn in preparation for tracheotomy tube insertion.
 - If cuff position could not be previously confirmed via palpation, ventilation should be held and the cuff fully deflated while the trachea is incised. The cuff position can then be adjusted through the tracheal opening before reinflation.
- A Björk flap is recommended to avoid false passage in the event of accidental decannulation.
- Insertion of the tracheotomy tube should be accurate and quick to minimize open airway time.
 - The cuff should be immediately inflated and connected to a closed circuit, after which ventilation may resume.
 - Tube placement should be confirmed with end tidal CO₂ and appropriately secured.
- Disposable tracheostomy tray and disposable inner cannula trach should be used. Size of the tube is at the discretion of the surgeon.

b. Percutaneous dilational tracheotomy

- The patient should be fully paralyzed to minimize cough reflex during airway entry
- A disposable percutaneous dilational tracheotomy kit should be used, as well as a disposable flexible bronchoscope if available with monitor.
- If the patient has very favorable anatomy, performing the procedure without the use of bronchoscopic guidance may be considered for conservation of resources and elimination of a potential pathway for aerosolization. Use of ultrasound guidance may also be considered.
 - o For patients undergoing the bronchoscopic-assisted approach, ventilation should be held when the bronchoscope adaptor is added to the circuit. The hypopharynx should be packed and a Yankauer suction placed in the mouth to reduce aerosols when the ETT is high with the balloon at or above the glottic aperture.
 - o Prior to inserting the bronchoscope, ventilation should be held, the scope entered, ventilation resumed, and any distal airway secretions cleared from the lower tracheobronchial tree.
 - o Ventilation should be held prior to adequate minimal cuff deflation to retract the ETT to the point of insertion site visualization, and the cuff re-inflated prior to resuming ventilation.
- Once the airway is entered and access is secured with the guidewire, a surgical sponge should be used to cover the area during insertion and removal of the dilator and tracheotomy tube to minimize the spray of aerosols.
- If tolerated, ventilation should be held prior to the insertion of the dilator until the tracheotomy tube is in place, the cuff is inflated, and the tube is connected to a closed circuit.
 - o Tube placement should be confirmed, visually using the bronchoscope and with end tidal CO₂ and appropriately secured.
- Proximal cuff vs distal cuff technique details
 - o Distal cuff PDT involves entering the airway using the bronchoscope anterior to the endotracheal tube. Once able to pass anteriorly, the endotracheal tube is advanced caudally. Advancement can be done with cuff up if tube is easily moved, or with cuff deflated as long as ventilation is paused. Once the first 3-4 tracheal rings can be visualized, PDT proceeds in standard fashion using bronchoscopic visualization outside of the endotracheal tube. Once procedure reaches time for the tracheostomy tube placement, ventilation is held, the endotracheal tube is withdrawn above the stoma and the tracheostomy tube inserted in standard fashion.
- Follow hospital protocol for decontamination of non-disposable equipment exposed to secretions of COVID-19 patients upon completion of the procedure.
- Guidelines Developed from the COVID-19 Tracheotomy Working Group, a Subgroup of the Airway Safety Committee of the University of Pennsylvania Health System and Approved by the Penn Medicine Critical Committee

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