RCSI Multidisciplinary Guidelines on Elective Tracheostomy Insertion in COVID-19 Ventilated Patients.

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The global pandemic of Coronavirus disease 2019 (COVID-19) is caused by a new strain of Coronavirus (SARS-CoV-2) discovered in 2019 and not previously identified in humans[1]. The overwhelming burden of world-wide disease – two million confirmed cases in over 100 countries – indicates the highly contagious nature of the virus. Spread is by human to human contact, while healthcare workers are at particular risk of contracting COVID-19 because of their exposure to infected patients, their inability to maintain social distancing while working in teams and the limited availability of personal protective equipment (PPE)[2].

COVID-19 is characterized by rapid respiratory decompensation and subsequent need for endotracheal intubation and mechanical ventilation in severe cases. Approximately 5-10% of hospitalized patients require invasive mechanical ventilation, the majority of whom fulfill criteria for Acute Respiratory Distress Syndrome[3]. Limited data from China and Italy, and our own initial experience here in Ireland, describe the prolonged intubation and ventilatory support that many of these patients require as they recover from pneumonia; often 15 to 20 days of mechanical ventilation, with several days spent receiving neuromuscular blocking agents and ventilation in the prone position and then, typically, a slow wean from mechanical ventilation[4 5]. One recent report from China showed a mortality rate of 61.5% in patients who were admitted to the ICU[6]. A more comprehensive report from the Chinese Center for Disease Control and Prevention showed a mortality rate of 49% among critically ill patients[3].

Ongoing airway management is an important topic of discussion in these critically ill patients with COVID-19. Any airway procedure, including endotracheal intubation and

tracheostomy, markedly increases the risk of exposure and transmission from patient to healthcare worker (physician and nurse)[7]. In such a rapidly escalating pandemic, the aim in treating patients with severe COVID-19-induced respiratory failure is to maximize the likelihood of recovery for the greatest number of patients as quickly as possible in a way that minimizes the risk to the provider. Consequent tracheostomy care and airway secretion management must also factor in the need to protect healthcare workers from occupational exposure, as critically ill patients with COVID-19 can exhibit prolonged viral shedding of greater than 30 days[8]. Reducing the risk of nosocomial outbreak amplification through transmission of SARS-CoV-2 to other patients and healthcare staff is of critical importance.

The surge in intubated and ventilated patients as a result of COVID-19 will result in a significant increase in patients who require prolonged mechanical ventilation (>14 days). Patients requiring prolonged ventilation are candidates for a tracheostomy to facilitate weaning. Tracheostomy has some other potential advantages over prolonged translaryngeal endotracheal intubation, such as improved patient comfort and reduced need for sedation. This may allow for less intensive nursing care and discharge to a lower acuity area or step-down facility.

In the largest multicenter trial performed to date, the timing of tracheostomy did not appear to impact 30 day or 2 year mortality or intensive care unit (ICU) length of stay[9]. In addition, over half of the subjects randomized to the late tracheostomy arm never received the intervention. This suggests that postponing tracheostomy allows a subset of patients to avoid the intervention. Thus, there is no clear benefit to early tracheostomy (within four days) for mechanically ventilated patients in the ICU. As such, the later timing of tracheostomy during the COVID-19 pandemic may be a justifiable consideration in this setting.

The following are recommendations from our combined departments based on our expertise managing this emergent public health threat. We acknowledge these recommendations may require individualization based on region, facility, resources, clinical expertise, and patient-specific factors. The major objective of tracheostomy guidelines in the context of a COVID pandemic is to promote safety and encourage excellent communication between Intensive Care Medicine/Anaesthesia, Respiratory, Surgical, and Nursing staff.

1. A multidisciplinary team composing of Consultant Surgical and Intensive Care Medicine/Anaesthesia physicians should review all cases considering the risk versus benefit for the patients, operating clinician and the entire healthcare team. Communication and collegial support is essential.

2. Patient selection is very important. Anatomy, history, comorbidities, clinical course (current and projected) may result in increased complications and procedures being postponed or indeed cancelled.

3. In the context of this COVID-19 pandemic most tracheostomy procedures should be avoided or delayed until after 14 days after symptom onset because of the high risk of viral aerosolization during the acute phase of the infection. The anticipated timing for viral clearance cannot be predicted currently. Furthermore, critically ill patients demonstrate longer periods of viral shedding[8]. The higher the viral load during the acute phase of the illness, the higher the aerosolization risk. An Evidence Summary for COVID-19 viral load over course of infection compiled by the Health Information and Quality Authority (https://www.hiqa.ie/sites/default/files/2020-04/Evidence-Summary_COVID-19_duration-of-infectivity-viral-load.pdf) suggests that viral loads are highest at the time of symptom onset and remain high for the first few days followed by a decrease over the next 1 – 3 weeks (15 studies) The median duration of virus detection based upon RT PCR is 13 days (16 studies).

4. The patient considered for tracheostomy should be haemodynamically stable (minimal vasopressor requirement) and not require prone ventilation, high levels of Positive End Expiratory Pressure (PEEP) (>8cmH2O), Fraction of inspired oxygen (FiO_2) (>0.5), or pressure support (>12cmH_2O).

5. Avoid tracheotomy in COVID-19 positive or suspected patients (at any time) during periods of respiratory instability or heightened ventilator dependence.

6. We acknowledge that resource constraints during a surge in Intensive Care Unit demand may necessitate tracheostomy formation to facilitate patient transfer from an

ICU to a COVID High Dependency Unit (HDU) or stepdown facility, thereby freeing the ICU for patients deemed in greater immediate clinical need.

7. The optimal location for tracheostomy placement in order of preference is:
    a. Neutral pressure suite, comprising a HEPA filtered ante-room (+10% atmospheric for donning), all air flowing to the Patient care area (+5% above atmospheric) air flowing to the Doffing area and sluice (atmospheric pressure)
    b. Negative pressure Room
    c. Theatre environment which has had laminar flow system stopped and all doors sealed for the duration and 30 minutes after the procedure in line with anaesthesia guidelines

8. Consideration should be given to percutaneous dilatational tracheostomy if the patient's anatomy and proceduralist expertise allow it to be done safely with minimal or no bronchoscopy, endotracheal suctioning, and disruption of the ventilator circuit. Open procedures generate more aerosolization and should be avoided if possible.

9. Choose a non-fenestrated, cuffed, tracheostomy tube. Standard size 8 for males and 6 for females. The cuff should remain adequately inflated to limit viral dispersion and transmission through the upper airway during ventilation.

10. When performing the tracheostomy procedure provide adequate sedation and paralysis to eliminate the risk of coughing during the procedure. Ventilation should be paused (apnoea) at end-expiration when the trachea is accessed and any time the ventilation circuit is disconnected.

11. Perform tracheostomy suctioning using a closed suction system with an attached viral filter. Use a heat moisture exchanger (HME) device attached to a non-vented tracheal adaptor or closed suction system instead of a tracheostomy collar during weaning to humidify the inhaled gases and minimize droplet dispersion and aerosolization during coughing and tracheal suctioning.

12. Adhere to strict donning and doffing procedures in full Personal Protective Equipment (PPE) based on institutional protocol. Limit the number of providers participating in

tracheotomy procedure and post-procedure management. Rely on cold instrumentation and avoid monopolar electrocautery.

13. Tracheostomy downsizing should be avoided, and decanulation decisions should be clinician led and be commenced at the earliest opportunity.

In the event of an open tracheotomy we advise the following checklist

Open Tracheostomy COVID Checklist: To be read aloud by designated instructor

TIMEOUT	**Identify patient; Name, date of birth, medical record number**
	Identify procedure to performed
	Confirm patient consent if relevant
PRE-INCISION	Tracheostomy Cuff Check
	Confirm paralysis
	Pre-oxygenate
	Stop ventilation and turn off flows
	Passive expiration, open valve
	Deflate Endotracheal Tube (ETT) cuff
	Advance tube distally
	Hyperinflate cuff
	Re-oxygenate and re-establish PEEP
	Stop ventilation and turn off flows
	Passive expiration, open valve
	Clamp ETT

INCISION Perform Tracheotomy

Deflate ETT cuff partially

Withdraw ETT proximal to tracheotomy

Insert cuffed non-fenestrated tracheostomy tube

Inflate cuff

Replace introducer with inner tube and pre-attached HME device

Attach ventilation circuit

Commence ventilation

Confirm CO2 trace :

CO2 Trace Confirmed?	**CO2 Trace Not Confirmed?**
Proceed to FINISH	Stop ventilation, turn off flows
	Allow passive expiration, open valve
	Deflate Tracheostomy Cuff and remove
	Advance ETT distally as pre-incision
	Hyperinflate cuff
	Re-oxygenate and re-establish PEEP
	Stop ventilation, turn off flows
	Passive expiration, open valve
	Deflate cuff
	Withdraw ETT proximal to tracheotomy
	Clamp ETT
	Insert tracheostomy tube

Inflate cuff

Replace introducer with inner tube and pre-attached HME device

Attach ventilation circuit

Commence ventilation

Confirm CO2 trace : Trace confirmed?

Proceed to FINISH, if not repeat above

FINISH Withdraw ETT slowly

Secure tube with Sutures & Ties

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