

# **Management Principles of Adult Critically Ill COVID-19 Patients**

The aim of this document is to provide critical care providers basic principles of management of adult critically ill patients with confirmed or suspected COVID-19.

This document does not cover all possible topics and the level of detail is not exhaustive. It has been developed and reviewed by representatives of the University of Toronto Interdepartmental Division of Critical Care Medicine (IDCCM) and is freely available. It reflects current knowledge and will be modified as new information becomes available. Adaptation to individual ICUs will be needed.

Additional information on general care of critically ill patients, intended for non-intensivists who may be caring for these patients, is available at <https://covidcriticalcare.ca/> and [www.quickicutraining.com](http://www.quickicutraining.com)

**Warning:** This document is not necessarily the current version. The most current version, along with COVID-19 related resources, can be found at <https://icu-pandemic.org> and <https://www.criticalcare.utoronto.ca/news/covid-19-resources>

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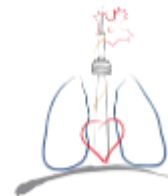
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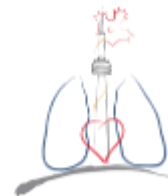
## Preamble

Each ICU should establish an interdisciplinary COVID-19 committee to:

- Ensure that intensivists and allied health personnel have up-to-date-information.
- Develop local decision support visual aids and guidelines, based on this document or others.
- Document lessons learned, so that this guidance can be updated with wisdom gained from local experience.

We recommend that each ICU team simulates high-stake scenarios (e.g. intubation, proning, CPR) that require rapid patient intervention, teamwork, and methodical infection prevention and control.

Refer to Public Health Ontario and hospital Infection Prevention and Control (IPAC) for definitive guidance on infection control issues, which are rapidly evolving.



## A. Precautions when admitting COVID-19 Patients to the ICU

Patients admitted to the ICU

- meeting the current COVID-19 case definition ([Interim national case definition: Coronavirus Disease \(COVID-19\)](#))
- with a COVID-19 test pending, or
- those who test positive for COVID-19

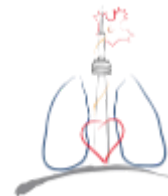
will be cared for using **droplet and contact precautions**.

Use **contact and droplet precautions with a fit tested N95 mask** for aerosol-generating medical procedures (AGMPs):

- Cardiopulmonary resuscitation (CPR)
- Bag-mask ventilation
- Non-invasive ventilation (NIV, including CPAP/NIV used for chronic conditions)
- High-flow nasal oxygen (HFNO, i.e., Optiflow, Airvo)
- Nebulised medications
- Intubation
- Disconnection of ventilator circuit
- Proning (due to the risk of accidental disconnection from ventilator)
- Extubation
- Tracheostomy
- Procedures likely to induce coughing (e.g. open suctioning of airways)
- Bronchoscopy (strongly discouraged) and sputum induction (no indication)

N95 masks may also be used whenever caring for an intubated suspect or confirmed COVID-19 case when there is a possibility of airway disconnection, e.g. during patient turns. Otherwise, regular masks as part of PPE for droplet and standard precautions should be used.

For patients with chronic CPAP/NIV used for chronic conditions and admitted for suspected COVID-19, consider whether CPAP/NIV could be safely avoided (e.g. CPAP for OSA: may be able to be avoided in a ward patient not receiving opioids), or whether immediate use is indicated (e.g. NIV for chronic respiratory failure secondary to neuromuscular weakness). If immediate use is indicated, involve IPAC for appropriate room placement and institution of contact and droplet precautions with a fit tested N95 mask.



## B. General and Specific ICU Care Principles

### Assessment:

Perform a focused clinical examination to minimise exposure time.

Non-ventilated patient: Auscultation places the healthcare worker (HCW) close to exhaled respiratory droplets and should be avoided.

Ventilated patients: Auscultation can often be avoided (e.g. post intubation, where CO<sub>2</sub> detection, symmetric chest rise and visualisation of ETT through cords suffice). But, if there is ANY concern about patient condition (e.g. sudden change in respiratory status), then clean the stethoscope's earpieces, tubing, and chest piece with germicidal wipe and carefully position in the ears while avoiding touching the face. After use, clean the stethoscope with germicidal wipe and hang up. Use a dedicated stethoscope in each room.

### Investigations:

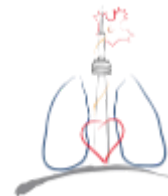
Nasopharyngeal swabs: Note that nasopharyngeal swab results are less sensitive than molecular viral studies on lower respiratory tract samples (endotracheal aspirate or expectorated sputum). Thus a negative nasopharyngeal swab should not be used to exclude COVID-19 in a patient in whom there is a high index of suspicion for COVID-19. If COVID-19 is not already confirmed, all intubated patients with suspected COVID-19 should have an endotracheal aspirate sent for viral studies. On admission, also send a NP swab for other respiratory viruses.

Bloodwork: Minimize to reduce HCW and laboratory exposure. The following laboratory tests may be done on ICU admission; they may not need to be repeated if done in the 12 hrs before admission, and if values are normal or stable may not need to be repeated until the next day:

- CBC
- Electrolytes and Ca/albumin, Mg, Phos
- Glucose
- Creatinine
- Bilirubin, ALT, AST, ALP
- Troponin
- Lactate
- Arterial or venous blood gas [if on respiratory support]

Additional considerations:

- If clinically suspected, consider testing for other causes of infection (blood cultures x 2, sputum culture, urine culture, urine legionella antigen)
- Some lab tests associated with prognosis but not actionable (unless bleeding, for coagulation tests): PT, PTT, Fibrinogen, D-dimer, LDH, CRP, ferritin
- Reserve Blood Group and Screen for bleeding patients or those likely to require future transfusion (e.g. Hgb <80 g/L)
- Do not use any point-of-care lab testing (ABG, Hgb, co-oximetry, UA), because these instruments aerosolise blood and are open. These tests should be sent to the core lab.
  - Exception: use point-of-care glucometers, with dedicated glucometers for patients in isolation.



- The need for repeat lab tests should be reassessed as clinically indicated.

CXR: Avoid routine daily CXRs. CXRs may be performed on initial presentation, to confirm ETT, central line and feeding tube placement and for worsening respiratory status.

CT/MRI: Limit use to avoid transport and contamination of scanner. A CT thorax should not be performed to support a diagnosis of COVID-19.

Echocardiogram: There are reports of significant LV dysfunction associated with a rise in troponin. Cardiomyopathy (stress cardiomyopathy or myocarditis) has been described late in illness, when the patient's respiratory status is improving. Ensure that echocardiographers are trained in PPE use.

Bronchoscopy: There is no role for bronchoscopy for the diagnosis of COVID-19, and the potential harm of aerosol generation outweighs any potential benefit. An endotracheal aspirate post-intubation can be sent for bacterial and fungal cultures and viral detection (e.g. if COVID-19 is not confirmed). Bronchoscopy may be considered in patients at very high risk for atypical infections (e.g. post BMT, organ transplantation, on immunosuppressive therapy), or for other uncommon situations (e.g. localisation of airway haemorrhage). Bronchoscopy should be performed only in paralysed ventilated patients.

## **SPECIFIC MEDICAL MANAGEMENT OF COVID-19**

The medical management of COVID-19 is targeted to evidence-based organ support, as there are no effective specific therapeutic options.

### **1. Fluid management**

In the absence of shock or tissue hypoperfusion, a conservative fluid management approach is recommended.

### **2. Antimicrobial and immunomodulatory therapy**

With levels of circulating seasonal influenza declining, empiric treatment with a neuraminidase inhibitor (oseltamivir), pending naso/oropharyngeal swab viral results, is not recommended.

Neuraminidase inhibitors (e.g. oseltamivir) do not have activity against SARS-CoV-2 and therefore should not be initiated for the management of COVID-19.

For up-to-date drug therapy see SHS-UHN Antimicrobial Stewardship page:  
<https://www.antimicrobialstewardship.com/covid-19>

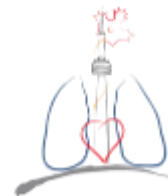
*Mild to moderate disease:*

Empiric antibacterial therapy is not recommended as the rate of bacterial coinfection is not yet known and Chinese data do not demonstrate a benefit to antibacterial treatment.

As there is no known effective antiviral agent, antiviral therapy is not recommended.

*Severe disease (requiring mechanical ventilation or circulatory support):*

**Empiric antibiotics for possible bacterial coinfection should be started on all confirmed COVID-19 patients with severe disease,** pending culture results from endotracheal aspirates:



- Ceftriaxone 1g q24h x 5d in the absence of risk factors for MRSA, P. aeruginosa and MDR organisms.
- In cephalosporin allergy: moxifloxacin 400 mg po/iv q24h x 5 days.

Patients under investigation may require broader spectrum antibiotics depending on their clinical presentation (e.g. ceftriaxone and azithromycin for community-acquired pneumonia).

Antiviral and immunomodulatory therapies are unproven and not recommended. In Canada, the CATCO trial (lopinavir/ritonavir vs. control, with other arms to be added) will launch in March 2020, and REMAP-CAP (multi-domain trial for severe community-acquired pneumonia; <https://www.remapcap.org/>; [NCT02735707](https://clinicaltrials.gov/ct2/show/study/NCT02735707)) is already enrolling. Whenever possible, enrolling patients in randomised clinical trials (RCTs) of antiviral or immunomodulatory therapies for COVID-19 is preferred to clinical administration.

If RCT enrolment is not possible and antiviral or immunomodulatory therapies are being considered in severely ill patients, Infectious Diseases consultation is strongly recommended.

Corticosteroids Surviving Sepsis guidelines for COVID-19 patients (<https://bit.ly/3dwe9jl>):

- Conditional recommendation (low quality evidence) AGAINST systemic corticosteroids for mechanically ventilated adults with COVID-19 and respiratory failure (without ARDS)
- Conditional recommendation (low quality evidence) FOR systemic corticosteroids for mechanically ventilated adults with COVID-19 and ARDS
- Conditional recommendation (low quality evidence) FOR low-dose corticosteroids for adults with COVID-19 and refractory shock

The potential harm of corticosteroids includes prolongation of viral shedding.

Steroids have also been used (with or without tocilizumab) to treat an acute cytokine storm which may occur in some patients.

Additional data on corticosteroids for ventilated COVID-19 patients may come from RCTs (e.g. REMAP-CAP, enrolling in Canada).

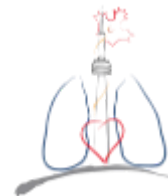
Macrolides as anti-inflammatory treatment are not recommended outside of a RCT.

### 3. Venous thromboembolism (VTE) prophylaxis

While published data on the risk of venous thromboembolism in patients with severe COVID-19 are lacking, reported derangements in coagulation parameters, prolonged immobilization and endothelial dysfunction may contribute to a hypercoagulable state. Thus, VTE chemoprophylaxis (unfractionated heparin or low molecular weight heparin) is recommended, in the absence of a strong contraindication.

### 4. Goals of Care

Goals of care discussions should be initiated early following hospital admission given the potential for rapid deterioration following onset of dyspnoea and hypoxaemia. Early establishment and documentation of goals of care may also reduce unnecessary utilization of limited critical care resources.



## C. Respiratory Care

Early recognition of patients with worsening respiratory function while on conventional oxygen therapies is critical to ensuring timely and safe escalation of respiratory support. For all patients receiving supplemental oxygen therapy, HFNO or NIV, formulate a plan for treatment failure. Patients with worsening hypoxemia, hypercapnia, acidemia, respiratory fatigue, haemodynamic instability or those with altered mental status should be considered for early invasive mechanical ventilation.

**Early consultation with ICU is strongly recommended, for example, when  $FiO_2$  is 50% or higher. The requirement for  $FiO_2 > 50\%$  by a venturi mask, HFNO, or NIV is associated with rapid patient deterioration, and prompt intubation should be considered if within goals of care.**

### Oxygen Therapy, HFNO, and NIV

#### OXYGEN:

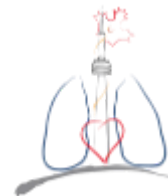
- Oxygen delivered by **nasal prongs** should be titrated to a maximum flow rate of 6 L/min for patient comfort. Apply a surgical mask over the patient's mouth and device to reduce the potential aerosolization of respiratory droplets.
- If a patient requires up to 50%  $FiO_2$  by mask, use a **venturi mask**.
- Use a non-rebreathing (NRB) mask with filter on exhalation port (e.g., HiOx80, Tavish mask)
- Oxygen should be delivered without added humidity

#### HFNO:

- Depending on local policy and resources, **HFNO may be considered for COVID-19 patients with hypoxemia who do not require immediate intubation.**
- **This weak recommendation is concordant with COVID-19 guidelines from the World Health Organization, ANZICS, and Surviving Sepsis.**
- Staff should use **contact and droplet precautions with a fit tested N95 mask** given the risk of aerosol generation with HFNO.
- HFNO should be used in a private/isolation room (ideally negative pressure) or in a cohorted ward with COVID-19 positive cases.
- When using HFNO, the patient should wear a surgical mask covering the mouth, nose, and cannula to reduce the risk of dispersion of aerosolized droplets.

#### NIV:

- **For this guidance, we recommend avoiding NIV because of the risk of aerosolised droplets (see below), lack of helmet interfaces to mitigate this risk, and harm of NIV in hypoxemic respiratory failure.**
- **(We note that for COVID-19 patients with hypoxemia who do not require immediate intubation, Surviving Sepsis makes a weak recommendation for HFNO rather than NIV, as much as possible, and to consider a trial of NIV only if HFNO is not available.)**
- The concern with NIV is that droplets will become aerosolised and dispersed due to a poorly fitted mask with heavy coughing. Data regarding safety of NIV are currently limited.
- Current experience suggests that NIV for COVID-19 patients with hypoxemic respiratory failure is associated with a high failure rate, delayed intubation, and possibly increased risk of aerosolization with poor mask fit.
- If NIV is appropriate for an alternate clinical presentation of COVID-19 (e.g. acute exacerbation of COPD, acute pulmonary edema), it should be provided using contact and



droplet precautions with a fit tested N95 mask. Negative pressure single rooms are preferable for patients receiving NIV, given the concern of aerosolization of droplets.

- Note that helmet CPAP has been used in Italy for respiratory failure associated with COVID-19. One single-centre RCT of patients with (non-COVID) ARDS showed that helmet CPAP compared to NIV delivered by face mask, was associated with a decreased need for intubation and decreased mortality. Helmet CPAP is also associated with reduced aerosol dispersion. Helmet CPAP is not widely available in Canada.

## Aerosol Generating Medical Procedures (AGMPs)

- These procedures may convert droplets to aerosols (particles with diameter of  $\leq 5 \mu\text{m}$ ) that can enter terminal bronchioles and alveoli, and this place health care workers at **risk of exposure to a high viral burden**. Therefore, they should be avoided or the risks should be mitigated.
- In situations where such procedures are unavoidable (e.g., intubation), **staff should follow additional precautions outlined in this document**.
- AGMPs should be performed, if possible, in an **airborne isolation room, by the most skilled healthcare provider**, with a **minimum number of staff**, planned to minimise **time-exposure**, and with **strict adherence to infection control measures**.

The most common AGMPs are:

- Cardiopulmonary resuscitation
- Bag-mask ventilation
- NIV (including CPAP/NIV used for chronic conditions)
- HFNO (i.e., Optiflow or Airvo)
- Nebulised medications
- Intubation
- Disconnection of ventilator circuit
- Proning
- Extubation
- Tracheostomy
- Procedures likely to induce coughing (e.g. open suctioning of airways)
- Bronchoscopy (strongly discouraged) and sputum induction (no indication)

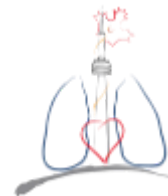
## Intubation

Even in urgent intubations, the urgency to intubate **must be balanced with the need for staff to meticulously don appropriate PPE**, which may take minutes. Staff safety remains a critical priority.

**We recommend that each ICU team simulates these procedures in ICU, ED, and ward. Low-fidelity is fine; sophisticated simulation equipment is not necessary.**

**We recommend multi-specialty collaboration to form a team for all intubations, led by an experienced group of clinicians, which may be intensivists or anaesthesiologists.**

## LOCATION



- If possible, intubation should be performed in a **controlled environment** such as an ICU or Emergency Department, and ideally in an **airborne infection isolation room** (negative pressure room with an attached anteroom).
- This recommendation will often be infeasible, and timely resuscitation should not be delayed for patient transport, provided that staff don adequate PPE. In case of intubation in a regular patient room, the door should be kept closed for the duration of the intubation.
- A baby monitor facilitates communication between the inside and the outside of the room.

## **STEPS**

**Steps 1-4 describe planning and occur outside the room.**

### **1. ASSEMBLE TEAM**

Limit staff inside the room to the minimum required to safely perform the procedure.

The ideal team should include the following, based on availability at that moment:

#### ***Inside room***

1. Airway expert physician (best skilled airway manager present)
2. One Respiratory Therapist (RT) to assist with intubation and ventilation
3. One Registered Nurse (RN) to deliver medications
4. Second MD to assist with hemodynamic resuscitation (if required)

#### ***Outside room***

5. Second MD in PPE, ready to enter the room (if not already inside)
6. Second RN in PPE in anteroom
7. Second RT in PPE in anteroom
8. One RN charting from outside the room (based on visual assessment of inside or communication via baby monitor)

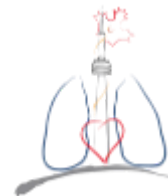
The RN and RT in PPE in the anteroom should:

- provide support in case someone has to leave the room
  - relieve fatigued individual(s) inside the room to minimize risk of safety breaches
  - be ready to get whatever the team inside needs
  - facilitate communication between team inside the room and rest of the team
  - observe for breaches in PPE
9. Runner (unit RN) to assist with supply of equipment stored on the unit and activation of other HCWs if required (e.g., anesthesiologist for difficult airway)
  10. Logistic/Safety Officer (Senior HCW - unit charge nurse, intensivist, senior resident) with logistic/flow coordination role. This person is responsible for:
    - ensuring protocol is followed
    - monitoring safety breaches
    - regulating access to the patient's room
    - ensuring correct opening/closing of doors
    - communicating with ICU prior to initiation of transport

### **2. PLAN**

Team members should, before entering the room:

- identify themselves
- review each person's role



- discuss primary and alternative plans
- review Intubation Checklist (Appendix).
- discuss how to communicate effectively, even when wearing PPE

### 3. DON PPE

PPE used for COVID-19 should follow current Public Health Ontario and hospital directives.

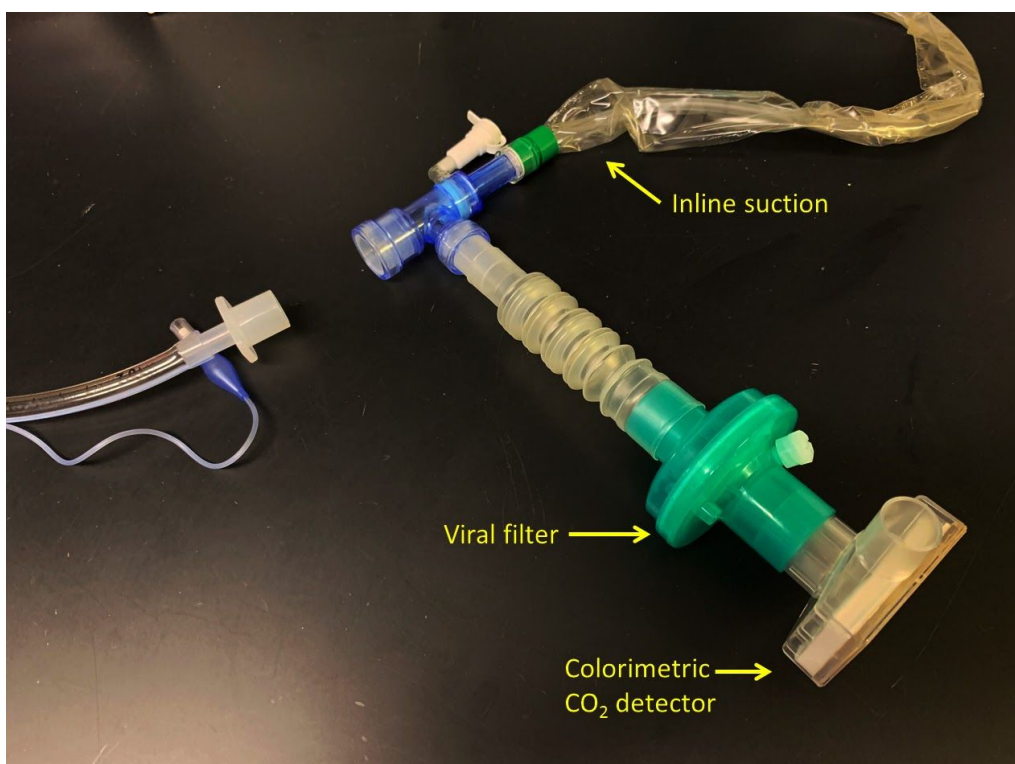
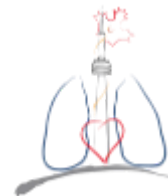
- **Don quickly but meticulously.**
- If multiple individuals arrive at the same time, **the RT has priority for donning and entering the room .**
- Members of the team initially staying outside the room (e.g., back-up RN and RT and runner), should **help with donning (e.g. tie gowns) and assessing for breaches**
- It is recommended that the intubating physician and assisting RT **double glove** (short cuffed glove over long cuffed glove) for intubation (risk of tear on BMV).

### 4. DRUGS & EQUIPMENT FOR INTUBATION

- To reduce the duration of the procedure and the time spent inside the room, gather everything needed outside the room before you enter.
- Preparing a COVID-19 intubation and protected code blue box ahead of time will save time.
- A checklist of necessary equipment and a completed 'Clinical predictors of a difficult intubation' form ( Appendix), ideally completed at hospital admission, may mitigate the need to request additional equipment after entering the room.
- Some equipment will be taken inside the room by the team, whereas "rescue" equipment (e.g., difficult airway cart, arrest cart) will be kept immediately outside of the room.
- Prepare as much as possible outside of the room.

#### *Inside the room*

- Intubation equipment
- Pre-connect **in-line suction, viral/bacterial filter, colorimetric CO<sub>2</sub> detector** to be placed between the endotracheal tube and the resuscitation bag (Figure 1).



**Figure 1. ETT connected to inline suction, viral filter and colorimetric CO<sub>2</sub> detector. Resuscitation bag (not shown) to be connected to colorimetric CO<sub>2</sub> detector.**

- Mechanical ventilator (if patient will be ventilated in the room)
- Medications for induction, hemodynamic support and maintenance of sedation, analgesia, and paralysis. These drugs should be drawn up and ready to be administered prior to entering the room.
- A videolaryngoscope with separate screen is recommended to maximise the distance between the intubating physician and the patient's airway. However, the intubator should choose the technique most likely to succeed on first attempt based on the patient's airway assessment and their own experience.
- Naso/orogastric tube (NGT/OGT) and lubricant for insertion after intubation.

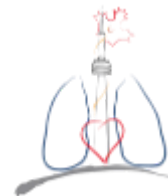
#### ***Outside the room***

- If a decision is made not to use videolaryngoscopy for the first attempt at intubation, a videolaryngoscope should be available.
- Difficult airway cart: this should include a laryngeal mask airway (LMA) and intubating LMA.
- Bronchoscope (only if deemed necessary by intubating team)
- Mobile hospital-wide arrest cart with defibrillator and arrest drugs
- If available, use the unit-specific arrest cart inside the room so that only this cart will require decontamination

**Steps 5-11 describe the intubation steps inside the room.**

#### **5. AIRWAY ASSESSMENT**

Ideally, shortly after admission to hospital, an assessment of the airway should be performed for every COVID-19 patient requiring oxygen supplementation. A "Clinical predictors of a



difficult intubation” form (see Appendix) should be completed and placed on the front of the chart, to inform staff who may be called for an urgent intubation.

## 6. APPLY MONITORS

- SpO<sub>2</sub> probe
- ECG leads
- Blood pressure cuff
- Waveform capnography, if available

## 7. CHECK IV/IO ACCESS

8. OPTIMIZE POSITION - Head of bed ~30 degrees may prevent early desaturation

## 9. OPTIMAL PRE-OXYGENATION

**Minimize techniques that can aerosolise droplet particles.** Adequate pre-oxygenation is essential for both successful safe intubation and avoidance of bag-mask ventilation.

- Consider a NRB mask with **filter on exhalation port** (e.g., HiOx80, Tavish mask).
- Data regarding safety of NIV and HFNO are currently limited, and the current recommendation is to avoid or limit use as pre-oxygenation devices due risk of aerosol formation. However, if necessary, HFNO may be used (see above).

If possible, **avoid manual bag-mask ventilation before intubation.**

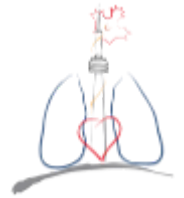
- Apneic oxygenation with nasal prongs is recommended.
- If bag-mask ventilation is performed, ensure a filter is used between the mask and bag, use a low-flow, low-pressure, small tidal volumes and a 2-person, 2-hand technique to achieve tight mask seal
- Nasal prongs used for apneic oxygenation should be removed to ensure a tight mask seal

## 10. OPTIMIZE PATIENT CONDITIONS

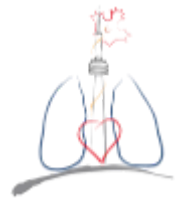
- Fluids & vasoactive agents to optimize hemodynamics; IV bicarbonate for metabolic acidosis
- If OGT/NGT present, aspirate gastric contents

## 11. INTUBATION

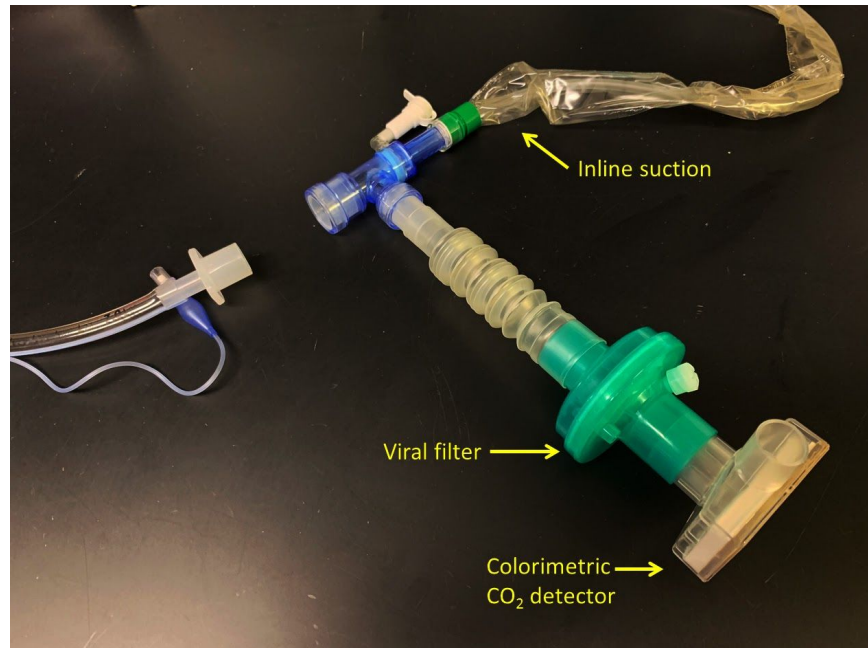
- Focus on safety, promptness, and reliability.
  - Aim to succeed on the first attempt because multiple attempts increase contamination risk.
  - Do not rush. Ensure that each attempt is the best it can be.
  - The chosen technique may differ according to local practices, equipment and familiarity. Use reliable techniques with which you are familiar.
  - Communicate clearly using simple instructions and closed loop communication.
- **Consider videolaryngoscopy (VL)** as the first intubation technique [GlideScope over McGrath as distance to patient greater with GlideScope]. In users experienced with VL, this could increase first pass success and avoid the operator’s face being close to the airway. However, this should be an individual decision based on appropriateness and familiarity with VL. The intubator should choose the technique most likely to succeed based on the patient’s airway assessment and their own experience.



- **To minimise patient coughing and agitation, rapid sequence intubation (RSI) is recommended.**
- In the patient unlikely to tolerate any apnea (e.g. severe hypoxemia or acidemia), consider maintaining spontaneous breathing using sedation with ketamine 0.5-2 mg/kg IV and lidocaine 1.5 mg/kg IV 2-3 minutes before intubation to reduce cough at laryngoscopy.
- Topical lidocaine is NOT recommended.
  
- **After intubation immediately connect the patient to the resuscitation bag or mechanical ventilator. To minimize disconnections after intubation, while allowing confirmation of  $\text{ETCO}_2$ , we recommend the following post-intubation connection options.**
- Note that the addition of a waveform capnography sensor and viral/bacterial filter between the circuit and the ETT will add dead space. If the  $\text{PaCO}_2$  is  $\geq 50$  mmHg, consider removal of the inline suction flex tube.



Option 1: After inflation of the ETT cuff, connect a prepared setup of inline suction + viral filter + colorimetric CO<sub>2</sub> detector. Following verification of ETT placement using colorimetric capnography, the ventilator or resuscitation bag can be attached distal to the viral filter, maintaining an aerosol-free environment (Figure 1).



**Figure 1.** ETT connected to inline suction, viral filter and colorimetric CO<sub>2</sub> detector. The resuscitation bag is initially connected to the colorimetric CO<sub>2</sub> detector.



Option 2: If using waveform capnography, after inflation of the ETT cuff, connect the ETT to in line suction + mechanical viral/bacterial filter + waveform capnography sensor + resuscitation bag (Figure 2).

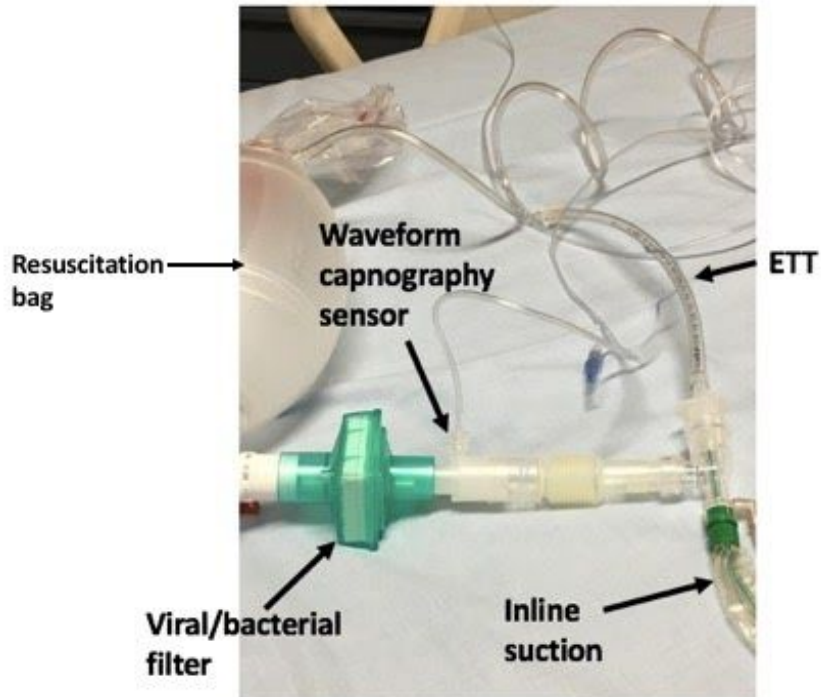
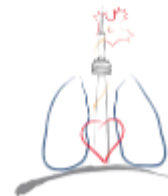
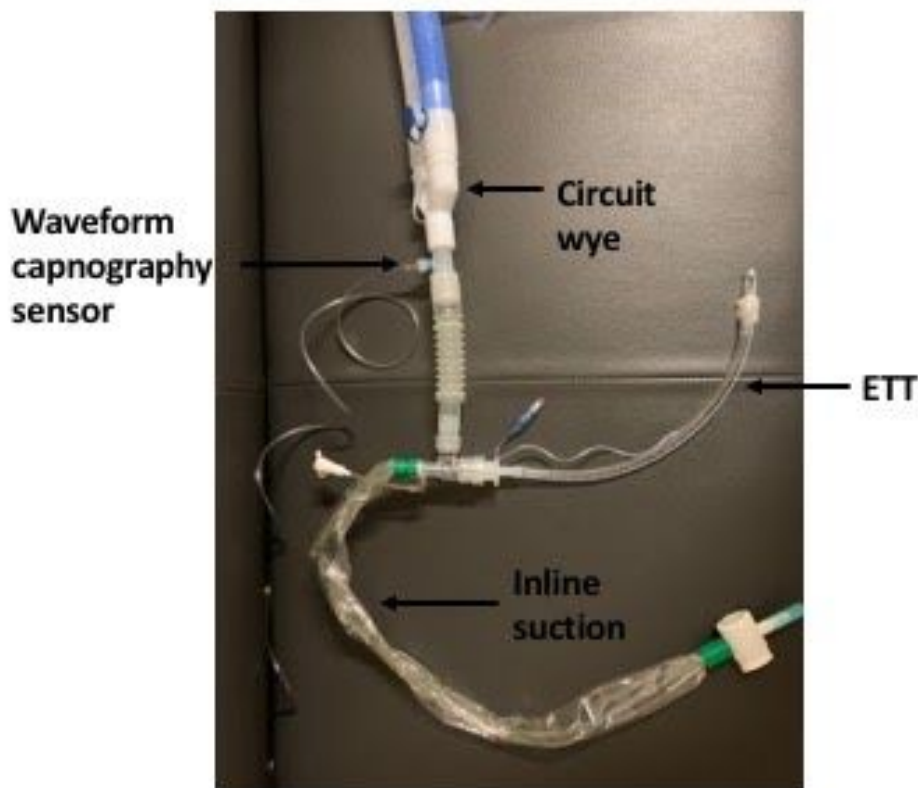


Figure 2. ETT connected to in line suction + waveform capnography sensor + viral/bacterial filter + resuscitation bag.



Option 3: After inflation of ETT cuff, connect ETT to in line suction + ETCO<sub>2</sub> adaptor (for continuous waveform capnography - if used) + circuit wye + heated circuit to insp/exp viral/bacterial filters and ventilator (Figure 3).



**Figure 3. ETT attached to in line suction + waveform capnography sensor and circuit wye. Note viral/bacterial filters on the expiratory and inspiratory limbs of the circuit are not seen in this photo as they are closer to the ventilator.**

- Avoid disconnections between ETT and resuscitation bag. If required, for example with air trapping): 1) make a loud announcement to the individuals in the room, and 2) leave filter connected to ETT.
- If performing intubation during CPR, **intubate patients early and hold CPR during intubation** to minimise aerosolisation and optimize intubation success.
- If possible, ventilators with built in bacterial/viral filters (not HME filters) in the expiratory circuit should be used. If this is not possible, a bacterial/viral filter must be placed in the expiratory circuit of the ventilator.
- While auscultation to confirm ETT placement is discouraged, on occasion it may be necessary to auscultate if unclear about ETT placement (e.g., no view of vocal cords, no ETCO<sub>2</sub> due to low cardiac output). The team leader, whose face shield should be less contaminated with respiratory secretions than the intubating physician, should auscultate with a stethoscope, paying attention not to contaminate face and displace the face shield.
- Place OGT /NGT after intubation is completed and ventilation is established.



- If COVID-19 is suspected but the initial NP swab was negative, send a deep tracheal aspirate for viral PCR using closed circuit suction. There are multiple reports of patients with **negative nasopharyngeal swabs whose lower respiratory tract samples are positive for SARS-CoV-2**. Also send the endotracheal aspirate for bacterial culture to rule out bacterial co-infection.

**Steps 12-14 describe post-procedure actions.**

## **12. CLEAN-UP**

At the end of the procedure, before leaving the room:

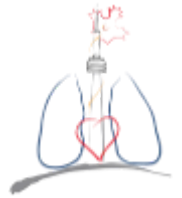
- **Wipe all non-disposable equipment** (e.g. laryngoscope) **with a hospital approved disinfectant wipe (e.g. Oxivir or Chlorox wipes), placed into a clear tied biohazard bag** left in the room.
- **Disposable equipment must be discarded** (e.g., unused drugs, filters, ECG electrodes, defibrillation pads, unused intubation equipment, IV supplies, bags).

## **13. DOFFING**

- This may occur partly in the room (gloves, gown) and outside the room (face shield, mask), or entirely in the anteroom if there is one.
- **DO NOT RUSH. BE METHODICAL. Remove PPE slowly and carefully** to avoid inadvertent contamination of yourself or others.
- **Anyone who is** unwell, has had equipment failure, or likely self-contaminated should be first to doff and exit the patient room.
- **Use a checklist/poster to guide order of removal of PPE.**
- **Have a “safety leader/doffing buddy” to observe for safety breaches while doffing.**

## **14. RECOVERY**

- This occurs outside the room
- Immediate ‘hot debrief to identify and document lessons learned.
- Take a “work pause” after the debrief.
- Staff may choose to change their scrubs.
- If you believe you have been contaminated, report to your supervisor immediately.
- Notify environmental services to clean and disinfect the room using the COVID-19 protocol and PPE.



## Mechanical Ventilation

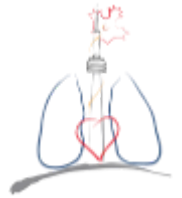
ARDS strategy (guideline: PMID [28459336](#); review: PMID [29466596](#))

- **Targets: tidal volume 4-6 ml/kg predicted body weight, Pplat <30 cmH<sub>2</sub>O, driving pressure <14 cmH<sub>2</sub>O**
- **Set initial PEEP at 10 cmH<sub>2</sub>O, and then adjust according to the PEEP-FiO<sub>2</sub> table (see below)**
- Alternatively, use the physiology-guided ventilation algorithm (see below and at <https://www.criticalcare.utoronto.ca/news/covid-19-resources>)
- Target **SpO<sub>2</sub> 88-95%**
- Adjust RR (respiratory rate) to target **pH ≥7.25**
- **Prone position** for at least 12-16 hours/day if PaO<sub>2</sub>/FiO<sub>2</sub> <150. The proning manoeuvre **requires contact and droplet precautions with a fit tested N95 mask given risk of disconnection from mechanical ventilation.**

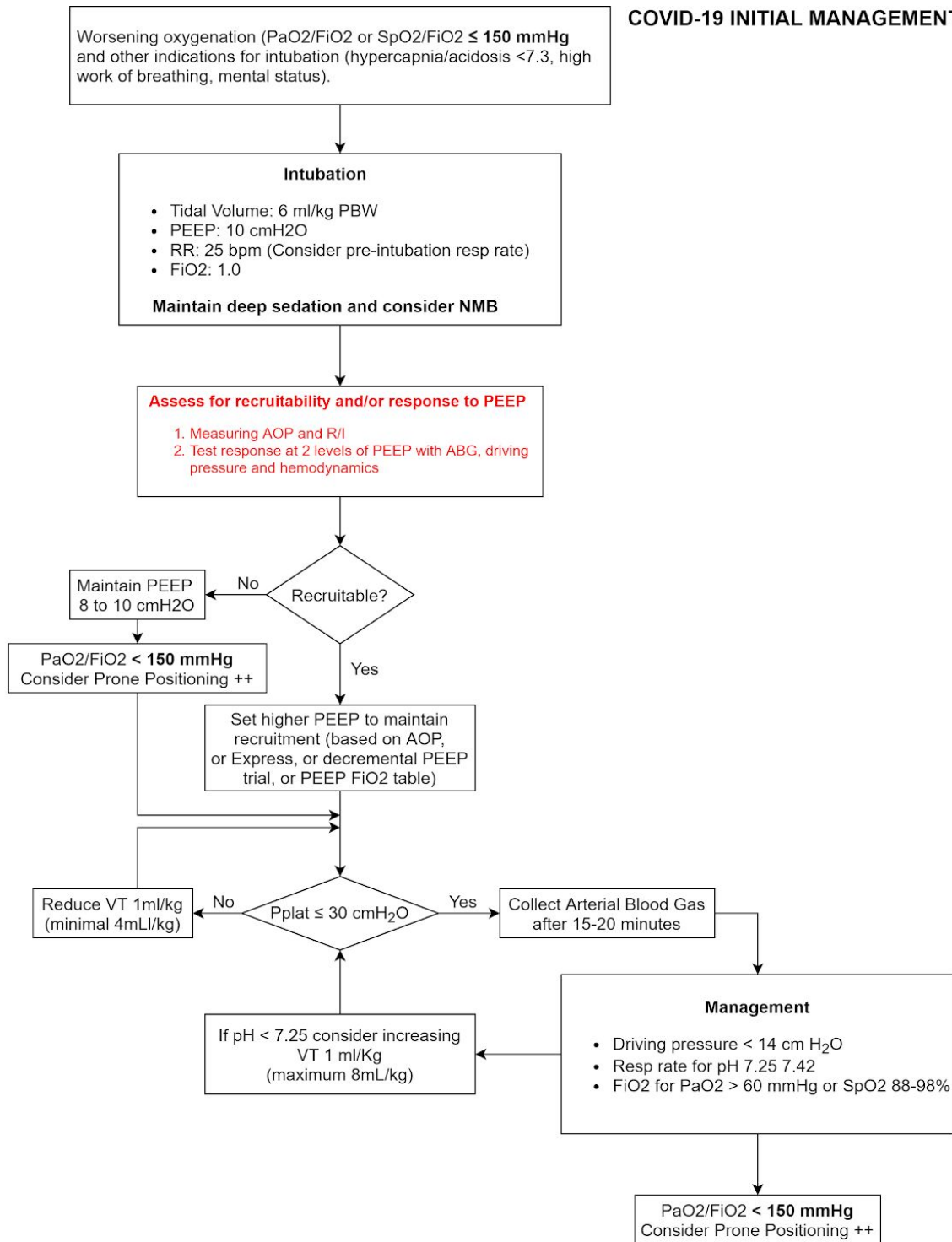
**PEEP-FiO<sub>2</sub> table from Lung Open Ventilation Study**

| Step             | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  | 16  | 17  |
|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| FiO <sub>2</sub> | 0.3 | 0.3 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.5 | 0.5 | 0.6 | 0.7 | 0.8 | 0.8 | 0.9 | 1.0 | 1.0 |
| PEEP             | 5   | 8   | 10  | 10  | 12  | 14  | 16  | 18  | 18  | 20  | 20  | 20  | 20  | 22  | 22  | 22  | 24  |

The following schematic is a proposed physiology-guided mechanical ventilation algorithm; it can be considered where intensivists and RTs are familiar with the measurements. See [\[LINK\]](#) for the most current version.



**COVID-19 INITIAL MANAGEMENT**



**Considerations**

Please visit [crec.coemv.ca](http://crec.coemv.ca) for instructional videos and a calculator for assessing AOP and Calculating the R/I Ratio

If the patient develops **worsening gas exchange, options include:**



- For  $\text{PaCO}_2 \geq 50$  mmHg, consider reducing dead-space by removal of the inline suction flex tube.
- Increasing analgesia and sedation and administering neuromuscular blockade
- Recruitment maneuver:
  - **The simpler and recommended option is sustained inflation:** set continuous positive airway pressure (CPAP) at 35-40  $\text{cmH}_2\text{O}$  for 35-40 sec.
  - **Another option, but only for MDs and RTs familiar with this technique, is staircase inflation:** set pressure controlled ventilation 15  $\text{cmH}_2\text{O}$ , PEEP 10  $\text{cmH}_2\text{O}$ , RR 20, then increase PEEP by 5  $\text{cmH}_2\text{O}$  every 2 minutes until Pplat is 50-60  $\text{cmH}_2\text{O}$
  - Consider higher PEEP strategy if patient responds to the recruitment maneuver, judged by increased  $\text{PaO}_2/\text{FiO}_2$ , decreased  $\text{PaCO}_2$ , or increased compliance
- prone ventilation
- inhaled nitric oxide and prostacyclin
- ECLS referral as per CCSO guidance (<https://bit.ly/2xm3RBS>):
  - Patient considerations for adult referrals
    - Mechanically ventilated <7 days
    - Body mass index  $\leq 40$   $\text{kg}/\text{m}^2$  or weight  $\leq 125$  kg
    - Age 18-65 years
  - Gas exchange considerations
    - $\text{PaO}_2/\text{FiO}_2 < 80$  mmHg for >6 hr or  $\text{PaO}_2/\text{FiO}_2 < 50$  mmHg for >3 hr
    - $\text{PaCO}_2 \geq 50$  mmHg for >3 hr, with RR 35/min and Pplat  $\leq 32$   $\text{cmH}_2\text{O}$

## Humidification during Invasive Mechanical Ventilation

As many centers are reporting thick secretions in COVID-19 patients, as well as high minute ventilation needs, we recommend **avoiding the use of heat and moisture exchanger (HME) circuits in favor of humidified circuits**, where available. Please see Appendix for more information on the advantages and disadvantages of HME filters versus heated humidification.

## Liberation from Mechanical Ventilation

- Spontaneous Breathing Trials (SBTs) should be done on a closed circuit (zero PEEP for a maximum of 30 minutes: see city-wide SBT policy). T-piece should not be used.
- If SARS-CoV-2 cleared (2 samples 24h apart negative), can use HFNC post-extubation.
- Lidocaine 100 mg IV prior to extubation may reduce cough.

## Tracheostomy

The risk/benefit profile of tracheostomy in patients with COVID-19 may be different as tracheostomy represents a high-risk aerosolizing procedure. No data are currently available. Contact and droplet precautions with a fit tested N95 mask should be utilised. Until data are available, tracheostomy may be considered after >14-21 days of mechanical ventilation and ideally when two tracheal aspirates taken 24 hours apart are negative for SARS-CoV-2.

## Tracheostomy Care and Management in the Non-ventilated Patient

Patients who have a tracheostomy but are not ventilated should be placed in a single room and should be cared for using droplet and contact precautions, unless an AGMP is performed - **including airway suctioning - in which case a fit-tested N95 mask is also needed**. Humidity





- Team members should **identify themselves, and quickly pre-brief prior to entering the room**. This is to ensure that roles and responsibilities are clear and that all supplies and medications enter the room with the team.
- A **daily and nightly ICU huddle** is recommended to 1) familiarize with the other members of the team, 2) review and discuss procedures and deviations from standard code blue
- **Ideally, the team** should include the following, based on availability at that moment:

*Inside the room*

1. Code Blue Team Leader
2. Airway expert physician
3. RT to assist with intubation and ventilation
4. RN to administer medications, cardioversion/defibrillation and update code blue team leader regarding changes in rhythm, and potentially document
5. HCW to do CPR (1) - Usually first responder
6. HCW to do CPR (2)
7. RN for documentation and time-keeping. This person could be outside the room, depending on availability of communication (e.g. baby monitor or intercom).

*Outside the room*

8. RN in PPE (in anteroom if there is one)
9. RT in PPE (in anteroom if there is one)

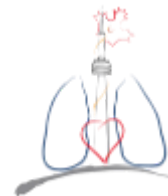
RN and RT in PPE should:

- provide support in case someone has to leave the room
- relieve fatigued personnel inside room to minimize risk of safety breaches
- be ready to get whatever the team needs
- facilitate communication between inside team and rest of the team
- observe for PPE breaches during donning and doffing

10. Additional MD in PPE [if available]
11. "Runner" to assist with supply of equipment stored on the unit and activation of other HCWs if required (e.g., anesthesiologist for difficult airway)
10. Logistic / Safety Officer (Senior HCW - unit charge nurse, intensivist, senior resident) with logistic/flow/safety coordination role. This person is responsible for
  - ensuring protocol is followed
  - monitoring safety breaches
  - regulating access to the patient's room
  - ensuring correct opening/closing of doors
  - communicating with ICU prior to initiation of transport

● **PPE**

- **CPR is an AGMP**
- Staff should wear **contact and droplet precautions with a fit tested N95 mask** before commencing chest compressions.
- **Donning** should be **carried out quickly but meticulously**.
- If multiple individuals arrive at the same time, **priority for donning and entering the room should be given to Code Blue team leader and ICU RN**.
- Members of the team initially outside the room (e.g., back-up RN and RT and runner), should help with donning (e.g. tie gowns) and assessing for breaches in PPE.



- **Equipment**

*Inside the room*

- If available, unit-specific arrest cart with defibrillator and arrest drugs. If only the hospital's arrest cart is available, the defibrillator and drawer with drugs can be removed and brought into the room.
- Intubation equipment
- Manual resuscitation bag with filter, capnograph and inline suction placed between the mask/endotracheal tube and the bag (see Figure 1 )
- Mechanical ventilator (if in ICU or ED)
- Consider a COVID-19 cardiac arrest box (disposable stethoscope, two communication boards, markers, ACLS COVID-19 card, plastic cover for arrest record, pen, stop watch, role sticker, mechanical HEPA filter, checklist for transportation of patients with COVID-19)

*Outside the room*

- Mobile hospital-wide arrest cart (that contains extra equipment, such as intraosseous supplies for emergency vascular access)
- If a decision is made not to use videolaryngoscopy for the first attempt at intubation, a videolaryngoscope should be available
- Difficult airway cart (if deemed necessary by intubating team)
- Bronchoscope (if deemed necessary by intubating team)

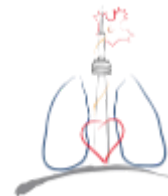
### **3. CODE BLUE TEAM - INSIDE PATIENT ROOM**

- First responder continues to provide CPR
- The first two HCWs to enter the room should be the Code Blue Team Leader and the ICU RN with the arrest cart (unless already inside the room). If other members of the code blue team are already present and properly protected, they should enter the room immediately with the arrest cart.
- ICU RN will immediately connect patient to defibrillator for rhythm analysis if not done already.
- Defibrillation, if indicated.
- No equipment can leave the room until the end of the code blue and without appropriate handling.

#### **MODIFICATIONS TO ACLS**

**For recommendations regarding intubation, please see the section on intubation. Recommendations below only apply to patients in cardiac arrest.**

- **Intubate patients early and hold CPR during intubation** to minimize aerosolization of particles and optimize intubation success.
- **Avoid BMV before intubation.**
- **Consider videolaryngoscopy** as the first intubation technique.
- As described in the intubation section, after intubation, connect the patient to the resuscitation bag or mechanical ventilator. To minimize disconnections after intubation



while allowing proper confirmation of  $\text{ETCO}_2$ , consider the recommended post-intubation connection options as described in Figures 1-3.

- **Avoid disconnections between the ETT and resuscitation bag.** If required, for example, with gas trapping: 1) make a clear, loud announcement to the individuals in the room, and 2) disconnect **after** the filter (i.e., leave filter connected to ETT).
- While auscultation to confirm ETT placement is discouraged, it may be necessary to auscultate if unclear about ETT placement (e.g., no view of vocal cords, no  $\text{ETCO}_2$  due to low cardiac output). The team leader, whose face shield should be less contaminated with respiratory secretions than the intubating physician, should auscultate with a stethoscope, paying attention not to contaminate face and displace the face shield.
- Place OGT/NGT after intubation and ventilation are established
- If COVID-19 suspected but initial NP swab is negative, a deep tracheal aspirate using closed circuit suction should be sent for viral PCR. There are multiple reports of patients with negative nasopharyngeal swabs whose lower respiratory tract samples are positive for SARS-CoV-2. Also send endotracheal aspirate for bacterial culture to rule out bacterial co-infection.

#### 4. CLEAN-UP

At the end of the procedure, before leaving the room:

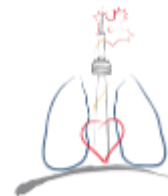
- Wipe **all non-disposable equipment** (e.g. laryngoscope) **with a hospital approved disinfectant wipe (e.g. Oxivir or Chlorox wipes), placed into a clear tied biohazard bag** left in the room.
- **Disposable equipment must be discarded** (e.g., unused drugs, filters, ECG electrodes, defibrillation pads, unused intubation equipment, IV supplies, bags).

#### 5. DOFFING

- This may occur partly in the room (gloves, gown) and outside the room (face shield, mask), or entirely in the anteroom if there is one.
- **DO NOT RUSH. BE METHODICAL. Remove PPE slowly and carefully** to avoid inadvertent contamination of yourself or others.
- **Anyone who is unwell, has had equipment failure, or likely self-contaminated** should be first to doff and exit the patient room.
- **Use a checklist/poster to guide order of removal of PPE.**
- **Have a “safety leader/doffing buddy” to observe for safety breaches while doffing.**

#### 6. RECOVERY

- This occurs outside the room
- Immediate ‘hot debrief to identify and document lessons learned.
- Take a “work pause” after the debrief.
- Staff may choose to change their scrubs.
- If you believe you have been contaminated, report to your supervisor immediately.
- Notify environmental services to clean and disinfect the room using the COVID-19 protocol and PPE.



## E. PATIENT TRANSPORT

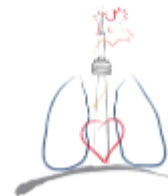
- Ideally, the movement of patients with confirmed or suspected COVID-19 should be limited, with initial admission to the appropriate location and ordering of only essential tests.

|                       |  |
|-----------------------|--|
| ALL PATIENTS          | <ul style="list-style-type: none"><li>● ALL staff must wear appropriate PPE as guided by the hospital's IPAC policy.</li><li>● Hallways must be cleared where possible and only essential staff should accompany the patient.</li><li>● Staff not involved in the transfer should be more than 2 m from patient.</li></ul> |
| NON-INTUBATED PATIENT | <ul style="list-style-type: none"><li>● Transfer patient wearing a surgical mask over nasal prongs or use a non-rebreathing mask with filter on exhalation port (e.g. Tavish mask, HiOx 80)</li><li>● Oxygen should be supplied non-humidified (dry) unless the patient has a tracheostomy.</li></ul>                      |
| INTUBATED PATIENT     | <ul style="list-style-type: none"><li>● Transfer patient connected to closed circuits with in-line suction (bag mask or portable ventilator) connected with mechanical HEPA filter.</li><li>● Consider paralytics when transporting patients with COVID-19.</li></ul>  |

The procedure described below focuses on **intubated patients**; appropriate modifications should be implemented for non-intubated patients

### A. PREPARATION

- **Team(s)**
  - Two teams will be necessary for transfer.
    - Team 1 (preparation team) will be responsible for preparing the patient for transport (one ICU RN and one RT)
    - Team 2 (transportation team) will receive the patient outside the room to minimize risk of contamination (ICU RN, one RT, and any other staff required to assist with transport). One (or more) staff will be assigned the role of "clean" HCW(s).
  - Both teams will wear PPE as guided by each hospital's IPAC policy.
  - If only one team is available, it will be necessary to doff and re-don clean PPEs between patient preparation and transportation.
  - Team huddle
    - Identify clean HCW(s) whose role is to push elevator buttons, clear elevator, use phone outside of the unit, if required.
    - Clarify all roles and ensure all necessary tasks to prepare the patient for transport are completed.
    - Ensure team has code blue key (if available/appropriate).
- **Communication**



Sending unit to call receiving unit/service (e.g. medical imaging) to ensure:

- Awareness of isolation requirements and diagnosis
- Clarify which door/room to use to enter receiving unit
- Prepare equipment/medications currently running

Receiving unit/service:

- Confirms that door and room, equipment, and medications are prepped
- Checks hallway to ensure clear path of entry (service elevators to unit)
- Alerts receiving team of transport on their way

#### ● **Equipment**

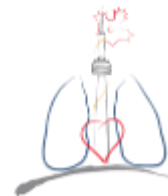
- Transport monitor (\*if patient going to OR uses OR monitor for transport)
- Transport boxes (intubation/meds)
- IV Pumps
- Resuscitation bag with appropriate filter and mask
- O<sub>2</sub> tank
- Clean drape
- Clear large plastic bags
- Stretcher/bed
- Consider suction machine to remain with clean HCW for use if required

#### ● **Patient preparation**

- Consider paralytics when transporting patients with COVID-19.
- Connect patient to appropriate monitors covered with clear plastic bag
- IV pumps moved to transport pole or pole on stretcher/bed (IV pumps should be covered with a clear plastic bag)
- Suction patient with in-line suction prior to departure
- Place ventilator on stand-by
- Attach resuscitation bag (or portable ventilator) with mechanical HEPA filter to O<sub>2</sub> tank and patient
- Wipe stretcher/bed handles and IV pole handle (if not on stretcher pole) with hospital approved disinfectant wipe
- The patient will be pushed out of the room and accepted by the transport team

### **B. TRANSPORTATION**

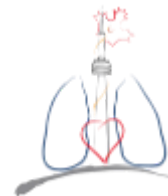
- HCW(s) assigned as “clean” should not touch patient or patient environment. Clean HCW will push elevator buttons, clear elevator, use phone outside of unit if required, etc.
- Ensure transfer pathway is clear (clean HCW or alternative HCW)
- Transport boxes and patient chart should be placed in separate clear plastic bags and, if possible, transported by the clean HCW
- Other HCWs (eg. RN, RT) not designated as clean person(s) do not touch anything in the hospital environment
- For medical imaging/procedures
  - The patient will be moved onto imaging table and connected to the ventilator
  - The stretcher must remain in the room during the procedure
  - The transport team must approach the control room door and doff. The dirty apparel must be discarded into the biohazard waste container in the procedure room, following institutional doffing procedures.
  - Once inside the control room the team should re-don, as soon as possible.



- Once the procedure is complete the team enters the procedure room and removes patient from the ventilator and attaches the patient to the resuscitation bag (or transport ventilator) with mechanical HEPA filter.
- The patient is then transferred to the stretcher/bed.
  
- Once the patient arrives (back) to the receiving unit, he/she is (re)attached to ICU monitors and ventilator.
- Once the patient is settled, members of the team may doff and exit isolation room as per institutional protocols.
- If transfer of accountability (TOA) needs to be performed, it will happen outside the patient room.

### **C. CLEANING TRANSPORT EQUIPMENT AND CONTAMINATED AREAS**

- If a stretcher has been used (e.g., transfer from emergency department to ICU), it will be wiped down, pushed outside of room to another HCW with clean PPEs who will wipe it a second time with a hospital approved disinfectant wipe.
- All non-disposable transport equipment, including O<sub>2</sub> tank, must be wiped with a hospital approved disinfectant wipe (e.g. Oxivir or Chlorox wipes), placed into a clear biohazard bag in the room and tied.
- Disposable equipment no longer necessary must be discarded (e.g., unused drugs, filters, ECG electrodes, IV supplies, bags, etc).
- Specific disinfection protocol should be in place for elevators, procedure rooms and equipment used for procedures and diagnostic imaging. Specific recommendations on this are outside the scope of this document.



## F. RAPID RESPONSE TEAMS - ASSESSMENTS OUTSIDE ICU

### Ward Preparation

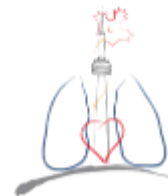
- Each hospital should have a specific plan for the management of clinical deterioration in patients with suspected or confirmed COVID-19 on the ward (e.g., code blue special protocols).
- Clear guidelines on PPE in COVID-19 wards and normal wards during resuscitation should be available and widely disseminated.
- Appropriate equipment [e.g. special isolation carts, non-rebreathing masks with filter on exhalation port (e.g., HiOx80, Tavish mask), manual resuscitation bags with appropriate filter placed between the mask and the bag] should be available and placed in patient rooms.

### Patient Assessment

- All hospitalised patients during the COVID-19 pandemic should have goals of care discussed early in their admission and clearly documented.
- For all hospitalised patients with suspected, probable or confirmed COVID-19 infection who require oxygen supplementation:
  - Intravenous line or saline lock must be in situ at all times (minimum single 20 G IV)
  - An airway assessment ('Clinical predictors of a difficult intubation' form) is recommended at admission and clearly documented in the patient chart (see Appendix).

### Rapid Response Team

- Rapid Response Team should be notified of every deteriorating patient with COVID-19. Calling criteria are the usual ones, plus  $\text{FiO}_2 \geq 40\%$  or  $\geq 50\%$ .
- Staff responding to emergencies outside of the ICU may not have adequate time to perform a thorough risk assessment.
  - If patient is in contact/droplet isolation, staff should don appropriate PPE before entering the room.
  - In case of unclear isolation status, staff should don appropriate PPE for contact/droplet isolation before entering the room, or if it is obvious from the door that intubation (or another AGMP) is needed, staff should don N95 masks.
- If AGMPs are required, these should ideally be performed in a negative pressure room. However, severely ill patients may not be stable enough for transport to a negative pressure room, and life-saving interventions should be delivered promptly and without delay due to transportation.



## G. SELECTED REFERENCES

Repository of resources: <https://icu-pandemic.org/>

World Health Organization, clinical management:  
<https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/patient-management>

Surviving Sepsis Campaign: Guidelines on the Management of Critically Ill Adults with Coronavirus Disease 2019 (COVID-19): <https://bit.ly/3dwe9jl>

ANZICS COVID-19 Guidelines: <https://www.anzics.com.au/coronavirus-guidelines/>

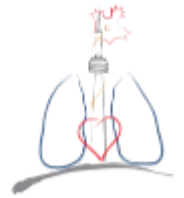
Intermountain Healthcare: Intensive Care Management of COVID-19  
Intermountain Healthcare: COVID-19 Guidance (no link available)

FICM, ICS, AoA, RCoA (all UK). COVID-19 Airway management principles:  
<https://icmanaesthesiacovid-19.org/covid-19-airway-management-principles>

Public Health Ontario. Best Practices for Prevention, Surveillance and Infection Control  
Management of Novel Respiratory Infections in All Health Care Settings:  
<https://www.publichealthontario.ca/-/media/documents/bp-novel-respiratory-infections.pdf?la=en>

Public Health Ontario. Routine Practices and Additional Precautions in all Healthcare Settings:  
<https://www.publichealthontario.ca/-/media/documents/bp-rpap-healthcare-settings.pdf?la=en>

SHS and UHN drug treatment: <https://www.antimicrobialstewardship.com/covid-19>  
Alberta Health Services, Critical Care Strategic Clinical Network and Provincial Critical Care  
Communicable Disease Working Group. Care of the Adult Critically Ill COVID-19 Patient:  
<https://www.albertahealthservices.ca/assets/info/ppih/if-ppih-covid-19-care-adult-critically-ill.pdf>

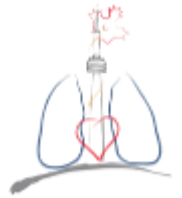


## APPENDIX

- A. Airway Assessment Tool
- B. Intubation Checklist
- C. Code Blue Checklist
- D. Ventilator humidification management

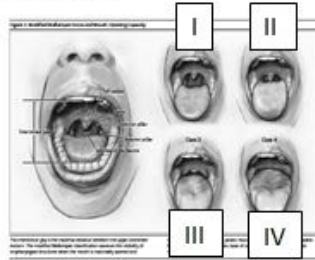
For the following, see <https://www.criticalcare.utoronto.ca/news/covid-19-resources>

- A. Suspected COVID-19 Infection - Template ICU Admission Orders
- B. Suspected COVID-19 Infection - Template Ward Admission Orders



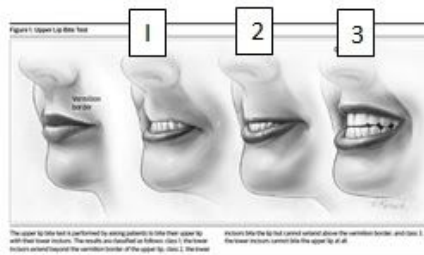
**CLINICAL PREDICTORS OF A DIFFICULT INTUBATION**

**1. Mallampati Score:**



- Class 1
- Class II
- Class III
- Class IV

**2. Upper Lip Bite Test:**



- Class 1
- Class 2
- Class 3

**3. Hyomental Distance:**

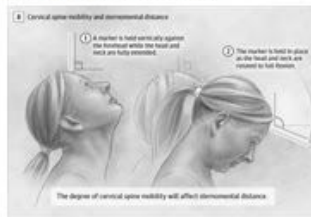
At least 3 of assessors fingers between hyoid bone and mentum

- Yes
- No

**4. Interincisor gap:**

- Greater than or equal to 3 cm
- Less than 3 cm

**5. Cervical Spine mobility**



- <90 degrees
- 90
- >90

**7. Other concerns & overall assessment:**

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Completed by: \_\_\_\_\_ Date: \_\_\_\_\_



**UPDATED March 19, 2020**

# **Protected INTUBATION**

Requiring intubation + Suspected/Confirmed High Consequence Pathogen

| INSIDE Room  | NEGATIVE PRESSURE | OUTSIDE Room  |
|--|-------------------|---|
| <p style="text-align: center; font-size: small;">MD-Lead<br/>+ Airway<br/>ICU/Anes/ED</p> <p style="text-align: center; font-size: small;">RN</p> <p style="text-align: center; font-size: small;">RRT</p>                       | Baby Monitor      | <p style="text-align: center; font-size: x-small;">Safety Lead<br/>(No PPE)</p> <p style="text-align: center; font-size: x-small;">MD- Backup<br/>(In PPE)</p> <p style="text-align: center; font-size: x-small;">RN<br/>(In PPE)</p> <p style="text-align: center; font-size: x-small;">Runner (No PPE)</p> <p style="text-align: center; font-size: x-small;">RRT-Backup (No PPE)</p> |
| <b>DO NOT use stethoscope</b>  |                   | <b>Safety Lead to monitors PPE donning/doffing Charting OUTSIDE ROOM</b>  |
| EXPERIENCED STAFF ONLY   |                   |   |
| <p style="font-weight: bold; font-size: large;">Required PPE (use donning/doffing checklist):</p> <p>1. Level 2/yellow cloth gown    2. Fit-tested N95 Respirator    3. +/- Bouffant<br/>4. Face Shield    5. Nitrile gloves</p> |                   |   |



**Intubate EARLY for increasing O<sub>2</sub> requirements.**

Consider early intubation for patients requiring O<sub>2</sub> with clinical deterioration OR oxygen requirements of absolute 0.5 FiO<sub>2</sub>. Preoxygenate with facemask with HEPA filter or BVM WITHOUT MANUAL VENTILATIONS. AVOID BiPAP.



**Have a clear PLAN. LIMIT equipment in the room.**

Have a TEAM HUDDLE and have a clear plan of approach with all team members. Limit the equipment in the room to absolute necessities. DO NOT use stethoscope.



**AVOID manual ventilations. USE a HEPA filter. PARALYZE early.**

Attach HEPA filter to BVM. Maintain oxygenation with a two-handed mask seal. The priority is to get the patient intubated and onto a closed, filtered ventilation circuit.



**AVOID direct laryngoscopy. Consider VL and/or LMA. PARALYZE.**

Maximize space between airway and provider. PAUSE compressions for intubation. Consider video laryngoscopy. Consider use of laryngeal mask airway. PARALYZE early. TRANSFER on CLOSED CIRCUIT ventilation system. Have a clear TRANSPORT plan.

*Review full protocols on <https://sunnynet.ca/coronavirus>*

Updated 2020Mar19





**UPDATED March 19, 2020**

## **Protected CODE BLUE**

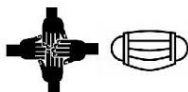
In-ED Cardiac Arrest + Suspected/Confirmed High Consequence Pathogen

| INSIDE Room   | OUTSIDE Room  |
|---|---|
| <p style="text-align: center; font-weight: bold;">DO NOT use stethoscope</p>  | <p style="text-align: center; font-weight: bold;">Safety Lead to monitors PPE donning/doffing Charting OUTSIDE ROOM</p> |
| EXPERIENCED STAFF ONLY  |   |
| <p style="font-weight: bold; margin: 0;">Required PPE (use donning/doffing checklist):</p> <p style="margin: 0;">1. Level 2/yellow cloth gown   2. Fit-tested N95 Respirator   3. +/- Bouffant<br/>4. Face Shield   5. Nitrile gloves</p> |   |



**ACTIVATE Protected Code Blue. Apply surgical mask to patient**

Ensure a “*Protected Code Blue*” is called. Press the *Code Blue* button on the wall. Apply surgical mask to patient. Begin compressions. DO NOT provide manual ventilations.



**DO NOT rush inside. Ensure PPE is donned. Bring Arrest Cart.**

Designate a Safety Lead to monitor PPE use. Have a TEAM HUDDLE and have a clear plan. Bring Cardiac Arrest Cart (modified to have ESSENTIAL EQUIPMENT) into room. Disinfect all surfaces afterwards. DO NOT use stethoscope.



**AVOID manual ventilations. USE a HEPA filter.**

Attach HEPA filter to BVM. Maintain oxygenation with a two-handed mask seal. The priority is to get the patient intubated and onto a closed, filtered ventilation circuit.



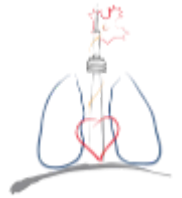
**AVOID direct laryngoscopy. Consider VL and/or LMA. PARALYZE.**

Maximize space between airway and provider. PAUSE compressions for intubation. Consider video laryngoscopy. Consider use of laryngeal mask airway. PARALYZE early. TRANSFER on CLOSED CIRCUIT ventilation system. Have a clear TRANSPORT plan.

Review full protocols on <https://sunnynet.ca/coronavirus>

Updated 2020Mar19





## Humidification During Invasive Ventilation

We outline benefits and risks of two common methods, followed by recommendations for practice.

### Heat and Moisture Exchanger

| Benefits   | Problems   |
|--|--|
| Provides effective humidification  | Adds dead space to the circuit (ranges from 30 to 90 mL)   |
| Circuit disconnects on the ventilator side will not result in potential exposure | Requires routine changing (potential for exposure)   |
|  | HMEs with viral filtration are less efficient with humidification compared to those without viral filtration |
|  | Potential for circuit occlusion at the patient connection due to mucous plugging                             |

### Heated Humidity

| Benefits                          | Problems  |
|-----------------------------------|---|
| Provides effective humidification | Circuit disconnects at patient Y (potential for exposure)   |
| No additional dead-space          | Expiratory limbs need a viral filter between the circuit and expiratory cassette.<br><br>Inspiratory limbs should also have filters at the outlet because some ventilators will ventilate back through the inspiratory limb circuit occlusion in the expiratory limb is detected. |



|   |  |
|---|--|
| <p>May provide optimal humidification to airways compared to HME viral filters (important when secretions are thick or tenacious)</p> | <p>If the expiratory cassette/block is not heated, filters may need to be changed due to condensation (placing the ventilator in standby momentarily will reduce the risk of exposure)</p> |
|---|--|

For patients requiring high minute ventilation, a considerable gain in alveolar ventilation can be achieved by removing the flex tube (called a catheter mount) and HME from the patient Y connection. This combination can increase alveolar ventilation by  $\approx 29\%$ . Many centres are reporting thick secretions in COVID-19 patients, as well as high minute ventilation needs.

**We recommend humidified circuits, where available, instead of HME circuits, and when  $\text{PaCO}_2 \geq 50$  mmHg, consider removal of the inline suction flex tube.**