

## Airway Management Guidelines for Patients with Known or Suspected COVID-19 Infection

Emergency Medicine: **George Kovacs** ([gkovacs@dal.ca](mailto:gkovacs@dal.ca))

Anesthesia: **J Adam Law** ([jlaw@dal.ca](mailto:jlaw@dal.ca))

Critical Care & Anesthesia: **Tobias Witter** ([tobias.witter@nshealth.ca](mailto:tobias.witter@nshealth.ca))

Infection Prevention and Control: **Ian Davis** ([Ian.Davis@nshealth.ca](mailto:Ian.Davis@nshealth.ca))

### Disclaimer:

Many of the publications upon which this document is based are considered 'low level' evidence, i.e., based on expert opinion and consensus. However, we feel that the benefit of providing this guidance exceeds the risk. These recommendations should not be considered mandatory or standard of care in the management of the COVID-19 patient: the clinician's professional judgement must be applied to every situation.

### Updates to this version (V 4.2 January 23, 2021):

- Recommendations provided in this document were based on a focused review of the literature including existing/updated consensus guidelines published since the last update. A select number of references have been added to the document.
- Where the literature yielded inconsistent and/or conflicting recommendations, additional expert opinion was sought from local resources (NS Health IPAC) and international airway management experts.
- A jurisdictional scan and review of existing evidence on various oxygen delivery methods was conducted by NS Health Infection Prevention and Control (IPAC). This review formed the basis on which oxygen delivery methods should or shouldn't be considered aerosol-generating medical procedures (AGMP).
- The EMS section has been removed.
- Further educational support material including videos have been embedded.
- At risk patients with escalating oxygen requirements should be placed in a resuscitation-capable negative pressure environment with staff wearing appropriate PPE for any necessary.
- The RSI Algorithm was updated emphasizing the importance of provider experience with chosen equipment.
- Ventilation by face mask or supraglottic device should be used as required for re-oxygenating patients who are desaturating. Ventilation provided by BVM with an attached filter and PEEP valve should be guided by waveform capnography.

### Definitions for the purpose of this document:

*High flow nasal cannula (HFNC):* Support device able of delivering high flows (up to 70 l/min depending on the device) of heated humidified oxygen concentrations via special nasal cannulas (e.g. AirVo, Vapotherm).

*Continuous Positive Airway Pressure (CPAP):* Any device or adjunct, able to facilitate a continuously elevated airway pressure with the intent to improve oxygenation.

*Biphasic positive airway pressure (BiPAP):* A ventilation form alternating between two airway pressures, allowing for spontaneous breathing on both levels.

## 1. Background

Despite significant improvements in our understanding and management of patients infected with SARS-CoV-2, 'the risk of respiratory failure requiring critical care support in patients with COVID-19 is significant'.<sup>1</sup> During the first wave, complexity and fear of the unknown created significant additional challenges for those tasked with identifying and caring for this new patient population. There remain many unknowns, however the common path for those severely ill patients is a presentation of acute hypoxemic respiratory failure.

Acute care provider teams are familiar with managing patients with this presentation. It is clear however, that while the principles are similar, pre-existing airway management guidelines cannot simply be applied to those with COVID-19 acute hypoxemic respiratory failure. Numerous COVID-19 airway management guidelines have been published to address these differences with variable levels of detail and as stated in our disclaimer remain for the most part supported by either poor quality studies and/or expert opinion<sup>2</sup>. Despite the ongoing gaps in evidence, acute care provider teams have been adapting their practices to local clinical environments as we all continue to ascend a learning curve in preparing for the arrival, transfer of care and management of these patients. Both the patient and provider teams are at risk during airway management of COVID-19 cases. While patient safety continues to be a goal, **safety of the staff caring for the patient is equally important**<sup>3</sup>. Caring for COVID-19 patient safely requires meticulous attention to detail using a common, standardized and rehearsed approach to airway management.

### 1.1 Context

In this document, recommendations for management of the COVID-19 patient relate to (a) efficacy of the recommended treatment modality; (b) its risk to staff safety and (c) resource availability.

### 1.2 Sources for the document

Material in this document is based on the following sources:

- Published evidence and recommendations;
- COVID-19 Hub for Nova Scotia Health Team Members and Physicians;
- Internal Nova Scotia Health (NSH) multi-disciplinary consensus meetings;
- Contact with clinicians working in ‘hot zones’ where surges have occurred;
- Expert opinion from authors of existing published international COVID-19 Consensus Guidelines.

This continues to be a living document, to be updated as more information becomes available or as guidance needs to be altered. Although many additional articles were reviewed for this update, few would meet a level of evidence to be included.

## 2. Principles

General:

- When airway management of the COVID-19 patient is indicated, provider safety must be ensured.
- When tracheal intubation is indicated, rapid achievement of first attempt success should be a primary goal.

Infection control:

- For any potentially aerosol-generating medical procedures (AGMPs), including tracheal intubation or positive pressure ventilation in the non-intubated patient, airborne/droplet/contact precautions should be used by all providers, informed by local infection prevention and control recommendations ([NSH COVID-19 Hub: Acute Medicine](#))
- A resuscitation capable ‘ready bed’ should be designated in an airborne infection isolation room (AIIR), with a separate preparatory space (‘antechamber’). If an AIIR is not available, the intubation should occur in a single room with the doors closed.

Airway Management Providers:

- Acute care physicians should train and prepare for intubating COVID-19 patients.
- The most skilled airway management provider available should perform tracheal intubation.

Team:

- Clinicians often feel a sense of urgency in managing hypoxemic patients. Airway providers and teams should slow down to ensure their own safety as they prepare to manage known or suspected COVID-19 patients.
- The number of primary team members at the bedside should be limited (e.g., to 3: primary airway provider, airway support provider and clinical support provider).
- Providers and teams should engage in regular practice of the necessary procedures, including PPE donning and doffing and the approach to airway management.

Equipment:

- Required airway equipment and medications should be prepared and available prior to entry into the designated ready room.
- Video laryngoscopy should be used as the primary approach for tracheal intubation.

Approach:

- Rapid sequence intubation should be used to facilitate first-pass intubation success and prevent patient coughing or gagging.
- If an awake intubation is considered necessary, e.g., due to unfavourable airway anatomy, this should only be done by an expert provider, trained to perform the approach in COVID-19 patients, using airborne/droplet/contact precautions.

Communication:

- Team briefings should occur prior to entering the ready room and immediately prior to initiating airway management.
- Checklists and/or other visual aids should be used to prepare for tracheal intubation;
- No transports of COVID-19 patients should occur without direct communication with the receiving providers/teams.
- The ability for team members in the room to communicate with the individuals outside the room should be tested and practiced (e.g., with use of writing tablets, small walkie-talkies, etc.)
- Closed loop communication should be used by the team.

### 3. Suggested Management

#### 3.1 Preamble:

SARS-CoV-2 is a novel virus presenting a new and unique constellation of symptoms and signs. Optimal management is still unknown. However, the following generalizations apply to these patients' respiratory support, including tracheal intubation:

- If possible, establish 'do-not-intubate' or 'do-not-resuscitate' status prior to tracheal intubation of any, but especially older or co-morbid patients with COVID-19 related respiratory failure.
- Use of HFNC or CPAP may be considered, in selected cases in an attempt to avoid the need for tracheal intubation.<sup>4</sup>
- **However**, in COVID-19 patients in hypoxemic respiratory failure with a worsening trajectory despite escalating oxygenation measures (including the use of HFNC or CPAP), tracheal intubation must not be delayed, so that it can occur under controlled, non-emergency conditions.
- Staff safety is paramount, so that use of oxygen delivery and ventilatory support modalities that are considered to be at risk of aerosol generation should occur in an AIIR with staff using airborne/droplet/contact precautions.

- Regardless of delivery modality, whenever possible, the patient requiring oxygen supplementation should be closely monitored for deterioration in a *resuscitation capable* room with adequate oxygen sources, suction, monitoring capability and room for staff to safely move and have 360° access to the patient. If needed, escalation to the next level should occur in a timely fashion. When tracheal intubation is indicated, it should occur in a controlled manner with close attention to staff safety.
- Some patients with COVID-19 who have respiratory failure can present with a profound degree of hypoxemia, yet seemingly few symptoms (the ‘silent’ or ‘happy’ hypoxemic patient): speaking in full sentences, without significant dyspnea and with normal mentation. These patients should be considered for supplemental oxygen that includes HFNC or CPAP.
- Others may have a more classic presentation of hypoxemia with tachypnea and high work of breathing, hypercarbia and tachycardia or with other signs such as confusion or hypotension. This population will likely require early tracheal intubation.
- Optimal oxygen goals are unknown, but a target SpO<sub>2</sub> of 92-96% should be considered<sup>5</sup>. If below 92%, initiation or escalation of oxygen therapy should be considered. An SpO<sub>2</sub> above 96% should be avoided by reducing the oxygen flow rate or de-escalation to a delivery modality with less potential for aerosol generation. Going forward, lower oxygen targets may be established for this disease.
- The COVID-19 patient in hypoxemic respiratory failure sometimes responds well to proning – both with or without tracheal intubation. The non-intubated patient can be supplemented by modalities that range from standard nasal prongs/cannulae to CPAP. However, on resumption of the supine position, the patient may again desaturate. The team should be ready for this eventuality ([NSH COVID-19 Hub: Prone Positioning in Acute Care Setting](#)).
- As few published studies currently address the degree of aerosol generation from HFNC or CPAP or the resulting extent of risk to staff, the term ‘*consider*’ will be used when a recommendation is made for the use of these modalities. However, the recommendations in this document are taking this uncertainty into account and with appropriate use of PPE and environmental considerations around airborne/droplet/contact precautions, health care providers will be protected if they use these modalities (NSH COVID19 Hub: Oxygen Delivery Review).

### 3.2 Supplemental oxygenation before the need for tracheal intubation is identified.

#### 3.2.1 Note to reader:

The current evidence is sparse and often contradictory regarding the ‘safety’ of a particular oxygen flow rate or delivery modality to the health care provider. In many cases, evidence is based on ‘bench’ (e.g., manikin) studies. The following statements can be made:

- An oxygen flow rate of  $\leq 6$  liters per minute (lpm), while still causing some aerosol dispersion, is generally considered acceptable for staff wearing droplet/contact precaution level PPE.
- Regardless of device used, the clinician should strive to use the lowest oxygen flow rate that is compatible with adequate patient oxygenation.
- Aerosol/droplet dispersion appears to be substantially lessened by applying a surgical or procedure mask over modalities such as standard nasal cannulae or HFNC.

#### 3.2.2 For the patient with known or suspected COVID-19 in the Emergency Department (ED) or inpatient unit – initial oxygen supplementation options:

- **O<sub>2</sub> nasal prongs/cannulae** at flows  $\leq 6$  lpm
  - Droplet and contact precautions should be used.
  - An AIIR is not required, as flow rates  $\leq 6$  lpm are not considered an AGMP
  - Standard nasal cannulae are generally well-tolerated at flows  $\leq 6$  lpm.

- The patient should wear a standard procedure or surgical mask applied over the nasal cannulae to help limit droplet spread.
  - A trial of lateral positioning or self-proning can occur with the patient wearing nasal prongs/cannulae. ([NSH COVID-19 Hub: Prone Positioning in Acute Care Setting](#))
  - There is no convincing evidence that flow rates by nasal prong/cannula <15 lpm are an AGMP (NSH COVID-19 Hub: Oxygen Delivery Review), but if the target SpO<sub>2</sub> of 92-96% is not achieved with standard nasal prongs/cannulae with flow rates up to 6 lpm, escalation to a non-rebreathing face mask (NRFM) should be considered as it may reduce range of droplet production (see below).
- **O<sub>2</sub> by simple or non-rebreathing facemask** at flows ≤ 15 lpm:
    - Droplet and contact precautions should be used.
    - An AIIR is not required, as flow rates < 15 lpm delivered by simple face mask or non-rebreathing mask are not considered an AGMP (NSH COVID-19 Hub: Oxygen Delivery Review).
    - Flow rates of supplemental oxygen should be limited to the least needed to achieve the target oxygen goal (e.g., SpO<sub>2</sub> 92-96%).
    - A trial of lateral positioning or self-proning can occur with the patient wearing a simple or non-rebreathing mask. These masks do have open expiratory ports and a surgical mask may also be applied.
    - In a patient with suspected or confirmed COVID-19, once oxygen requirements have increased beyond 6 lpm, patients should ideally be in a resuscitation capable space where they can be safely managed should they deteriorate.

### 3.3 Further escalation required.

For the patient with known or suspected COVID-19 who has ongoing hypoxemia despite a trial of the foregoing, or as initial management due to profound hypoxemia and/or distress, options are as follows:

#### 3.3.1 Early tracheal intubation may be indicated for the following indications:

- Significant hypoxemia refractory to non-rebreathing mask at flows ≤ 15 lpm in conjunction with one or more of the following:
  - Clinical signs of the patient tiring:
    - Dyspnea;
    - Tachypnea with RR > 30-35 (adult);
    - Tachycardia;
    - Agitation;
    - Accessory muscle use; paradoxical chest/abdomen movement;
  - Worsening PaO<sub>2</sub>/FiO<sub>2</sub> ratio.
  - Increasing PaCO<sub>2</sub>.
  - Rapidly progressive disease trajectory or other clinical judgement.
  - Other standard indication for tracheal intubation, e.g., failure to protect the airway or obstructing airway pathology, hemodynamic instability, sepsis, multi-organ failure.
- Tracheal intubation is considered an aerosol-generating medical procedure and should ideally be performed in an AIIR.

**3.3.2** Available literature and general expert consensus is that the use of **HFNC or CPAP** can prevent an intubation in a significant proportion of patients with COVID-19, and even if intubation cannot be avoided, it will allow for the HCPs to prepare and ready for the intubation. It is important to recognize that **HFNC and CPAP** are acknowledged as being potentially aerosol-generating<sup>6,7</sup>.

**HFNC** including Airvo™; Optiflow™ or Vapotherm™ deliver humidified oxygen at flow rates of 40-70 lpm:

- Should be considered as potentially aerosol-generating and ideally used in an AIIR. If an AIIR is not available then treatment should be performed in a single room with the door closed.
- Staff caring for the patient using HFNC should use airborne/droplet/contact precautions.
- To help reduce aerosolization potential, consider using FiO<sub>2</sub> 1.0 and reducing flows to the lowest needed to achieve target oxygen goal (e.g., SpO<sub>2</sub> 92-96%), as permitted by hospital supplies of oxygen.
- A trial of HFNC in the prone position can be considered in the cooperative awake, spontaneously breathing patient.
- If HFNC are used, the patient should be closely monitored in an appropriate setting (e.g. ICU, ED, IMCU) for deterioration, and if not responding favourably within a 30-60 minute trial period, should proceed to a controlled COVID-19 protected tracheal intubation.

**CPAP.** If HFNC is not available, CPAP can be delivered by a variety of devices, e.g.:

- By a non-invasive ventilation device.
- By a commercial flow-dependent CPAP mask with a viral filter. This includes the Rescuer® Emergency CPAP System 8700 ([NSH COVID-19 Hub: Acute Medicine-CPAP Rescuer](#)). This has been distributed around the province as a resource for empiric use when escalation of oxygen therapy is required but local resources do not include traditional CPAP or HFNC devices. It can be used to temporize, for example, pending the arrival of a transport crew able to perform tracheal intubation.
- CPAP can be delivered by applying nasal prongs at 5-10 lpm and applying an overlying cuffed mask attached to viral filter, catheter mount, bag-valve mask device with PEEP valve (10 cm H<sub>2</sub>O) with oxygen running at a flow of 15 lpm (Figure 1).



Figure 1: BVM/PEEP/manometer, flexible mount, waveform CO<sub>2</sub> connector, viral filter, mask (the flexible mount shown in the above figure has a suction port which should be closed AND cannot be used for suctioning)



- All CPAP generating options should be considered as potentially aerosol-generating and ideally used in an AIIR. Staff caring for the patient using CPAP should use airborne/droplet/contact precautions.
- To help reduce aerosolization potential, consider starting with the least supporting pressure (e.g., CPAP 8-10 cm H<sub>2</sub>O) consistent with adequate SpO<sub>2</sub> (e.g., 92-96%).
- A trial of CPAP in the prone position can be considered in the cooperative, awake, spontaneously breathing patient.
- If CPAP is used, the patient should be closely monitored for deterioration, and if not responding favourably within a 30-60 minute trial period, should proceed to a controlled COVID-19 protected tracheal intubation.

**BiPAP** is not generally recommended for support of the COVID-19 patient in hypoxemic respiratory failure.<sup>8,9</sup>

If the patient responds well to support with HFNC or CPAP, that modality can be continued with ongoing close observation for tiring or deterioration. With or without a trial of HFNC or CPAP, when required, tracheal intubation should occur before it is an emergency. Controlled tracheal intubation before the patient decompensates will minimize the potential for risk to staff due to breaches of PPE donning protocols.

### 3.3.3 Tracheal intubation after a failed trial of or CPAP:

- Failure to respond to the trial of HFNC or CPAP is an indication for tracheal intubation. Response should be monitored by attention to parameters such as respiratory rate<sup>10</sup> and ROX index ([SpO<sub>2</sub>/FiO<sub>2</sub>]/RR)<sup>4, 11, 12</sup>.

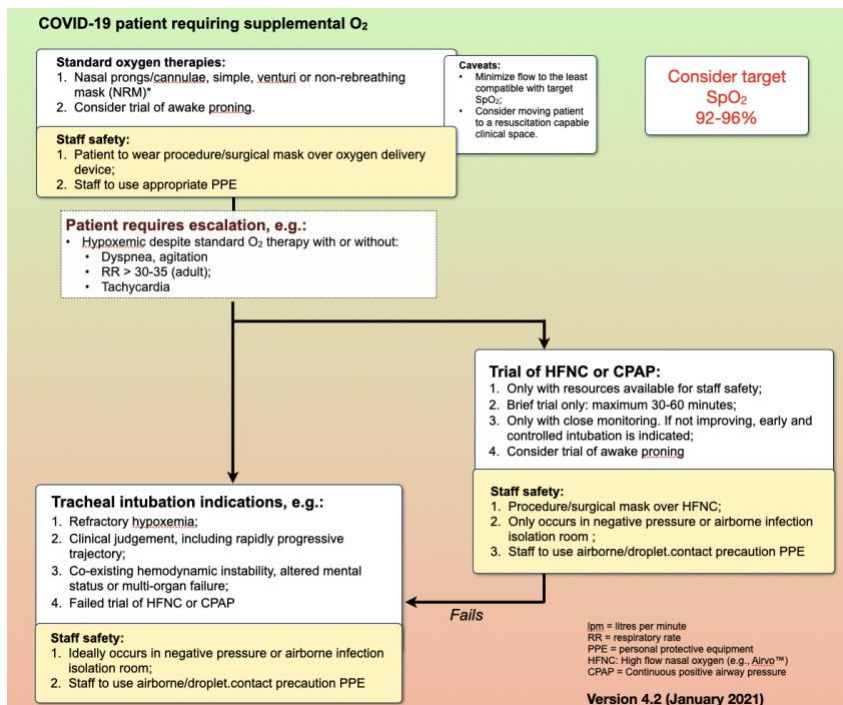


Figure 2: Suggested COVID-19 escalation of oxygenation pathway (for larger image see Appendix 1)

#### 4. COVID-19 Protected Tracheal intubation of the COVID-19 patient: recommendations

##### 4.1 Location:

Tracheal intubation of the patient with COVID-19 should ideally occur in an AIIR.<sup>1, 13, 14</sup> However, the risks of transporting a critically ill patient to another location for tracheal intubation must be weighed against the benefits. Regardless of location, ideally, the chosen area should be resuscitation capable, providing staff with enough room to move safely while caring for an acutely ill patient. Providers should strive to perform in-situ simulation in these areas.

##### 4.2 Approach:

Rapid sequence intubation (RSI) is the default approach for managing these patients, so that the risk of aerosolized droplet production by coughing or gagging can be minimized. For every case, a 'double set-up' RSI is recommended, with the location of the cricothyroid membrane marked and prepped for rescue cricothyrotomy (Appendix 2: RSI visual aid). Video laryngoscopy is recommended to facilitate tracheal intubation and maintain distance away from the patient's face. If used, awake intubation should only be performed by a provider very familiar with the procedure and its application to the patient with COVID-19.

##### 4.3 Equipment Preparation:

Providers are encouraged to create compact kits that can be taken into the room (e.g., Appendix 3) to avoid contamination of other equipment. It is assumed that clinicians using the airway equipment described below are experienced and have practiced the chosen procedures individually and with their teams while wearing the appropriate PPE. Core equipment should include:

- Suction: open rigid and closed in-line tracheal suction setups.
- The bag-valve mask (BVM) device should be fitted with PEEP valve, cuffed face mask, viral filter and waveform CO<sub>2</sub> and pressure monometer. Adding a flexible catheter mount provides an easier range of motion for BVM setup to help minimize the risk of accidental disconnection (Figure 1). Connections must be secure.
- Waveform capnography provides breath to breath ventilation feedback and the appearance of a square trace is reassuring evidence of a quality mask seal in the spontaneously breathing patient and in those requiring rescue ventilation.
- A pressure manometer along with waveform capnography provide important user feedback that may help avoid over-ventilating (high rates, pressures and volumes) patients.
- Oropharyngeal airway (with alternative sizes).
- Regular nasal prongs.
- Intubation devices: Regardless of which video laryngoscope (VL) is chosen, clinicians should be experienced with its use and deliberately practice to ensure a high first pass success rate without serious adverse events.
  - We recommend use of a video laryngoscope that supports use of single-use (disposable) blades. For a first attempt, we recommend use of a Macintosh-shaped blade and routine use of a tracheal tube introducer ('bougie')<sup>15</sup>. There are slight differences between Macintosh-shaped blades and clinicians should be very familiar with their chosen device ([Macintosh VL Video](#)). Examples of video laryngoscopes include:
    - Storz C-MAC® S with single-use Macintosh 3 or 4 blades;
    - GlideScope® Spectrum™ with single use [Macintosh-shaped] DVM 3 or 4 blades;
    - McGrath Mac with single-use Mac size 3 or 4 blades.
  - Hyper-angulated video laryngoscope blade options are available for all of the foregoing. These can be used for the patient with anticipated difficult Macintosh laryngoscopy, for a second intubation attempt after proven difficult Macintosh laryngoscopy (if the patient is still oxygenated), or alternatively, for first attempt use due to clinician preference if skilled with the



device. Use of an 'out-of-package' bougie is NOT recommended when using a hyper-angulated VL device ([Hyper-angulated VL Video](#)). Examples of hyper-angulated blade VLs include:

- Storz C-MAC® S with single-use D-blade;
    - GlideScope® Spectrum™ with single-use LoPro S3 or S4 blade;
    - McGrath™ Mac with X blade.
  - Other Options:
    - A high quality single-use direct laryngoscope should be available in case the VL system fails.
    - If available, a single-use flexible intubation endoscope may be valuable in experienced hands, for example, used through a supraglottic device, e.g., in the event of difficulty achieving tracheal intubation using standard video laryngoscopy.
- Tracheal tubes:
  - Evac (i.e., including a subglottic suction port) tubes should be considered as first choice unless a difficult tracheal intubation is predicted. If an Evac tube is chosen, for an average sized adult, decrease the size by 0.5 mm internal diameter (ID).
  - If difficult intubation is predicted, a conventional tracheal tube or a Parker Flex-tip tracheal tube is recommended: size 7.0-7.5 mm ID for an adult female; 7.5-8.0 for an adult male.
  - 10 ml syringe for cuff inflation.
  - Use a familiar commercial tracheal tube securing device (no tape).
- Tracheal tube adjuncts:
  - It is recommended that a bougie be considered for all tracheal intubations facilitated by a video-enabled or traditional direct Macintosh blade<sup>15</sup>. As previously noted there are some differences between Macintosh blades and clinicians should be experienced with their device to ensure a high first pass success rate.
  - If a hyper-angulated blade video laryngoscope blade is chosen for use, a conventional or Parker Flex-tip tracheal tube is suggested, appropriately shaped to a 60 to 70-degree distal bend with a rigid or semi-rigid stylet.
  - In experienced hands, a bougie that maintains a pre-shaped curve or is steerable may be used with a hyper-angulated video laryngoscope.
- Tracheal tube confirmation:
  - As previously stated, waveform capnography is strongly recommended and should be attached proximal to the viral filter. Seeing six complete breaths with sustained amplitude confirms correct tracheal tube placement.
  - A colorimetric CO<sub>2</sub> detection device (capnometry) is an alternate if waveform capnography is not available.
  - A complete absence of CO<sub>2</sub> must not be ascribed to peri-intubation arrest or low-flow state: rather, esophageal intubation must be excluded.
- Supraglottic airway device for rescue:
  - A supraglottic airway device (SGD) should be selected based on the patient's weight. A second SGD, one size smaller or a different type should also be available.
  - The type of device should be based on provider familiarity and ease of placement and should ideally support endoscopically guided (with flexible intubation endoscope) tracheal intubation if needed. A 'second generation' device that is designed to obtain a better seal and also features an esophageal drainage port is ideal.
  - The EMS i-gel® with a passive oxygenation port is the currently recommended device for use in our Provincial emergency departments; other devices such as the King LTS-D™ have a high first

pass success rate in trained hands, however the SGD will not support an endoscopically guided intubation through the device (Pending document: [NSH COVID-19 Hub: Acute Medicine](#)).

- Cricothyrotomy equipment:
  - Bougie, #10 scalpel blade and a 6.0 tracheal tube; pack of sterile gauze.
- Vascular access with two IVs should be in place. If not yet established, supplies for IV and intra-osseous (I-O) access should be available.

#### **4.4 Pharmacologic preparation:**

Drugs should be drawn up and clearly labelled outside the room:

- Ketamine 1.0-1.5 mg/kg. Providers may choose to decrease the dose of ketamine for patients with a shock index of >1 (HR/SBP) by 25-50%.
- An induction sedative-hypnotic other than ketamine can be used, guided by provider familiarity and preference;
- Rocuronium 1.5 mg/kg;
- Succinylcholine 1.5 mg/kg can be used as an alternative to rocuronium.
- IM ketamine in the 50 mg/ml concentration should be available for behavior control, if needed.
- Push dose pressors should be drawn up in advance, labelled and ready to administer (e.g., epinephrine or phenylephrine).
- A norepinephrine drip should be available before RSI, to be started at a dose of 0.1mcg/kg/min, as necessary.
- Post intubation sedation and analgesia (bolus and infusion) should be readied. Choice of sedative should be governed chiefly by provider familiarity.
- 20-cc syringe of saline flush solution.

#### **4.5 Personal Protective Equipment (PPE):**

PPE for all team members involved in tracheal intubation of the COVID-19 patient should be for airborne/droplet/contact precautions. Please consult with your local infection control authorities regarding exact PPE recommendations. A checklist should be used for PPE donning and doffing (Monitor updates on [NSH COVID-19 Hub: Acute Medicine](#)).

- SLOW DOWN: Regardless of the urgency to proceed with the intubation, take the time to don (and later doff) PPE safely. Designate one team member to be a 'checker' or coach. A 360-degree review of each team member should occur before entering the room.
- Peripheral vision, fogging and glare from PPE visors may cause challenges. Be prepared for this by having practiced with the equipment during simulation exercises beforehand.

#### **4.6 Team Briefing outside room:**

No matter their experience level, providers will be anxious about airway management for patients with COVID-19. These patients are critically ill and are physiologically compromised. Based on physiologically similar cohorts, post-intubation cardiac arrest may occur in up to 2-3% of critically ill patients.<sup>16, 17</sup> Regardless, the team must be reminded that their safety is the foremost priority.

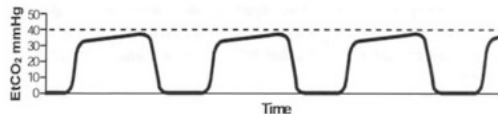
- Outside the room, the team leader should be identified. This individual may or may not be the primary airway provider.
- Primary team identified, for example:
  - Primary airway provider;
  - Airway support provider (e.g., RT, medic);

- Clinical support provider (e.g., nurse).
- Support team (if available) is identified with PPE donned in anteroom after the primary team has entered the patient's room, for example:
  - Second provider as intubation support/cardiac arrest lead;
  - Airway support provider (e.g., RT, medic or nurse) as a 'runner' who can easily identify the requested equipment and pass it into the room.
- Articulate the plan to the team:
  - RSI as the default approach;
  - Preoxygenation strategy;
  - Review your plan for difficulty if encountered using the RSI visual aid (e.g., Appendix 2);
  - Assign specific airway roles for those inside the room (e.g., timing, bougie assistant, two-handed BVM ventilation);
  - The plan for confirmation of tracheal intubation using capnography or capnometry;
  - The plan for transfer to mechanical ventilation, including how to do planned circuit disconnections, if required;
  - The plan for cardiac arrest;
  - Invite questions from the team.

#### 4.7 Inside the room:

Preparation should be guided by a checklist with which the team has trained and become familiar (e.g., Appendix 4):

- Monitors applied to patient:
  - Standard SpO<sub>2</sub>, ECG, non-invasive blood pressure (on the opposite arm to that to be used for medication administration, cycled at intervals of no less than 2 minutes);
  - Waveform CO<sub>2</sub> monitoring should begin with preoxygenation. Anything other than a square waveform may be indicative of a poor seal on the patient's face.



- Patient positioning:
  - The patient should be positioned in a back up (close to sitting or position of comfort) if hemodynamics permit. The bed can be transitioned to a flatter (but still somewhat back up or reverse Trendelenburg) position as the patient loses consciousness with RSI.
  - The head and neck should be positioned in the standard 'sniff' position.
  - Obese patients should be ramped (using blankets or a dedicated positioning insert) to also achieve ear-to-sternum 'sniff' positioning.
- Good free-flowing vascular access should be confirmed.
- A tracheal tube clamp and extra viral filter should be readily available should a circuit disconnection occur.
- Airway exam: evaluation of the patient's airway anatomy should occur. Dentures removed.
- Final briefing and review of cognitive aid (e.g., algorithm, Appendix 4) with any changes to the plan based on airway exam findings.
- Marking the cricothyroid membrane by palpation or facilitated by ultrasound should be considered for all patients as part of the 'double set-up'. This will not necessarily represent a point of entry but serves as a landmark for the initial vertical incision as part of a bougie assisted cricothyrotomy ([Video link](#)).

#### 4.8 Pre-oxygenation:

Patients with COVID-19 being intubated for respiratory failure can be expected to desaturate rapidly with the onset of apnea during RSI. Thus, optimized pre-oxygenation is important. Once again, recognizing the need

to minimize the potential for aerosol generation during the process, options for pre-oxygenation include the following:

#### 4.8.1 Continue the existing oxygen delivery modality for the pre-oxygenation phase:

- The patient requiring tracheal intubation shortly after arrival by EMS may already be receiving CPAP by cuffed facemask system with viral filter and straps.
- Or, EMS may have used a standard BVM CPAP system applied to the patient: facemask-viral filter-BVM with PEEP valve. This may also be continued into the pre-oxygenation phase.
- An inpatient may have been receiving HFNC or CPAP or in rare cases, BiPAP: any of these modalities can simply be continued for the pre-oxygenation phase prior to RSI.
  - Notwithstanding, transferring the patient on HFNC or CPAP to standard cuffed mask and BVM device for pre-oxygenation provides the opportunity to confirm the size of mask is that needed for a good seal, before the potential need for positive pressure ventilation.
  - As previously indicated, these modalities should ideally be administered in an AIIR with staff using airborne/droplet/contact precautions.

#### 4.8.2 Change from nasal prongs or non-rebreathing mask to a more effective pre-oxygenation modality:

- The patient currently receiving oxygen supplementation by standard nasal prongs or NRFM proceeding directly to RSI will need to be transitioned to a more effective means of pre-oxygenation.
- In some cases, ketamine administration may be required to facilitate tolerance of pre-oxygenation techniques ('delayed sequence intubation')<sup>18, 19</sup>.
- One option (e.g., Figure 2c) to provide some CPAP during pre-oxygenation is a bag-valve mask (BVM) flowing at 15 lpm with PEEP valve (10cm H<sub>2</sub>O) and viral filter, placed over nasal prongs flowing at 10 lpm. The need for additional flow administered by nasal prongs follows from the significant degradation of flow (often by 50% or more) through many disposable BVMs ([CPAP pre-oxygenation video](#)).
- It is important that the BVM set-up has an integrated connector to enable monitoring of waveform CO<sub>2</sub>. A good seal during pre-oxygenation should ideally be confirmed by the presence of a square waveform capnographic trace in the spontaneously breathing patient.
- Providing gentle manually assisted ventilations (pressure support) in tachypneic spontaneously breathing patients poses an additional risk of aerosolization when asynchronous breaths are delivered with a poor mask seal. This is not recommended.
- If available (e.g., in the operating room), end-tidal oxygen readings can be used to monitor efficacy of pre-oxygenation efforts.
- Regardless of the setting or pre-oxygenation technique, the goal in the pre-oxygenation phase is to achieve an SpO<sub>2</sub> > 90%, if feasible.

#### 4.9 RSI and tracheal intubation should follow:

- Adequate time (e.g., 45 seconds for succinylcholine; 60 seconds for rocuronium) must be given for the complete onset of neuromuscular blockade to minimize the possibility of coughing or gagging with airway instrumentation.
- Pre-oxygenation as described above can be continued after loss of consciousness while awaiting the onset of neuromuscular blockade, with the addition of an oral airway and jaw thrust using a V-E grip (use of thumbs and thenar eminence to hold mask on the face, while lifting the mandible using the middle and ring fingers placed behind the angle of the mandible e.g., Figure 3; [Video](#)).<sup>3</sup>



Figure 5: Two-handed mask hold with a thumbs forward / thenar eminence ('V-E') grip and jaw thrust

- Positive pressure bag-mask ventilation while awaiting the onset of neuromuscular blockade is ideally avoided but if elected, should be done with a V-E grip, and keeping insufflation pressures well below 20 cm H<sub>2</sub>O, with attention to maintaining a good seal.
- The timing and placement of an OPA as the patient transitions to an apneic state must consider the patient's ability to tolerate the device and the fact that removal of the mask during preoxygenation will lead to loss of recruitment (CPAP effect).
- Flow to the BVM and nasal prongs should be turned off when the mask is removed for laryngoscopy to avoid potential contamination from the mask.
- The clinician should stand straight during laryngoscopy, using indirect viewing via the video screen for both laryngoscopy and intubation.
- Despite good visualization on the video laryngoscope screen, it is critical that the user maintain awareness of what is happening when the blade, bougie or tracheal tube enter the mouth.
- Use of a bougie should be considered to facilitate all tracheal intubations using *Macintosh* videolaryngoscopy<sup>15</sup> (VL) as previously discussed. If used, it must be extracted carefully (without flicking secretions into the room) and discarded in a trash bin next to the bed.
- The tube should be advanced until the cuff has disappeared 2-cm below the cords: auscultation to rule out endobronchial intubation will be difficult and is not advised.
- The cuff of the tracheal tube must be inflated prior to initiation of positive pressure ventilation.
- The BVM or ventilator circuit with viral filter should be attached to the proximal end of the tracheal tube AND oxygen flow resumed.
- Sustained waveform capnography should be confirmed.
- Blood pressure should be reassessed.
- The tube should be firmly secured using a commercial securing device.

## 5. Failed first attempt at tracheal intubation (refer to algorithm, Appendix 2).

### 5.1 Re-oxygenation:

If the first attempt at laryngoscopy and intubation fails, these patients will very likely desaturate before a second attempt. If needed, attempts to reoxygenate the patient must occur in a controlled manner. Options include:

- Gentle face mask ventilation with OPA, 2-handed mask hold for a good seal and low tidal volumes; bag-valve mask (BVM) flowing at 15 lpm with PEEP valve (10cm H<sub>2</sub>O) and viral filter, placed over nasal prongs flowing at 10 lpm.
- Placing a second-generation SGD can be considered for both re-oxygenation and as a potential exit strategy (preferably one that supports flexible endoscopic intubation).

- These two techniques are the preferred strategy as waveform capnography feedback will help guide the effectiveness of these re-oxygenation strategies, often before saturations improve.
- Apneic CPAP: Place an OPA. Re-apply the filtered BVM system, again with PEEP of 10 cm H<sub>2</sub>O at a flow of 15 lpm over nasal prongs 10 lpm without manual assistance. This strategy may be in-effective as the patients saturation will already be declining and there will be no waveform capnography feedback in this scenario. Active FMV described above should be the default strategy in the re-oxygenation scenario.

### 5.2 Further attempts at tracheal intubation after a failed first attempt:

- A further attempt at tracheal intubation can occur in the still-adequately oxygenated patient.
- A second attempt can occur with an optimized technique with the original device, use of a different device (e.g., hyper-angulated videolaryngoscope), or use of a different operator.
- Flexible endoscopic intubation through an intubating SGD is an option for the clinician skilled in the technique in the still-adequately oxygenated patient.

### 5.3 Failed tracheal intubation in the still-oxygenated patient

- Even if still adequately oxygenated, failure to intubate the COVID-19 patient in respiratory failure after a maximum of three attempts should prompt strong consideration for performing a surgical airway, as awakening the patient is unlikely to be a viable option.
- If not done to this point, an SGD should be placed while equipment and/or personnel to perform surgical airway are obtained, with attention to minimizing insufflation pressure and leak.
- The 'exit strategy' surgical airway should be performed in a timely fashion in the still-oxygenated patient to help minimize how long positive pressure ventilation must occur by face mask ventilation or a SGD. It will ideally occur by an open surgical technique (e.g., scalpel/bougie cricothyrotomy) by the most experienced clinician available to perform the procedure.
- Any ongoing attempts at positive pressure ventilation by face mask or SGD ventilation during cricothyrotomy should be discontinued just before the cricothyroid membrane is incised, to avoid risk of aerosolization via the incision.

### 5.4 'Can't intubate, can't oxygenate'

- Distinct from the foregoing 'exit strategy' situation whereby surgical airway must occur in a timely fashion, emergency cricothyrotomy must be performed immediately if a 'can't intubate, can't oxygenate' (CICO) situation occurs.
- The CICO situation is defined by the failure of at least one attempt at all of tracheal intubation, optimized face mask ventilation and SGD ventilation, with current or imminent hypoxemia.
- If CICO occurs, scalpel/bougie-assisted cricothyrotomy should proceed immediately by the most qualified individual already present ([Bougie assisted cricothyrotomy video](#)).

### 6. Post-intubation management:

- Ongoing sedation and analgesia should be addressed given the expected duration of pharmacologic paralysis with high-dose rocuronium;
- If intubated outside an intensive care setting, consideration should be given to maintaining pharmacologic paralysis with ongoing sedation during transportation to the setting of the patient's final disposition. This may help avoid accidental extubation or coughing and bucking during transfer.
- Initial ventilator settings should be consistent with a lung protection ventilation strategy, e.g., tidal volume 6 ml/kg predicted body weight; plateau pressure  $\leq$  30 cm H<sub>2</sub>O; RR 25/minute; PEEP 8-10 cm H<sub>2</sub>O; FiO<sub>2</sub> 1.0, titrated down rapidly as permitted to maintain SpO<sub>2</sub> 92-96% thereafter. Tidal volume should be reassessed and adjusted to keep the driving pressure (difference between PEEP and plateau pressure) below 15 cmH<sub>2</sub>O.<sup>20</sup>
- Ongoing hypoxemia post intubation can be addressed with options that include increasing FiO<sub>2</sub> if not already at 1.0; recruitment maneuver to re-recruit alveoli collapsed during the intubation process (e.g.



inspiratory hold at 40cm H<sub>2</sub>O x 10-15 seconds), maintaining pharmacologic paralysis and sedation. If despite these measures, the patient does not improve, placing the patient in prone position is strongly recommended.

- Consideration should be given to placing invasive vascular access in the same setting as tracheal intubation, e.g., arterial line ± central venous access.
- Consideration should be given to placing a nasogastric tube.
- Inline suction should be used. To place this, a circuit disconnection may be required, as follows:
- **Circuit disconnects** should be minimized:
  - If needed, they should ideally occur proximal to the viral filter.
  - Ventilation should be discontinued beforehand, ideally at end-expiration.
  - If disconnection is occurring distal to the filter (i.e., between tracheal tube and filter), first clamp the tube and also ensure that positive pressure ventilation from the ventilator or BVM has temporarily been suspended. After reconnection and tube de-clamping, confirm successful resumption of ventilation with waveform capnography.
  - The tracheal tube of a spontaneously breathing patient should be clamped only VERY briefly, for fear of development of negative pressure pulmonary edema.

## 7. Extubation of the trachea

Extubation of the patient with COVID-19 may not occur for some days but may have to be addressed by ICU staff. Similarly, Anesthesia staff caring for suspected or known COVID-19 positive patients undergoing urgent or emergency surgical procedures will need to extubate the patient. This is a similarly high-risk time with the potential for aerosolization of patient secretions due to cough. The following precautions should occur:

- Airborne/droplet/contact precautions.
- Minimize staff in the room.
- Consideration can be given to transfer of the patient to an AIIR for extubation.
- A clear plastic sheet can be transiently placed in front of the patient's face during extubation, to help limit droplet spread with any coughing that occurs immediately after extubation;
- Further efforts to avoid droplet/aerosol spread with cough after extubation might include:
  - Early application of the mask used for preoxygenation, reattached to the circuit distal to the filter;
  - Early application of a simple or non-rebreathing face mask;
  - Nasal prongs/cannulae with application of an overlying procedure or surgical mask.
- Use of an airway exchange catheter as a placeholder, (as may be done for the patient who was difficult to intubate) should not occur, to minimize the possibility of cough.

## 8. Cardiac arrest and **Protected Code Blue**<sup>1, 8</sup>

**8.1 Peri-intubation cardiac arrest** in the patient with COVID-19 may relate to the combination of profound hypoxemia, medications and reduction in venous return from the onset of positive pressure ventilation after intubation. These patients requiring tracheal intubation are at increased risk of peri-intubation cardiac arrest given their degree of hypoxemia and apnea intolerance during RSI. Return of spontaneous circulation (ROSC) in these patients can generally be accomplished with re-oxygenation, together with measures to support blood pressure and cardiac output. Resuscitation from arrest occurring in the context of tracheal intubation for the COVID-19 patient would involve staff already wearing airborne/droplet/contact precautions. Beyond this, standard resuscitation considerations apply, with the exception of ensuring that the cuff of the endotracheal tube is well-inflated, so that the intra-thoracic pressure generated with chest compressions (if needed) does not allow air to escape past an underinflated cuff.

**8.2 Cardiac arrest occurring in the non-intubated patient on the ward or in the ICU** unfortunately has a poor outcome<sup>21</sup>. Please see [NSH COVID-19 Hub: Code Blue Guiding Principles](#).

## 9. Recommended resources

1. Oxygen Delivery to Suspected or Positive COVID-19 Patients Rapid Review - Jurisdictional Scan and Evidence Synthesis – Updated Dec. 16, 2020 (NSH COVID19 Hub: Oxygen Delivery Review).
2. Consensus statement: Safe airway Society principles of airway management and tracheal intubation specific to the COVID-19 adult patient group. Medical Journal of Australia pre-print (open access). Available at: <https://www.mja.com.au/journal/2020/212/10/consensus-statement-safe-airway-society-principles-airway-management-and>
3. Royal College of Anaesthetists COVID-19 Airway Management Principles <https://icmanaesthesiacovid-19.org>
4. Training and airway management videos related to management of the COVID-19 patient will be available at <https://AIMEairway.ca> and should be considered non-proprietary open access materials.
5. [Coronavirus disease 2019 \(COVI-19\) from Life In The Fastlane \(LITFL\): updated weekly](https://litfl.com/coronavirus-disease-2019-covid-19/) (<https://litfl.com/coronavirus-disease-2019-covid-19/>)
6. Aligning difficult airway guidelines with the anesthetic COVID-19 guidelines to develop a COVID-19 difficult airway strategy: a narrative review. Wong-P and Lim-WY. J. Anesth 2020,34(6):924-943.
7. Airway management guidance for the endemic phase of COVID-19. Cook-TM et al. Anaesthesia 2020 doi: 10.1111/anae.15253
8. Consensus guidelines for managing the airway in patients with COVID-19. Cook-TM et al. Anaesthesia 2020, 75, 785-799.
9. COVID-19 Treatment Guidelines Panel. Coronavirus Disease 2019 (COVID-19) Treatment Guidelines. National Institutes of Health. Available at <https://www.covid19treatmentguidelines.nih.gov/>. Accessed [December 8,2020]
10. Personal protective equipment during the coronavirus disease (COVID) 2019 pandemic – a narrative review. Anaesthesia 2020 doi: 10.111/anae.15071.
11. Respiratory support of adult patients with COVID-19. Whittle-JS et al. JACEP Open 2020 doi: 10.1002/emp2.12071.

## Procedural Video Support Materials:

1. [COVID19 Mac Video Laryngoscopy](#)
2. [COVID19 Hyperangulated Video Laryngoscopy](#)
3. [2-handed mask application/ventilation: Use the V-E grip as part of an aggressive jaw thrust](#)
4. [CPAP Preoxygenation](#)
5. [Emergency Cricothyrotomy \(emergency Front of Neck Airway\)](#)

---

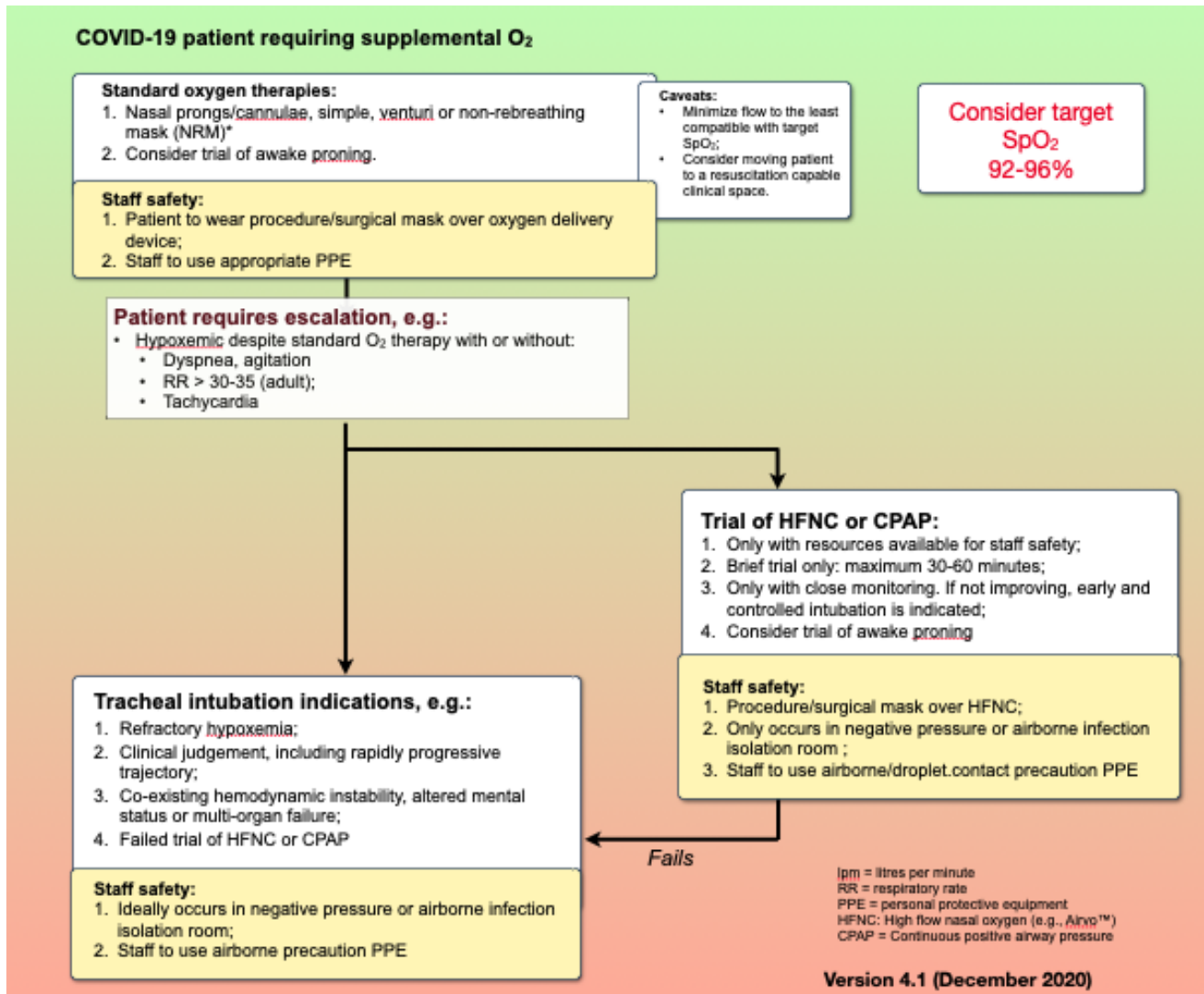
## 10. References:

1. *Wax RS, Christian MD*. Practical recommendations for critical care and anesthesiology teams caring for novel coronavirus (2019-nCoV) patients. Can J Anaesth. 2020.
2. *Wong P, Lim WY*. Aligning difficult airway guidelines with the anesthetic COVID-19 guidelines to develop a COVID-19 difficult airway strategy: a narrative review. J Anesth. 2020; 34(6): 924-43.

3. *El-Boghdadly K, Wong DJN, Owen R, Neuman MD, Pocock S, Carlisle JB, et al.* Risks to healthcare workers following tracheal intubation of patients with COVID-19: a prospective international multicentre cohort study. *Anaesthesia*. 2020; 75(11): 1437-47.
4. *Ricard JD, Roca O, Lemiale V, Corley A, Braunlich J, Jones P, et al.* Use of nasal high flow oxygen during acute respiratory failure. *Intensive Care Med*. 2020; 46(12): 2238-47.
5. *Alhazzani W, Moller MH, Arabi YM, Loeb M, Gong MN, Fan E, et al.* Surviving Sepsis Campaign: guidelines on the management of critically ill adults with Coronavirus Disease 2019 (COVID-19). *Intensive Care Med*. 2020.
6. *Hui DS, Chow BK, Lo T, Tsang OTY, Ko FW, Ng SS, et al.* Exhaled air dispersion during high-flow nasal cannula therapy versus CPAP via different masks. *Eur Respir J*. 2019; 53(4).
7. *Haymet A, Bassi GL, Fraser JF.* Airborne spread of SARS-CoV-2 while using high-flow nasal cannula oxygen therapy: myth or reality? *Intensive Care Med*. 2020; 46(12): 2248-51.
8. NHS England. Guidance for the role and use of non-invasive respiratory support in adult patients with coronavirus (confirmed or suspected). 2020 [updated March 26, 2020; March 31, 2020]; Version 2: [Available from: [https://www.england.nhs.uk/coronavirus/wp-content/uploads/sites/52/2020/03/CLEARED\\_Specialty-guide\\_-\\_NIV-respiratory-support-and-coronavirus-v2-26-March-003.pdf](https://www.england.nhs.uk/coronavirus/wp-content/uploads/sites/52/2020/03/CLEARED_Specialty-guide_-_NIV-respiratory-support-and-coronavirus-v2-26-March-003.pdf)].
9. *Alraddadi BM, Qushmaq I, Al-Hameed FM, Mandourah Y, Almekhlafi GA, Jose J, et al.* Noninvasive ventilation in critically ill patients with the Middle East respiratory syndrome. *Influenza Other Respir Viruses*. 2019; 13(4): 382-90.
10. *Blez D, Soulier A, Bonnet F, Gayat E, Garnier M.* Monitoring of high-flow nasal cannula for SARS-CoV-2 severe pneumonia: less is more, better look at respiratory rate. *Intensive Care Med*. 2020; 46(11): 2094-95.
11. *Roca O, Caralt B, Messika J, Samper M, Sztrymf B, Hernandez G, et al.* An Index Combining Respiratory Rate and Oxygenation to Predict Outcome of Nasal High-Flow Therapy. *Am J Respir Crit Care Med*. 2019; 199(11): 1368-76.
12. *Roca O, Messika J, Caralt B, Garcia-de-Acilu M, Sztrymf B, Ricard JD, et al.* Predicting success of high-flow nasal cannula in pneumonia patients with hypoxemic respiratory failure: The utility of the ROX index. *J Crit Care*. 2016; 35: 200-5.
13. *Murthy S, Gomersall CD, Fowler RA.* Care for Critically Ill Patients With COVID-19. *JAMA*. 2020.
14. *Brewster DJ, Chrimes NC, Do T.* Consensus statement: Safe Airway Society principles of airway management and tracheal intubation specific to the COVID-19 adult patient group. *The Medical Journal of Australia*. 2020; ((preprint)).
15. *Driver BE, Prekker ME, Klein LR, Reardon RF, Miner JR, Fagerstrom ET, et al.* Effect of Use of a Bougie vs Endotracheal Tube and Stylet on First-Attempt Intubation Success Among Patients With Difficult Airways Undergoing Emergency Intubation: A Randomized Clinical Trial. *JAMA*. 2018; 319(21): 2179-89.
16. *Wardi G, Villar J, Nguyen T, Vyas A, Pokrajac N, Minokadeh A, et al.* Factors and outcomes associated with inpatient cardiac arrest following emergent endotracheal intubation. *Resuscitation*. 2017; 121: 76-80.
17. *Janz DR, Semler MW, Joffe AM, Casey JD, Lentz RJ, deBoisblanc BP, et al.* A Multicenter Randomized Trial of a Checklist for Endotracheal Intubation of Critically Ill Adults. *Chest*. 2018; 153(4): 816-24.
18. *Castro de Oliveira BM, de Souza RLP.* Advantages of Delayed Sequence Intubation in Selected Patients With COVID-19. *Anesth Analg*. 2020; 131(2): e133-e34.
19. *Cook TM, El-Boghdadly K, McGuire B, McNarry AF, Patel A, Higgs A.* Consensus guidelines for managing the airway in patients with COVID-19: Guidelines from the Difficult Airway Society, the Association of Anaesthetists the Intensive Care Society, the Faculty of Intensive Care Medicine and the Royal College of Anaesthetists. *Anaesthesia*. 2020; 75(6): 785-99.
20. *Amato MB, Meade MO, Slutsky AS, Brochard L, Costa EL, Schoenfeld DA, et al.* Driving pressure and survival in the acute respiratory distress syndrome. *N Engl J Med*. 2015; 372(8): 747-55.

21. *Shao F, Xu S, Ma X, Xu Z, Lyu J, Ng M, et al.* In-hospital cardiac arrest outcomes among patients with COVID-19 pneumonia in Wuhan, China. *Resuscitation.* 2020.

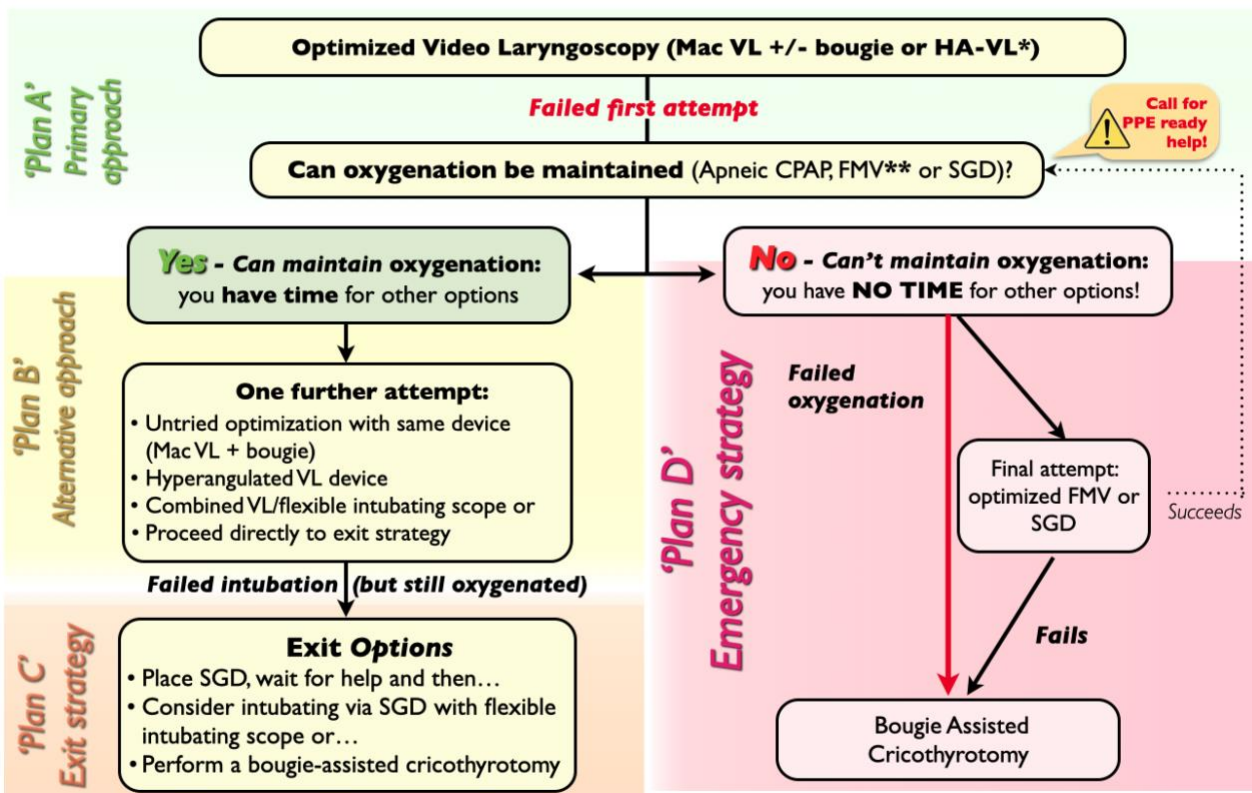
## 11. Appendices



Appendix 1: Suggested Escalation of Oxygenation Pathway

## COVID-19 Adult Emergency Rapid Sequence Intubation Approach

PPE Check/Team briefing/Checklist review/Pre-oxygenate in designated area/



FMV = Face Mask Ventilation; SGD = Supraglottic Device; VL= Video Laryngoscopy; Mac VL= MacIntosh blade VL; HA-VL= Hyperangulated VL. \* Choice of VL should be based on deliberate practice and operator experience. \*\* When preoxygenation is inadequate (SpO<sub>2</sub><93%) or SpO<sub>2</sub> is falling gentle *controlled* FMV should be initiated (ideally guided by BVM attached End-tidal CO<sub>2</sub> & pressure manometer)  
Halifax ED Version 1.7 (27/11/20) Adapted from Can J Anesth (2013) 60: 1089-1118, with permission

Appendix 2: RSI algorithm visual aid



## COVID19 Airway Pre-Packs and Kit Dumps

### Airway Assistant Kit Dump V1.0

Included	NOT INCLUDED
Assembled BiPAP/PEEP/Monoman- flexible mount-Inline ETCO <sub>2</sub> viral filter-Mask CPA (red)	Alternative Mask size
Nasal Prongs and Non-rebreather AnchorFart & Twist tie Extra oral filter 100ml syringe In-line suction	CPA alternative size Tube clamp





COVID Airway Stock



### Intubation Kit Dump V1.1

INCLUDED	NOT INCLUDED (sent from COVID unit)
Regular Intubation Tubes (ETT) 6.0 and 7.0MM Subject 1.0 Ways for VA and Lockdown	Appt. cart/kit in room
100ml Syringe	Endotracheal Tubes (7.0mm, 8.0mm, 9.0mm)
100ml Syringe	100ml Syringe
100ml Syringe	100ml Syringe
100ml Syringe	100ml Syringe
100ml Syringe	100ml Syringe
100ml Syringe	100ml Syringe
100ml Syringe	100ml Syringe
100ml Syringe	100ml Syringe




Appendix 3: Sample Airway Pre-packs and Kit Dumps

## COVID-19 AIRWAY CHECKLIST

**STOP BEFORE ENTERING ROOM**  
**SLOW DOWN CHECK PPE**

V16-1220

TEAM	EQUIPMENT	PLAN
<input type="checkbox"/> PPE Spotter <input type="checkbox"/> Primary team <input type="checkbox"/> MD: Intubator/Lead <input type="checkbox"/> Airway assistant* <input type="checkbox"/> Clinical assistant* <input type="checkbox"/> Support team <input type="checkbox"/> MD: Intubator assist + cardiac arrest lead <input type="checkbox"/> Airway assistant* <input type="checkbox"/> Review roles *RT, Medic, Nurse	<input type="checkbox"/> AIRWAY ASSIST KIT <input type="checkbox"/> INTUBATION KIT <input type="checkbox"/> Supplies from COVID CART <input type="checkbox"/> Two bougies <input type="checkbox"/> Towels/ramp for positioning <input type="checkbox"/> KIT DUMP Sheets <input type="checkbox"/> Video-laryngoscopy check <input type="checkbox"/> Ventilator + extra filter <input type="checkbox"/> IV equipment <input type="checkbox"/> Medications (w/flush): RSI (Induction/paralytic) Pre-dosed vasopressor Post ETI sedation-analgesia	<input type="checkbox"/> SUMMARIZE PLAN <input type="checkbox"/> Preoxygenation <input type="checkbox"/> Plan A: MAC-VL +/- BOUGIE or HA-VL <input type="checkbox"/> Plan B: Alternative <input type="checkbox"/> Plan C: Exit strategy <input type="checkbox"/> Plan D: Emergency strategy <input type="checkbox"/> Encountered difficulty <input type="checkbox"/> Cardiac arrest <input type="checkbox"/> Circuit disconnection ADDRESS QUESTIONS?

---

### INTUBATION

**PRE-OXYGENATION/RSI/DSI**

Minimize flow  
3-5 min / SATs >90%

NP 5-10LPM  
NRB 15LPM  
Mask over top

Filtered CPAP/BVM 15LPM w/PEEP 10cmH2O

NP 5-10LPM  
Ketamine 1mg/kg PRN  
if disconnection needed

**ANTICIPATE DE SAT**

MAY NOT OBTAIN

Head up 25 / Sniff position

Ketamine 1-1.5mg/kg if not given in press 50 (no longer discontinue)

Rocuronium 1.5 mg/kg

Apneic CPAP or Controlled FMV

50 second count

Place tube (see algorithm)

Closed loop Communication

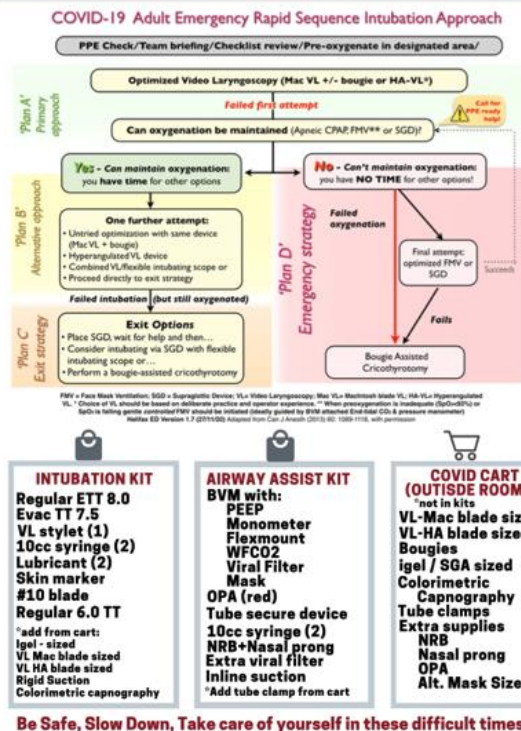
---

### POST INTUBATION

<input type="checkbox"/> Inflate cuff before ventilation <input type="checkbox"/> Connect directly to ventilator w/viral filter <input type="checkbox"/> Confirm tube placement by capnographic waveform - secure <input type="checkbox"/> Suction Required: Clamp tube; connect inline suction <input type="checkbox"/> Hypotension: Rescue Pressor + infusion PRN (Naratript, Epi, Phenylephrine) <input type="checkbox"/> Initial Ventilator: Vt 6-8mL/kg if Driving pressure < 15, Pplat <30 Reassess and titrate as needed PEEP 10-12, FIO2 1.0, RR 16 <input type="checkbox"/> Sedation-Analgesia: Ketamine/Propofol/Fentanyl Bolus doses should be available	<p><b>CIRCUIT DISCONNECTION</b></p> <p>Place finger over tube, clamp tube then attach filter</p> <p>Exit one-by-one Doff with a spotter</p>
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------

### COVID-19 Adult Emergency Rapid Sequence Intubation Approach

PPE Check/Team briefing/Checklist review/Pre-oxygenate in designated area/



**INTUBATION KIT**

- Regular ETT 8.0
- Evac TT 7.5
- VL stylet (1)
- 10cc syringe (2)
- Lubricant (2)
- Skin marker
- #10 blade
- Regular 6.0 TT
- \*add from cart: Igel - sized VL Mac blade sized VL HA blade sized Rigid Suction Colorimetric capnography

**AIRWAY ASSIST KIT**

- BVM with: PEEP
- Monometer
- Flexmount
- WFCO2
- Viral Filter
- Mask
- OPA (red)
- Tube secure device
- 10cc syringe (2)
- NRB+Nasal prong
- Extra viral filter
- Inline suction
- \*Add tube clamp from cart

**COVID CART (OUTSIDE ROOM) not in kits**

- VL-Mac blade sized
- VL-HA blade sized
- Bougies
- Igel / SGA sized
- Colorimetric
- Capnography
- Tube clamps
- Extra supplies
- NRB
- Nasal prong
- OPA
- Alt. Mask Sizes

**Be Safe, Slow Down, Take care of yourself in these difficult times**

Appendix 4: Sample COVID-19 Airway Checklist

