Airway and Respiratory Management of the Suspected COVID Patient

This document is largely borrowed based on SARS based evidence, case series data from China and Europe, and from national expert opinion. (Internet Book of Critical Care)

Respiratory Medication Therapy

1. Avoid routine initiation of aerosol nebulization in COVID suspect patients without prior lung disease or home use of chronic inhaled meds (asthma, COPD)

2. In patients requiring inhalation medication therapy, the use of metered dose inhaler (MDI) delivery is preferred. **Don't use nebulized meds in any situation where an MDI alternative is suitable. MDI FIRST!**

3. In those who can't use an MDI inhaler or fail MDI therapy- consider aerosol treatment through a Breath Actuated Nebulizer (BAN) with intermittent patient initiated setting to minimize continuous efflux of droplets. Suspected COVID patients requiring BAN treatment should be placed in negative pressure isolation.

4. In the event of failure of the above techniques, nebulization can be used with proper mask seal in patients in full negative pressure isolation. It is recommended that the addition of a surgical mask be applied over the mask to capture any droplet efflux.

Oxygenation

1. There should probably be a lower threshold to intubate in COVID-19 than in most patients, for the following reasons:

    - Patients can develop worsening "silent" atelectasis and decline rather abruptly, without lots of symptoms. COVID-19 may cause hypoxemia with relatively little respiratory distress ("silent hypoxemia") Therefore, work of breathing cannot be relied upon to detect patients who are failing.
    - Oxygenation techniques used to maintain saturation during intubation (e.g. mask ventilation) may increase virus aerosolization. Thus, "pure" rapid sequence intubation without bagging is preferred. This will be safer if the patient is starting out with more oxygenation reserve.
    - Intubation requires considerable preparation, so a semi-elective intubation is preferred to crash intubation.

2. Exactly when to intubate is always a clinical decision. Progressively rising FiO2 requirements should be a signal to consider intubation (e.g.in patients with escalating oxygen requirements who might in other circumstances go through a staged application of nonrebreather mask, non-invasive ventilation (BIPAP), or high flow nasal cannula. Consider early intubation with RSI at the onset of increasing hypoxia despite O2 per low flow nasal cannula support (see below). The rationale is taken from the 2012 SAR experience.

Of the bedside therapies used to support oxygenation/ventilation, clinical experience taken from the 2012 SARS coronavirus experience suggests that intubation, bag valve mask manual ventilation, bedside suction, and non-invasive ventilation poses the highest airborne droplet exposure risk. Tran et al.

High Flow Nasal Cannula (HFNC)

1. In general patients needing higher support of oxygen should be considered for early intubation, however, as resources become limited, strategies may need to be revised.
2. WHO guidelines on COVID-19 state that "Recent publications suggest that newer HFNC do not create widespread dispersion of exhaled air and therefore should be associated with low risk of airborne transmission." It is still unclear what true transmission risk is at this time.

3. Reasons that HFNC might *not* increase viral transmission are:

    - HFNC supplies gas at a rate of ~40-60 liters/minute, whereas a normal cough achieves flow rates of ~400 liters/minute (Mellies 2014). Therefore, it's doubtful that a patient on HFNC is more contagious than a patient on standard nasal cannula who is coughing.
    - HFNC typically requires less maintenance than invasive mechanical ventilation. For example, a patient who is on HFNC watching television may be less likely to spread the virus compared to an intubated patient whose ventilator is alarming every 15 minutes, requiring active suctioning and multiple providers in the room.
    - The intubation procedure places healthcare workers at enormous risk of acquiring the virus, so intubation with a goal of reducing transmission is probably counterproductive (see figure above from Tran 2012).
    - Existing evidence does not support the concept that HFNC increases pathogen dispersal substantially (although the evidence is extremely sparse). This includes a small study of

patients with bacterial pneumonia (Leung 2018) and an abstract regarding particulate dispersal by volunteers (Roberts 2015).

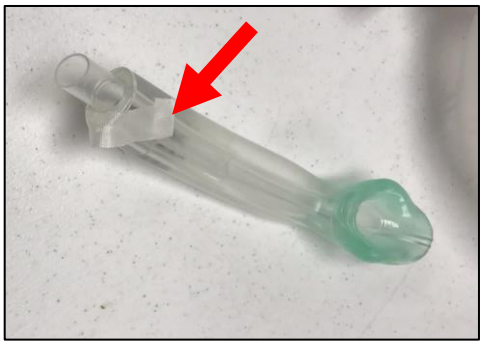
4. One possible *compromise* might be to use HFNC with a moderate rate of flow (e.g. 15-30 liters/minute, rather than 40-60 liters/minute). Since 15-30 liters/minute flow is close to a baseline minute ventilation for a sick respiratory failure patient, adding this level of flow is unlikely to affect matters substantially.

Viral Filters

The high-efficiency version used within the system is the Curaplex (Tri-anim) HMEF Aero-Sat and Aero-Pro Hepa Light versions rated for 99.999% filtration of viruses. The respiratory department should have similar filters available.

Intubation

1. **This represents a high risk for transmission to healthcare workers.** Limit the number of people in the room and the operator should be the **most skilled person available**. (This is not an ideal opportunity for learners)
2. **Airborne precautions *are* mandatory** (e.g. N95/FFP2 masks or positive air-purifying respirators, along with full face shields and full contact precautions). This should be performed in negative pressure isolation.
3. Perform rapid sequence intubation ideally with no bag-mask ventilation prior to intubation to avoid aerosolizing particles. However, during the apneic period, a bag-valve mask with a PEEP valve could be *passively* held on the patient's face to maintain positive pressure in the airway and thereby prevent de-recruitment.
4. We recommend the use of videolaryngoscopy as an attempt to avoid placing the operator's face close to the patient.
5. LMA or iGel use should be preferred to bag valve mask for pre-oxygenation as this glottis seal minimizes secretion escape.
    - Tape over the gastric port to minimize fluid escape.

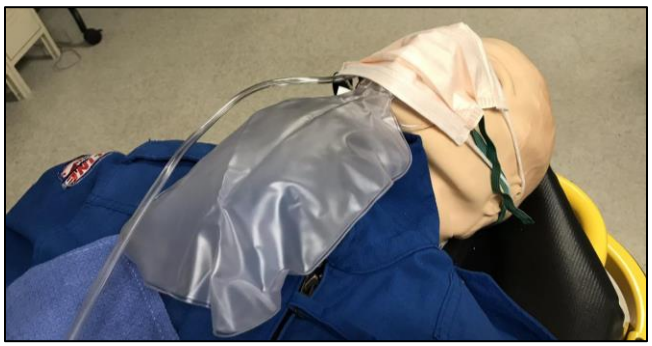


6. Attach a *viral filter* to the iGel, LMA, the bag-valve mask before the procedure, if possible. This should reduce the spread of viral particles out of the endotracheal tube following intubation (or during bag-mask ventilation if that is required)(Peng et al. 2/27).

7. Place drape across patient's chest and chin.
8. Avoid unnecessary suction.
9. Endotracheal tube confirmation with a stethoscope could pose a risk of transferring virus to the practitioner. It could be safer to advance the endotracheal tube to a pre-calculated depth calculated based on the patient's height.

Non-Rebreather (AVOID)

While this has been the most recommended strategy in articles and case reports, it also poses some of the highest risk as extremely high flows are required to maintain fiO2 which potentiates the patient's exhalations becoming aerosolized. Escalation to non-rebreather in suspected COVID patients is discouraged. If NRB must be used, we encourage the placement of a standard surgical mask over the NRB to minimize aerosol escape.



Non-Invasive Ventilation (NIPPV) - CPAP/BIPAP (AVOID)

This has been largely banned for potential to increase risk to providers—however, that is predicated on passive exhalation systems (i.e. vents exhalation goes to the environment and has only 1 tube). In a multicenter cohort of 302 patients with MERS coronavirus, 92% of patients treated with BiPAP failed this modality and required intubation (Alraddadi 2019). In the FLORALI trial of ARDS patients (with mostly pneumonia of various etiologies), patients randomized to BiPAP did worse compared to patients randomized to HFNC.

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