NYP Guidelines for Respiratory Support of Suspected or Confirmed COVID-19 Patient: Non-invasive Ventilation, High Flow Nasal Cannula Oxygen, Invasive Ventilation and Patients with Tracheostomies

Updated March 22, 2020

Categories of patients:
These guidelines affect two categories of patients:

- Patient Under Investigation (PUI) for COVID-19: in the ED, on the floor, in the ICU
- Confirmed cases of COVID-19

Risk of contamination
We assume that Noninvasive Positive Pressure Ventilation (NIPPV) such as BIPAP has a higher risk of contamination and pathogen spread than High Flow Nasal Cannula (HFNC) which has a higher risk compared to invasive mechanical ventilation. We acknowledge however that endotracheal intubation itself is a high-risk procedure and NYP guidelines for airway management of PUIs and confirmed COVID-19 patients should be followed.

Room Requirements
Patients on NIPPV (BiPAP/CPAP) and HFNC require airborne precautions (AIIR and N95 respirator)[1] as both are considered aerosol generating. **Intubated and ventilated patients** require contact and droplet precautions and **do not require airborne isolation (negative pressure rooms, N95 respirator mask).**

<u>Noninvasive Positive Pressure Ventilation (NIPPV):</u>
Initiation of NIPPV (BiPAP/CPAP) **requires attending approval**. It is **strongly** recommended to **avoid NIPPV** (BiPAP/CPAP) in PUIs and confirmed COVID-19 cases.

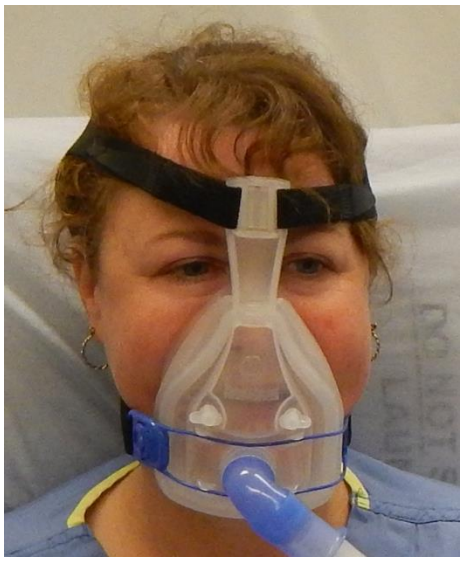
Rare exceptions to consider initiation of BiPAP in PUIs or COVID-19 patients include

- Patients with a DNI order who have an acute indication for NIPPV
- Patients who use NIPPV chronically (e.g. OHS / OSA),
- Patients who present with a COPD or CHF exacerbations that are expected to be **rapidly reversible (e.g. 2 hours trial)**
- **Rarely** extubation to NIPPV in patients at high-risk for reintubation (**requires attending approval** please see separate policy ****),

It should not be initiated in patients with progressive respiratory failure[1]. The decision to initiate NIPPV in PUIs will be based on clinical judgement and **requires attending approval**.

If a patient is confirmed COVID-19 positive, early intubation should be strongly considered especially if the clinical condition does not rapidly improve[1]. If the indication is for hypoxemic (not hypercapneic) respiratory failure the patient should be transitioned to HFNC if not intubated[1].

NIPPV Equipment and Circuits



A **FULL FACEMASK**[1] must be used and not a nasal mask while supplies are available. Consider alternative therapies if no full facemask is available. Patients with beards often have an inadequate seal with a BIPAP and therefore increased risk of aerosolization. NIV should be avoided in most patients with beards.

Example of full face BIPAP mask *(cropped from Wikipedia)*

Single-limb NIPPV with BiPAP machine

- Single limb circuits with integrated expiratory filters **are the preferred set-up when available**
- Circuit without integrated filter is **NOT** recommended[1]

Double-limb NIPPV requires a ventilator and allows for a HEPA filter in the expiratory limb

- Use of this set-up is preferred over single-limb without an integrated filter but will be limited by ventilator availability

High flow nasal cannula (HFNC)

The decision to initiate HFNC in PUIs and confirmed COVID-19 patients will be based on clinical judgement and **requires attending approval.**

In general, HFNC should not be initiated in PUIs and confirmed COVID-19 patients with rapidly progressive severe hypoxemic respiratory failure[1] as it is not clear that it will prevent intubation, HFNC is considered to be aerosol generating, and it may lead to an emergent intubation placing unnecessary risk for HCW transmission.

HFNC should be considered in select COVID-19 positive patients, such as

- Patients with a DNI order who have an acute indication
- Patients with an acute indication who are expected to be rapidly reversible
- Patients who are stable or improving on HFNC
- Patients who are stable or improving on NIPPV support and transitioning to HFNC

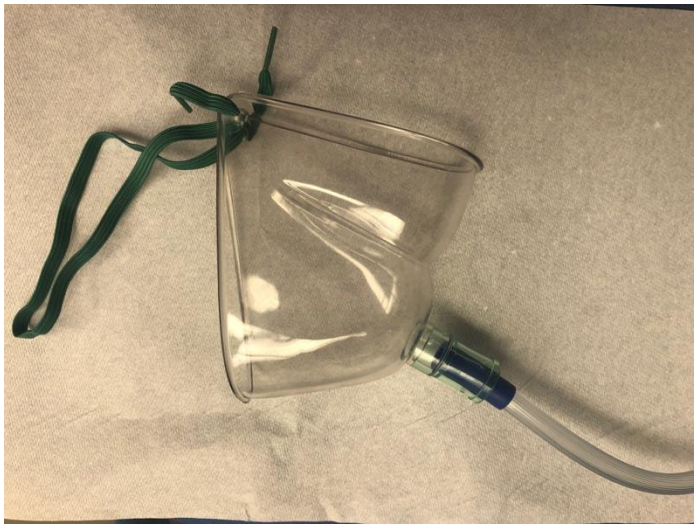
- Extubation to HFNC in patients at high-risk for reintubation (**requires attending approval** please see separate policy ****)

In confirmed COVID-19 patients managed on HFNC, early intubation should be strongly considered when the patient requires escalating support, is at maximum support on HFNC, or does not demonstrate improvement and /or show signs of respiratory fatigue[1].

Equipment and Monitoring:
When using HFNC, use minimal flow necessary to maintain SpO2 > 88% - 94%; lower flow rates for example under 30 L/min may have less aerosolization. In attempt to minimize flow, titrate FiO_2 to maximum support prior to increasing flow greater than 30 L/min.

Ensure proper size and fit of nasal canula

Once HFNC has been initiated the patient needs to be **assessed by an attending** after one and after three hours to determine if patient needs to be intubated. As per NYP guidelines, patients should be monitored with continuous pulse oximetry for early identification of rapid deterioration.



If feasible, the patient while on HFNC should have a face tent on top of the lower face with suction tubing connected to the port at the bottom of the mask (where the oxygen tubing is usually inserted – see figure). Please note this does not negate the need for airborne isolation (negative pressure room and N95 respirator) but it may mitigate dispersion of airborne droplets.

Alternatively place a surgical mask over on patient, if tolerated by the patient.

Invasive Mechanical Ventilation

Please see separate policy on airway management and intubation (insert policy #). Intubation requires a negative pressure room and full airborne isolation precautions (with N95)[1].

PUI or confirmed COVID-19 patients who are intubated are placed in single closed door room on droplet and contact precautions **(not airborne, no routine use of N95 required)**.

If an event occurs that will likely result in the significant risk of aerosolization of respiratory secretions, an N95 respirator is recommended for immediate care. Droplet and contact precautions should be resumed as soon as possible[1, 2]

Examples of potential events that might result in significant aerosolization are:

- ETT disconnect (e.g. proning)
- ETT cuff deflation (e.g. reposition ETT, checking cuff pressure)
- Self-extubation (e.g. agitation, spontaneous breathing trials)
- Use of AMBU bag
- Tracheostomy change
- Spontaneous breathing trial with t-piece, should be avoided

Equipment and Circuit

- Circuit Configuration
  - Preference for heated circuits when available to maximize respiratory function and prevent inspissation of secretions. If equipment or resources are limited, non-heated circuits would be acceptable.
  - Per protocol, HEPA filters should continue to be placed at the end of the expiratory limb of the circuit.
  - Only closed inline suction should be used.
- Maintenance
  - Change circuit and inline suction ballard only when integrity is compromised
  - Change HEPA PRN due to increased iPEEP (intrinsic PEEP) without signs/symptoms of bronchospasm, increased peak inspiratory pressures (PIP), or increased airway resistance.

- Beside AMBU bag should have PEEP valve and HEPA filter attached between endotracheal tube and the AMBU bag.

<u>Tracheostomy in PUI or confirmed COVID-19 patients</u>

Patients with a tracheostomy should be placed on droplet and contact precautions **(not airborne and routine use of N95 is not required)**.

For aerosol generating procedures in patients with tracheostomy, an N95 respiratory is recommended for health care workers. Examples of aerosol generating procedures and respiratory support include

- Tracheostomy change
- Open suction via tracheostomy
- Performance of surgical tracheostomy

If a patient with tracheostomy requires **more than 5 l/m oxygen** via trach collar, he/she should be **placed on a ventilator with closed inline suction system**. **High flow oxygen** should **not** be used for patients with tracheostomy.

Respiratory / Inhaled Medications

NIPPV: If feasible, it is recommended to avoid inhaled nebulized bronchodilators in patients on NIPPV as it is an aerosol generating procedure. If deemed necessary, a nebulizer may be used with **attending approval** (requires full airborne precautions).

HFNC: Several devices are available for the delivery of inhaled bronchodilators in patients on HFNC. As each delivery mode is believed to be similarly effective, the following list is in order of preference[1] based on the following principles: 1) minimize use of aerosol generating procedures with the aim of minimizing the risk of transmission to HCW; and 2) minimize the use of metered dose inhalers (MDIs) to preserve MDI resources for use in patients on invasive mechanical ventilation.

1) Breath actuated nebulizer with an exhaust filter
2) Dry powder inhaler (DPI), if patient capable
3) MDI with spacer, if patient capable
4) Recommend not use nebulizer (**requires attending approval** if deemed absolutely necessary)

Invasive Mechanical Ventilation:
Several delivery modes of bronchodilators are available for patients on invasive mechanical ventilation. As each delivery mode is believed to be similarly effective, the following list is in order of preference based on the guiding principle of minimizing the use of aerosol generating procedures with the aim to minimize risk of transmission to HCW.

- Nebulizers should be reserved for treatment of specific symptoms and not used prophylactically. When deemed medically necessary and **approved by an attending**:
  1) Integrated vibrating mesh (aerogen) nebulizer when available
  2) If integrated device non-functional or not available on the ventilator in use, an inspiratory limb vibrating mesh nebulizer placed as far away from patient-Y as possible
  3) MDI
  4) Recommend not to use acorn /standard/jet nebulizer (**requires attending approval** if absolutely deemed necessary)

Targeted inhaled pulmonary vasodilators for ARDS
Compared to other inhaled targeted pulmonary vasodilators (e.g. inhaled prostacyclin), inhaled nitric oxide (iNO) requires fewer resources (less frequent in room monitoring), decreased disconnection risk, and allows for preservation of PPE while minimizing the risk of transmission to HCWs. Therefore, iNO is the preferred inhaled targeted pulmonary vasodilator for PUIs and confirmed COVID-19 patients with ARDS.

Patient Transport
Non-intubated patients on NC, venturi mask, nonrebreather mask, or HFNC **require a surgical MASK over the device to ensure coverage of any open exhalation ports.**

For patients on NIPPV, it is recommended to attempt patient transport on 100% nonrebreather mask to minimize aerosolization during transport with plan to reinstitute NIPPV upon arrival to their AIIR.

When clinical status does not allow temporary discontinuation of NIPPV,

- A **filtered circuit or dual limb** circuit during transport is preferred, if not available a mask should be placed over the top of the unfiltered exhalation ports.
- Patients should wear a mask with face shield over the top of their BiPAP mask

Intubated patients should be transported on an ICU or transport ventilator when possible reserving AMBU bag transport only when a ventilator is unavailable. As per protocol, all patients on ventilator assistance should have a HEPA filter on the exhalation limb of the circuit. If the transport ventilator is utilized, a HEPA filter should be placed between the endotracheal tube and the Y-connection of the circuit.

Extra caution should be taken to prevent breaches or disconnections in circuit integrity for all devices during transport. Please refer to transportation guidelines ****

Footnotes

1. If resources become unavailable [e.g. staff (physician, advanced care providers, RN, RTs, etc.) N95 respirators, ventilators, negative pressure rooms, HEPA filters, vibration nebulizers/Aerogen), the NYP guideline committee for NIV and HFNC oxygen for suspected or confirmed COVID-19 patient will reconvene and revise the above recommendations based on available resources.

2. Based on NYS DOH recommendations (as of 03/16/2020); subject to change if CDC, WHO, and/or NYS DOH policies change.