

NH Regional Ventilator Humidification Guideline for Novel Coronavirus (COVID-19)

Goal: to provide clarification and guidance on the use of humidification on all invasive ventilators used in Northern Health (NH).

Ventilators invasive types - transport, adult, pediatric, and neonatal ventilators

Guiding Principles:

- Humidification of the ventilator circuit is the highest standard of care for patients requiring ventilator support.
- Use of humidification in COVID-19 or suspected COVID-19 patients is a clinical decision and at the onset of treatment the patient should be placed on a “dry” circuit that is fitted with a Heat and Moisture Exchange Filter.
- Every filter change necessitates a break in the patient circuit and poses a threat of aerosolizing potentially infectious pathogens to the air.

Humidification of the ventilator circuit is an important piece of the care puzzle for any patient. In non-COVID-19 times, use of a double limb heated wire circuit to provide humidification is the gold standard of care for patients requiring prolonged stays on the ventilator. This practice is challenged in the face of Covid-19 pandemic and the need to limit infection risk posed by aerosol generating medical procedures.

There is no current consensus on using Heat and Moisture Exchange Filter (HMEF) versus a Heated Humidity circuit. More evidence is supporting HME placement to minimize aerosolization risks. World Health Organization (WHO) and UpToDate recommendations lean toward the use of an HME over Heated Humidity circuit. UpToDate provides some excellent guidance surrounding ventilator precautions for COVID-19:

It is prudent to avoid unnecessary disconnection with the endotracheal tube (ETT) in ventilated patients with COVID-19 in order to avoid derecruitment and unnecessary exposure of virus to the environment. For example, in-line suction devices and in-line adapters for bronchoscopy are preferred, if resources allow. If disconnection is necessary (e.g., during transfer when portable ventilators are used or manual bagging), the ETT should be temporarily clamped during disconnection and unclamped after reconnection. This is considered an aerosolizing procedure in which case an airborne infection isolation room is preferable but is not always feasible.

Other infection precautions include use of dual limb ventilator circuitry with filters placed at the exhalation outlets as well as heat moisture exchange

(HME) systems rather than heated humidification of single limb circuits. HME should be placed between the exhalation port and the ETT.

It is particularly important to adhere to the standard practice of maintaining the ETT cuff pressure between 25 and 30 cm H₂O so that a tight seal exists between the cuff and the tracheal wall.

All ventilators should have appropriate filters in place and agreed upon filter change schedule (e.g. every six hours). The ventilator should be wiped down after every filter change.

For Northern Health Purposes:

In pursuit of providing the highest quality care to northerners, initiate COVID-19 or suspected COVID-19 patients on a dry circuit that is fitted with an HME. Should the patient's individual characteristics and disease progress such that there is an increase in quantity or thickness of secretions, the decision can be made to switch to a heated humidity system when clinically indicated. Of course, the switch to heated humidity requires the clinician to weigh the benefits of the added humidity with the risks of increased risk of aerosolization should the ventilator circuit become inadvertently or incorrectly disconnected.

Filter Change Frequency:

WHO recommends practitioners avoid (or minimize) disconnecting the patient from the ventilator to prevent lung collapse and worsening hypoxaemia. Thus,

- Change HME when soiled/not functioning
- use in-line catheters for airway suctioning
- clamp tube when disconnection required
- minimize unnecessary transport

The same applies to the ventilator circuit itself and the bacterial/viral filters placed on the inspiratory and expiratory ends of the ventilator-patient circuit interface. That is, they should be changed only when soiled or not functioning.

Filter change intervals can be as short as every 12 hours or as long as every three to five days, **depending on the patient-ventilator system**. The rate of moisture buildup depends on many variables: the filter itself, ventilator circuit properties, ambient room temperature, whether or not heated wire circuits and heated humidity in play, if the expiratory housing is heated, and the patient's own unique characteristics (i.e., breath rate, temperature, disease process).

This moisture buildup adversely affects the ability of the ventilator equipment to provide breaths and can adversely affect patient outcomes if operators are not vigilant. Inexperienced operators who are not confident in identifying the signs of a failing filter should expect to proactively change the filter every 24 hours.

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