



How to modify the Breathing Circuit of the Home NIV Patient to reduce spread of infection in Adult Patients with suspected or confirmed COVID-19 during hospitalization.

2020 April 3

The following document is a guide for clinicians treating the patient already on home mechanically ventilation (HMV) who is admitted to hospital with suspected or confirmed coronavirus infection. Breathing circuit modifications as described in this document are NOT recommended for HMV patient management at home^{1,2,3}.

NIV is considered an aerosol generating medical procedure (AGMP). Strict use of PPE for all persons in the room, including the use of a fit-tested, seal-checked N95 respirator, gloves, gown and face or eye protection. The patient should be placed in an AIIR if one is available on the unit. If no AIIR is available on the unit, the patient should be placed in a private room. The door of the room should be closed when an AGMP is being performed.⁵

A non-vented full face mask with proximal expiratory filter/HME and leak port is recommended; a good mask fit/seal is important to minimise droplet dispersion and reduce contamination of the environment. Taping the filter in place has been suggested to mitigate inadvertent disconnections.¹

As a last resort: plug leak ports from the patient's mask using adhesive tape and add an intentional leak valve after the filter. **BE CAREFUL NOT TO PLUG OR BLOCK THE ANTI-ASPHYXIA VALVE**

Use an anti-bacterial/viral filter at the outlet of the ventilator/bilevel device. Check manufacturer recommendations for AB filter recommendations with low resistance.

Temporarily lowering ventilating pressures: has been suggested when tolerated by the patient to help mitigate large mask leaks.²

Close monitoring of the patient is recommended. The efficacy and tolerance of ventilation needs to be assessed and monitored when filter(s) is/are added to the breathing circuit. Blocked filters can be mistaken for clinical deterioration¹- remedy by changing the filters. Monitor the patient closely including measurement of respiratory rate, WOB, SpO₂, and heart rate.

Assess the suitability of ventilator settings. This is especially important when oxygen is added to the breathing circuit because it can alter the volume delivery. Monitor patient closely: the use of HME/filter can result in patient difficulty triggering the ventilator. Trigger sensitivity may need to be increased or increase breath rate to maintain adequate minute ventilation.

Calibrate the breathing circuit with the new configuration. For example, when using the ResMed Stellar150 bi-level device, perform a “Learn Circuit” procedure. For written instructions, see the VEP website at www.ontvep.ca →Resources→Learning Guides. Instructions are also available in video format at www.ontvep.ca →Resources→Video tab.

The use of the filters contraindicates the use of a humidifier. There is risk of water saturating the filters making them ineffective and increasing the resistance to flow. It is recommended humidifiers be removed from the breathing circuit altogether.

Engage appropriate alarms. Engage the non-vented mask alarm where available. Ensure staff is trained to recognize and appropriately respond to alarm conditions.

Change filters frequently. Antibacterial/viral filters on the ventilator/bi-level device are to be changed at a minimum one time per 24 hrs². HMEs may need to be replaced several times per day.

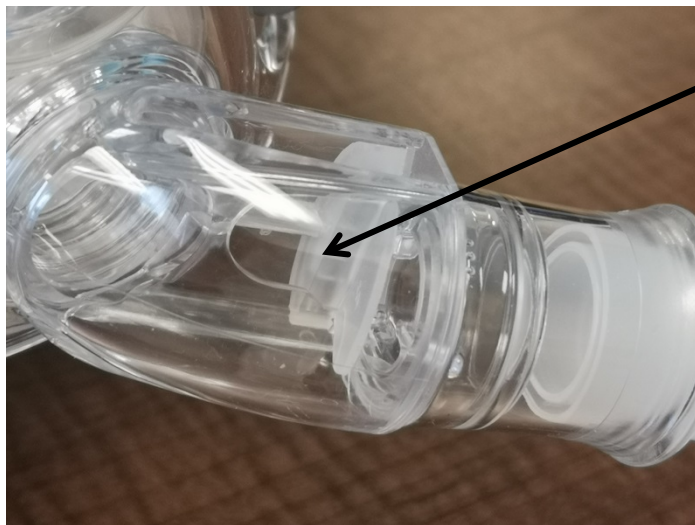
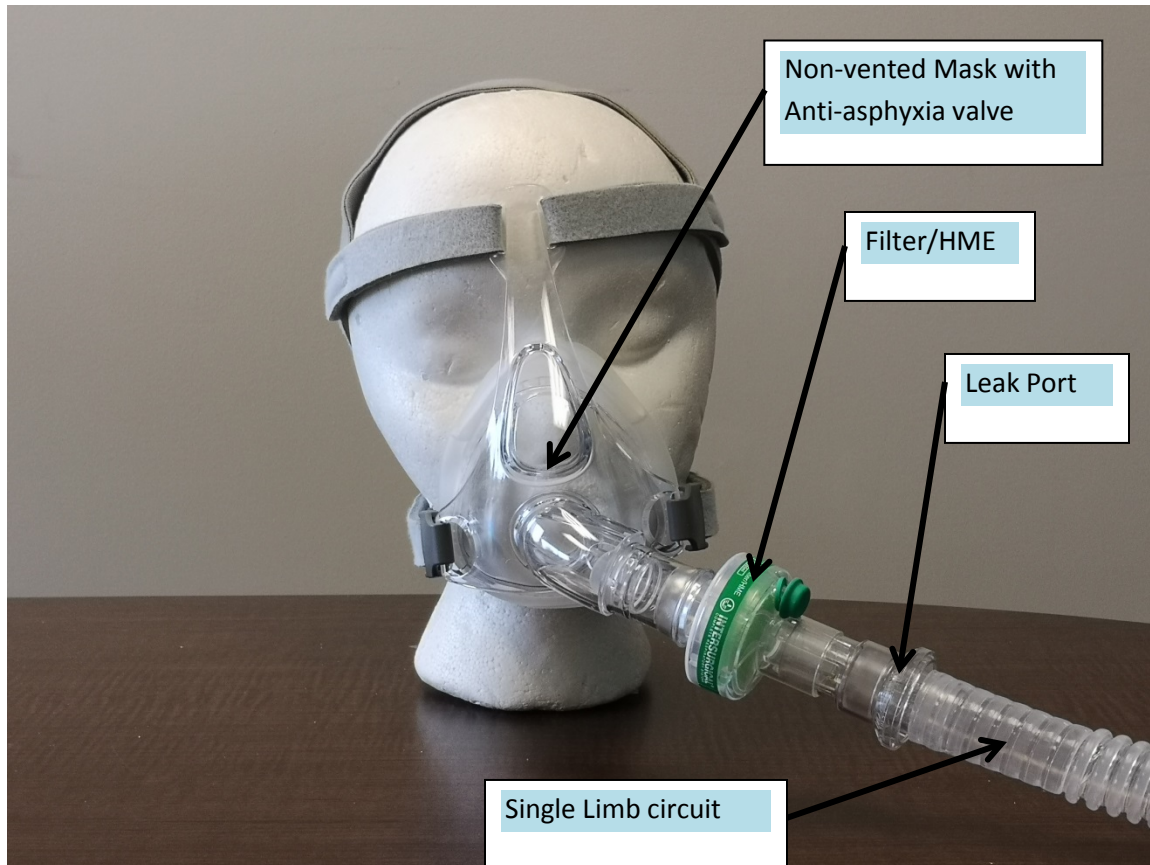
Sequence for connecting and disconnecting therapy. Connect as follows: put on the mask, connect the breathing circuit, start ventilation. To disconnect: stop the therapy, remove the breathing circuit and mask.

Discard all consumables after use and disinfect ventilator/bi-level positive pressure device between patients.

SEE APPENDIX, BELOW, FOR A VARIETY OF MODIFIED CIRCUIT CONFIGURATIONS

APPENDIX

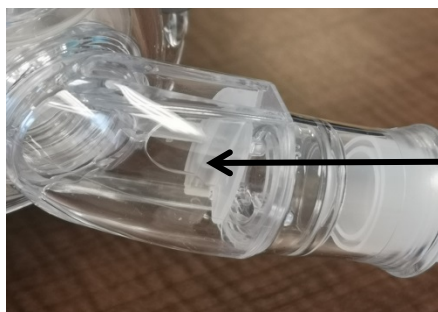
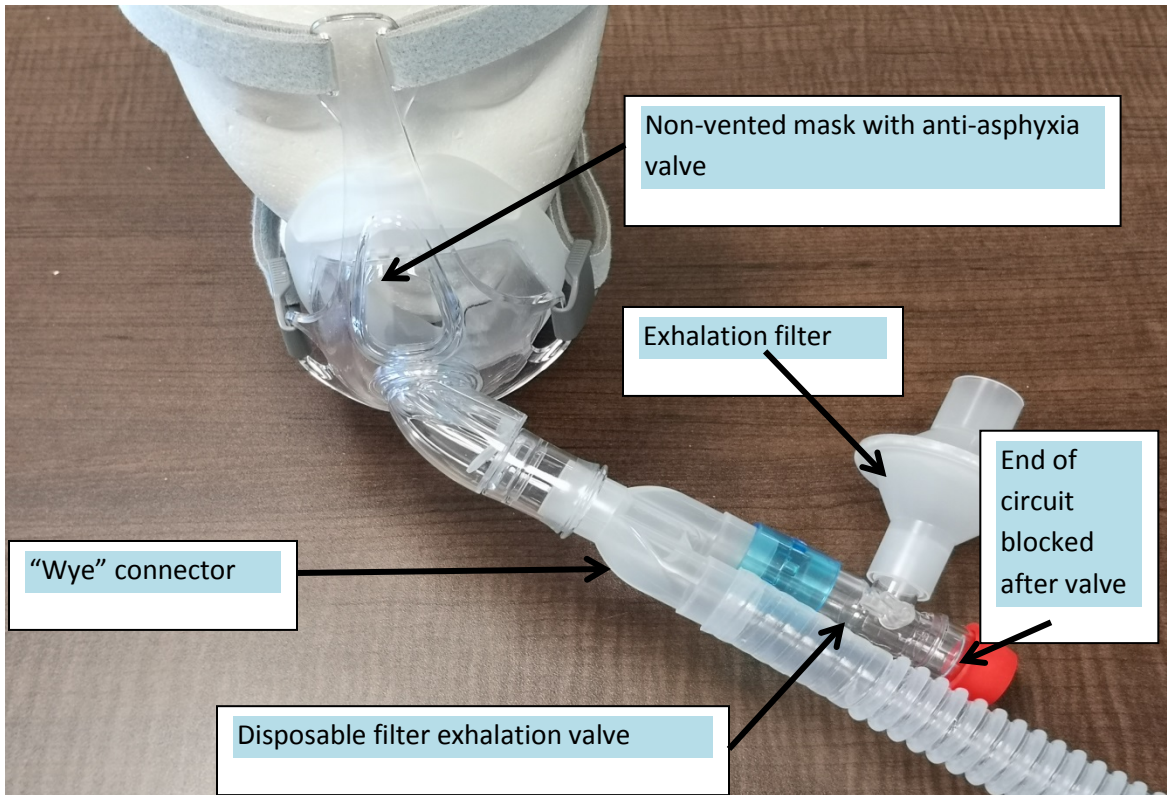
NON-INVASIVE SINGLE LIMB CIRCUIT WITH NON-VENTED MASK USING FILTER/HME AND LEAK PORT



Close up of Anti-asphyxia valve

Pause therapy prior to changing HME/filter noting that the patient will inhale/exhale through the open anti-asphyxia valve risking surrounding contamination. Use PPE as recommended by your health care facility

**SINGLE LIMB CIRCUIT MODIFICATION WITH NON-VENTED MASK
AND DISPOSABLE FILTER EXHALATION VALVE**

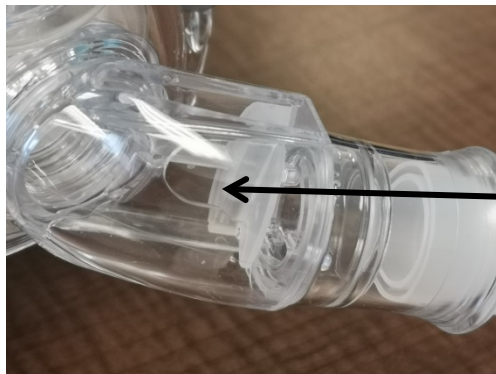
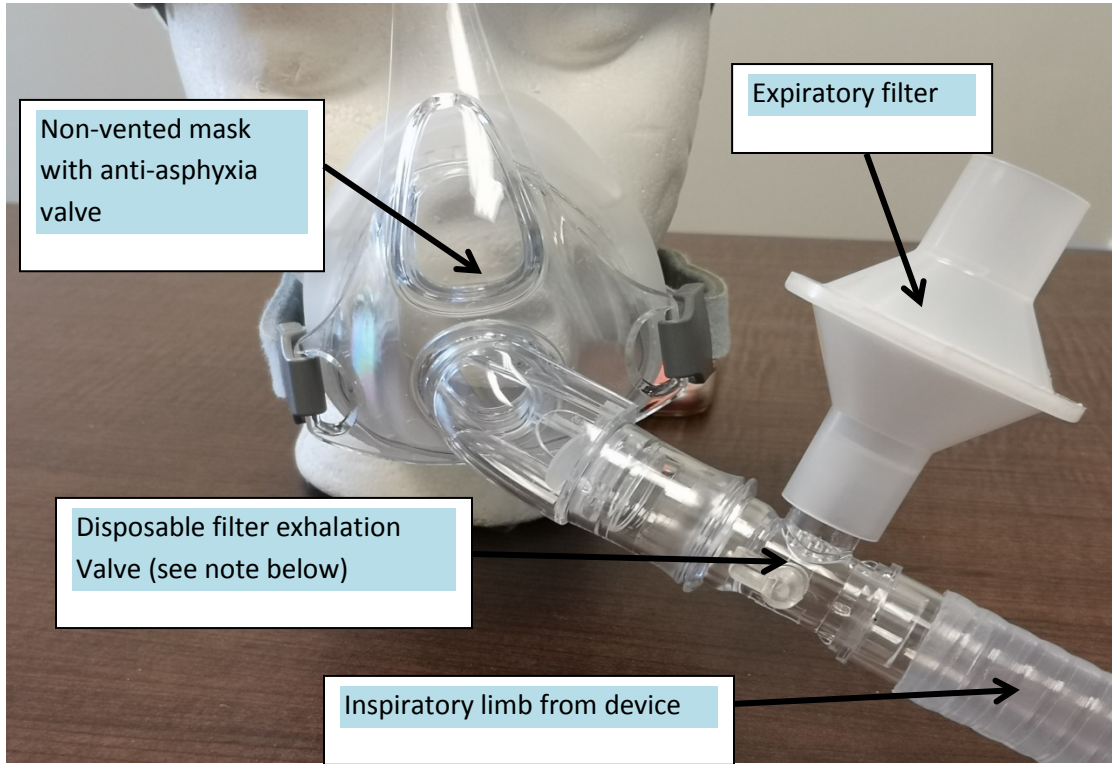


Close up of Non-vented mask Anti-asphyxia valve



Close up of Disposable filter exhalation valve showing vent ports. Monitor closely for signs of secretion buildup

**MODIFIED SINGLE LIMB CIRCUIT WITH NON-VENTED MASK
AND DISPOSABLE FILTER EXHALATION VALVE**



Close up of Non-vented mask Anti-asphyxia valve



Note: The exhalation ports on this device may become occluded with secretions if placed too close to mask: A 6- inch tubing placed between the valve and mask may reduce the incidence of blockage, however will increase circuit deadspace. Evaluate and monitor patient closely.

References:

1. Guidance for the role and use of non-invasive respiratory support in adult patients with coronavirus (confirmed or suspected) 26 March 2020 Version 2 [https://www.england.nhs.uk/coronavirus/wp-content/uploads/sites/52/2020/03/C0063-Specialty-guide-Respiratory-and-Coronavirus- v1_26-March.pdf](https://www.england.nhs.uk/coronavirus/wp-content/uploads/sites/52/2020/03/C0063-Specialty-guide-Respiratory-and-Coronavirus-v1_26-March.pdf)
2. Gonzalez J, Maisonobe J, Oranger M, Mendoza-Ruiz A. Homecare respiratory equipment for patients suspected to be infected with the respiratory virus Covid19. Retrieved from <http://splf.fr/wp-content/uploads/2020/03/LES-PROCEDURES-DU-GAVO2-ProtectionVirale2020-MAJ14mars2020.pdf> March 18, 2020
3. David M. Rappaport. CPAP, Non-Invasive (NIV) by Mask and Use of Systems for intubated patients in the time of Corona patient surge. Version date: March 24, 2020.
4. Guan L, Zhou L, Zhang J, et al. More awareness is needed for severe acute respiratory syndrome coronavirus 2019 transmission through exhaled air during non-invasive respiratory support: experience from China. Eur Respir J 2020; 55: 2000352 [https://doi.org/10.1183/13993003.00352-2020]. <https://erj.ersjournals.com/content/erj/55/3/2000352.full.pdf>
5. Infection Prevention and Control for COVID-19: Second Interim Guidance for Acute Healthcare Settings <https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/health-professionals/infection-prevention-control-covid-19-second-interim-guidance.html#a8.5>