Repurposing home bilevel devices for use with intubated patients while minimizing risk to health care workers during insufficient supply of conventional ventilation for patients with COVID-19

FAQs

➢ Does this modified device pose a risk of COVID-19 aerosolization?
  o It is believed that the high flow produced by all forms of NIV and/or CPAP produces aerosolization of viral particles.

➢ What personal protective equipment (PPE) is required when handling COVID-19 patients being treated with the bilevel devices?
  o Healthcare workers and staff should use standard PPE when taking care of COVID-19 patients.
  o This includes face shield, N95 masks, isolation gowns, and gloves.

➢ Are there other devices that can be repurposed with the modified circuit for use with intubated patients?
  o Yes – the device must have bilevel S/T mode capability.
  o Common US Manufacturers and Devices:
    ▪ Philips Respironics– DreamStation BiPAP™ ST, System One BiPAP™ ST
    ▪ ResMed – VPAP™ S9 ST, AirCurve™ 10, Lumis™

➢ Can CPAP devices be used as ventilators?
  o CPAP devices provide a constant single pressure, which is similar to PEEP provided by conventional ventilators
  o CPAPs have traditionally been used in the home for treatment of obstructive sleep apnea
  o However, CPAP does not provide ventilation and would not be appropriate for patients with hypercapnic respiratory failure

➢ What level of added oxygen is required to increase patient’s inhaled oxygen fraction (FiO₂)?
  o With this circuit, higher pressures will dilute added O₂ and increase requirement
    ▪ Monitoring of FiO₂ is desirable
  o Please see Protocol for details

➢ Can the circuit be set up without in-line spirometry/gas sampling?
  o Yes, the circuit can be used without inline monitoring of spirometry, end-tidal CO₂, and FiO₂.
  o For patient safety, it is desirable to have some assessment of ventilation, CO₂, and oxygenation.
  o These parameters should be checked whenever there is a change in IPAP/EPAP settings.

➢ What type of sedation do patients on these devices require?
  o The selection of agents and patient monitoring should follow critical care/institutional sedation guidelines, and does not have to be modified specifically for patients receiving therapy with the repurposed bilevel device.
  o Because this device has fewer safeguards than a standard ventilator, heavy sedation and paralysis should be undertaken with due consideration of risk of circuit disconnection.
➢ Under what circumstances should bilevel be considered for invasive ventilation?
   o Bilevel devices, which are intended for non-invasive use, should not be invasively used unless there is critical shortage of conventional ventilators.
   o However, bilevel devices intended for non-invasive use may be considered in the following situations:
     ▪ If there is no other ventilator available
       • It is likely to work best in those with higher lung compliance (appears to be relatively frequent in many COVID-19 patients).
     ▪ Patients with milder respiratory failure who still require ventilator support
     ▪ Patients being weaned from mechanical ventilation. As they stabilize and improve, patients may see equal benefit from invasive bilevel ventilation as standard ventilation, thus freeing up advanced ventilators.

➢ Are all components of this circuit commercially available?
   o Yes. Most components are likely to be found in respiratory therapy departments
   o Please refer to Protocol for substitutions for individual components
     ▪ If all substitutions are unavailable, 3D printing may be considered

➢ Can the humidifier that comes with the home bilevel device be used in this circuit?
   o To refill the chamber, therapy must be stopped.
   o Using the humidifier in the home device may prolong this interruption in therapy.

➢ Is a Heat and Moisture Exchanger (HME) or heated humidification via reservoir preferred?
   o In-line heated humidification is preferred, as it provides more humidity without interruption

➢ How often should the Heat and Moisture Exchanger (HME) be replaced?
   o Typically, these are changed every 24 hours, but should be changed whenever moisture accumulates

➢ How should these devices be disinfected between patients?
   o Between patients, surface disinfection is recommended
   o Internal disinfection of these devices has not been studied

For additional information and associated documents, please see below links:
Primer - Theory and Background for Bilevel Repurposing
Protocol - Repurposing of Bilevel Devices for Invasive Ventilation
Clinical Guidelines / Operating Checklist - Philips Respironics Devices
Clinical Guidelines / Operating Checklist - ResMed Devices
Monitoring and Alarm Guidelines / Construction
Construction of an Anesthesia Circuit Component Diagram
Construction of a Bilevel Circuit Component Diagram
Frequently Asked Questions