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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?
  - 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?
  - Healthcare workers and staff should use standard PPE when taking care of COVID-19 patients.
  - 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?
  - Yes – the device must have **bilevel S/T mode** capability.
  - 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?
  - CPAP devices provide a constant **single** pressure, which is similar to PEEP provided by conventional ventilators
  - CPAPs have traditionally been used in the home for treatment of obstructive sleep apnea
  - 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 (FiO_2)?
  - With this circuit, higher pressures will dilute added O_2 and increase requirement
    - Monitoring of FiO_2 is desirable
  - Please see Protocol for details

- Can the circuit be set up without in-line spirometry/gas sampling?
  - Yes, the circuit can be used without inline monitoring of spirometry, end-tidal CO_2, and FiO_2.
  - For patient safety, it is desirable to have some assessment of ventilation, CO_2, and oxygenation.
  - These parameters should be checked whenever there is a change in IPAP/EPAP settings.

- What type of sedation do patients on these devices require?
  - 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.
  - 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?
  - **Bilevel devices, which are intended for non-invasive use, should not be invasively used unless there is critical shortage of conventional ventilators.**
  - 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?
  - Yes. Most components are likely to be found in respiratory therapy departments
  - 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?
  - To refill the chamber, therapy must be stopped.
  - 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?
  - In-line Heated humidification is preferred, as it provides more humidity without interruption

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

- How should these devices be disinfected between patients?
  - Between patients, surface disinfection is recommended
  - 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