

## Alaska Native Medical Center

### ANMC Guideline: Use of BiPAP Ventilation on Medical and Surgical Floors Outside the Critical Care Unit (CCU)

1. **Purpose:** To describe the conditions and procedure for applying noninvasive positive pressure ventilation (NPPV) at ANMC.
2. **Scope:** All organizational components of the Alaska Native Medical Center (ANMC) accredited campus defined as its staff, residents, non-physicians, interns, volunteers and contractors.
3. **Definitions:**
  - 3.1 **NPPV (Noninvasive positive pressure ventilation)** is the application of positive pressure via the upper respiratory tract for the purpose of augmenting alveolar ventilation. NPPV can be provided with a standard critical care ventilator (capable of leak tolerance) attached to a snug fitting face mask or with a BiPAP (Bilevel Positive airway Pressure) see 3.2. ventilator or similar device designed specifically for NPPV.
    - 3.1.2 NPPV with a critical care ventilator is generally performed in the Pressure Support Mode; and PEEP, pressure support, and FiO<sub>2</sub> are set for desired support. The patient must “trigger” on the inspiratory valve mechanism for pressure support to be delivered, and the expiratory valve must be opened for exhalation to occur.
  - 3.2 **The “BiPAP” ventilator** or similar device is a flow generator designed to regulate flow as needed to maintain desired pressures. This flow changes as needed to compensate for leaks, different size exhalation ports, and patient efforts. No inspiratory or expiratory valves are present. The circuit is a single limb circuit with expiratory gases escaping through a small exhalation port in the mask or through an expiratory port attached close to the mask. With “BiPAP” ventilation and IPAP (inspiratory pressure) and an EPAP (expiratory pressure) are set to correspond with a desired pressure support and PEEP level.
4. **Procedure:**
  - 4.1 Indications and Location of Care: NPPV may be indicated in a variety of conditions and settings. These may be divided into three categories, each with different treatment goals (reference 1).
    - 4.1.2 **Type 1 Support: All patients must be monitored in ANMC CCU**
      - 4.1.2.1 The application of NPPV in a condition in which cessation of ventilator support could lead to imminent death. A general treatment goal would be to provide support during an acute situation that, with appropriate treatment, would be expected to resolve within 24 to 48 hours. Examples would be:
        - 4.1.2.1.1 Hemodynamically unstable COPD exacerbations
        - 4.1.2.1.2 Severe asthma exacerbation
        - 4.1.2.1.3 Moderate to Severe cardiogenic pulmonary edema

- 4.1.2.1.4 Patients with conditions requiring NPPV, but who are unable to demonstrate the ability to apply or remove their mask or cooperate with therapy.
- 4.1.2.1.5 Includes patients who do not improve within 1 hour of implementation of NPPV/BiLevel support regardless of the site of implementation. Improvement includes decreasing PaCo<sub>2</sub> of 10 mmhg or more, improvement of mental status, and improvement in work of breathing

**4.1.3 Type 2 Support: Patients may be monitored outside of the CCU and/or on general hospital floor.**

4.1.3.1 The application of NPPV in a condition in which ventilator support may confer clinical benefit but in which cessation of NPPV does not pose a life-threatening risk. Treatment goals generally include providing intermittent support to relieve symptoms or provide continuation of chronic home therapies in these patients. Examples would be:

4.1.3.1.1 Sleep-disordered breathing/ Patients using BiPAP at home (who are not hospitalized for acute respiratory failure)

4.1.3.1.1.1 These patients may use their home BIPAP/CPAP device in a general care room.

4.1.3.1.1.2 Prior to use, the Respiratory Therapist will assess the patient to ensure that the patient is able to use the equipment and apply the mask correctly. The Respiratory Therapist will also assess the condition of the patient's home equipment and notify Biomedical Engineering to perform an electrical safety check prior to use. If there are any concerns about the patient's equipment, then the equipment will be provided by the Respiratory Care department. The Respiratory Therapist will make a note in the Respiratory Therapy progress notes that this assessment was performed.

4.1.3.1.2 Neuromuscular and chest-wall disease

4.1.3.1.3 Alert, hemodynamically stable, hypercapnic COPD with ventilatory drive

4.1.3.1.4 Patients transitioning from the ICU or ER into the Type 2 support category can also use BIPAP in the general care area, provided they meet the criteria outlined in the following section.

**4.1.4 Who is a Candidate for NIV in the General Care Area**

4.1.4.1 Alert and cooperative patients with mild respiratory acidosis and mild to moderate respiratory distress caused by an acute COPD exacerbation or hypoxemia from heart failure are the ones that benefit most from non-invasive ventilation. Alert and hemodynamically stable patients with mild to moderate COPD exacerbation and mild cardiogenic pulmonary edema with hypoxemia can be treated safely and effectively in the general ward if the hospital physicians and the staff have appropriate expertise.

4.1.4.2 Prior to placement of a Type 2 patient into a general care bed, the attending physician, respiratory therapist, and nursing should assess the patient to determine if the cessation of NPPV would pose an immediate life-threatening risk, and will assess whether additional monitoring such as telemetry, etc. is necessary.

4.1.4.2.1 The Respiratory Therapist will assist this assessment by providing documentation of the patient's tolerance of cessation of NPPV. Documentation should include changes in RR, HR, SpO<sub>2</sub>%, and signs of respiratory distress. The patient should also be cooperative and compliant with wearing the mask and headgear. Prior to the patient moving to the floor, the Respiratory Care department will contact the nurse manager and provide education on the device and setup. Respiratory therapy will continue to follow the patient.

4.1.4.2.2 Some patients will require Type 2 support at home. In this situation, a DME company will assess the patient and supply a device and provide education for the patient, family and caregivers prior to discharge. The Respiratory Therapy department will assist the case manager to determine proper equipment and settings prior to discharge in order to ensure this transition is performed while maintaining patient safety.

#### 4.1.5 **Type 3 Support: Comfort/Compassionate Care administered on the general hospital floor.**

4.1.5.1 The application of NPPV for "end of life support" in a patient with an irreversible lung disease or other terminal medical condition, in which the patient has a documented "Do Not Intubate and Do Not Resuscitate" orders on their chart, and NPPV/BIPAP has been determined to be in the best interests of supporting patient comfort.

4.1.5.2 Prior to the patient moving to the floor, the Respiratory Care department will contact the nurse manager and provide education on the device and setup. Respiratory Services will continue to consult on the patient.

4.1.5.3 Patients with an active DNR order, but who are not comfort care, should be evaluated and triaged as to the most appropriate place for treatment as per 4.1.4.2.

## 5. **Contraindications to NPPV**

### 5.1 Absolute Contraindications

5.1.2 Respiratory arrest or impending respiratory failure

5.1.3 Inability to properly fit a mask

### 5.2 Relative Contraindications

5.2.2 Medically or hemodynamically unstable; hypotensive shock, uncontrolled cardiac ischemia or arrhythmia, uncontrolled upper GI bleeding, etc.

5.2.3 Agitated, uncooperative, or profoundly drowsy

5.2.4 Unable to protect their airway or difficulty swallowing

5.2.5 Excessive secretions, not manageable by clearance techniques

- 5.2.6 Multiple organ failures (>2)
- 5.2.7 Recent upper airway or gastrointestinal surgery

## **6. Hazards and Complications of NPPV**

- 6.1.2.1.1 Leaks, mask discomfort, skin breakdown, eye irritation. These may be avoided by ensuring proper mask fit.
- 6.1.2.1.2 Sinus congestion, oronasal drying.
- 6.1.2.1.3 Patient-ventilator dissynchrony.

## **7. Application and Responsibilities**

- 7.1.2 Respiratory Therapy responsibilities include to following:
  - 7.1.2.1 Verify physician order for BIPAP. Order shall include FiO<sub>2</sub>, PEEP and pressure support level; or EPAP and IPAP (in the case of BIPAP).
  - 7.1.2.2 Wash hands and put on appropriate personal protective equipment.
  - 7.1.2.3 Explain procedure to patient.
  - 7.1.2.4 Set parameters on ventilator and verify proper operation.
  - 7.1.2.5 Attach mask to circuit and place on patient.
  - 7.1.2.6 Secure mask with headstrap. Tighten strap just enough to prevent leaks. A small leak in the BIPAP mask is allowable.
  - 7.1.2.7 Set alarms appropriately to signal disconnect or mask malposition. Chart on flow sheet Q4hrs per
  - 7.1.2.8 Re-assess the patient as needed in response to changes in physician orders, changes in patient condition, and in response to alarms.
- 7.1.3 Nursing responsibility will include the following:
  - 7.1.3.1 Notify Respiratory Therapy of changes in the physicians orders
  - 7.1.3.2 Notify Respiratory Therapy of changes in the patient's respiratory status
  - 7.1.3.3 Respond to ventilator alarms, address immediate needs, and notify Respiratory Therapy to re-assess the patient and alarm status.
- 7.1.4 Infection Control:
  - 7.1.4.1 Follow infection control guidelines per ANMC policy.
  - 7.1.4.2 Ventilator circuits, masks, and headstraps are single patient use items, and are discarded after each patient.

## **References**

1. Operators Manual, BIPAP V 60 Ventilatory System 2009
2. Noninvasive Positive-Pressure Ventilation (NPPV) for Acute Respiratory Failure. Comparative Effectiveness Review 68. (Prepared by the Duke Evidence-based Practice Center under Contract No. 290-2007-10066-I.) AHRQ Publication No. 12-EHC089-EF. Rockville, MD: Agency for Healthcare Research and Quality. July 2012.
3. The Canadian Critical Care Trials Group / Canadian Critical Care Society Noninvasive Ventilation Guidelines Group. An abridged version of this article appeared in the February 22, 2011 issue of CMAJ

Responsibility	ANMC Respiratory Therapy Manager
Written	11/2014
Recommend approval and date	ANMC Internal Medicine CCBG, ANMC Chief Medical Officer
Approval	ANMC Chief Medical Officer
Date approved	4/16/2015
Date last reviewed	4/16/2015
Date last revised	4/16/2015
Supersede	none

Official Signature on File  
o/s: Dr. Paul Franke  
ANMC Chief Medical  
Officer

4/16/2015  
Date

**Table 1.** Indications, Contraindications and Risks of NIV in General Ward<sup>1</sup>

<b>Indications</b>	<b>Contraindications</b>	<b>Risks</b>
<p><b>Clinical observations:</b></p> <p>Increased dyspnea-moderate to severe</p> <p>Tachypnea (&gt;24 breaths per minute in obstructive, &gt;30 per min in restrictive)</p> <p>Signs of increased work of breathing, accessory muscle use, and abdominal paradox</p> <p><b>Gas exchange parameters:</b></p> <p>PaCO<sub>2</sub>&gt;45 mm Hg</p> <p>pH 7.3-7.35</p> <p>Hypoxemia (use with caution), PaO<sub>2</sub>/FiO<sub>2</sub> ratio &lt;200</p>	<p><b>Absolute Contraindications:</b></p> <p>Respiratory arrest or impending respiratory failure</p> <p>Unable to fit mask</p> <p><b>Relative Contraindications:</b></p> <p><i>Medically unstable:</i> hypotensive shock, uncontrolled cardiac ischemia or arrhythmia, uncontrolled copious Upper GI bleeding</p> <p>Agitated, uncooperative or profoundly drowsy</p> <p>Unable to protect airway</p> <p>Swallowing impairment</p> <p>Excessive airway secretions, not managed by secretion clearance techniques</p> <p>Multiple organ failure (two or more)</p> <p>Recent upper airway or upper gastrointestinal surgery</p>	<p><b>Potentially fatal:</b></p> <p>Progressive respiratory decompensation</p> <p>Cardiorespiratory arrest</p> <p><b>Non fatal:</b></p> <p>Aspiration of gastric content</p> <p>Gastric distention</p> <p>Skin necrosis of the face at the site of mask</p> <p>Difficulty in clearing airway secretions</p>