Noninvasive Positive Pressure Ventilation (BIPAP)

Purpose: To describe the conditions and procedure for applying noninvasive positive pressure ventilation (NPPV) at LSUHSC. (Noninvasive positive pressure ventilation is sometimes referred to as BIPAP).

Description: NPPV can be defined as 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” ventilator or similar device designed specifically for NPPV.

NPPV with a critical care ventilator is generally performed in the Pressure Support Mode; and PEEP, pressure support, and FiO2 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.

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 an IPAP (inspiratory pressure) and an EPAP (expiratory pressure) are set to correspond with a desired pressure support and PEEP level.

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).

Type-1 Support – the application of NPPV in a condition in which cessation of ventilatory 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;

1. COPD exacerbation
2. Asthma exacerbation
3. Other parenchymal lung disease
4. Cardiogenic pulmonary edema

*NPPV Type 1 support will be provided only in a critical care unit or in the emergency department.* NPPV for Type 1 patients shall not be provided in any other settings unless used as a temporary measure while an ICU or ER bed is being made available, and only if a medical staff member remains with the patient until the patient is relocated.

Type-2 Support – the application of NPPV in a condition in which ventilatory support may confer clinical benefit but in which cessation of NPPV does not pose an immediate life-threatening risk. Treatment goals generally include providing intermittent support to relieve symptoms in these patients. Examples would be;

1. Sleep-disordered breathing
2. Neuromuscular and chest-wall disease
3. Stable, hypercapnic COPD

NPPV Type-2 support can be provided outside the ICU in specific situations:

1. Patients using BIPAP at home and who are not hospitalized for acute respiratory failure can use their BIPAP device in a general care room. 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, equipment will be provided by the Cardiopulmonary Services department. The Respiratory Therapist will make a note in the Cardiopulmonary Services progress notes that this assessment was performed. A Pulmonary Consult is not required for this patient, unless other pulmonary concerns are present.

2. Patients transitioning from the ICU or ER into the Type 2 support category can also use BIPAP in the general care area after completion of a Pulmonary Consult. The Pulmonary physician will 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 is necessary. 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, SpO2%, 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 Cardiopulmonary Services department will contact the nurse manager and provide education on the device and setup. Pulmonary Services will continue to consult on the patient.

Some patients will require Type 2 support at home. In this situation, a DME company will assess the patient and supply a device prior to discharge. The Cardiopulmonary Services department will assist the case manager in order to ensure this transition is performed while maintaining patient safety.

Type-3 Support – the application of NPPV for “end of life support” in a patient with an irreversible lung disease or other medical condition, in which the patient has expressed their wishes for “Do Not Resuscitate”. Patients in this category may transfer to the general care area after completion of a Pulmonary Consult. Prior to the patient moving to the floor, the Cardiopulmonary Services department will contact the nurse manager and provide education on the device and setup. Pulmonary Services will continue to consult on the patient.

Contraindications:

1. Patient’s inability to maintain a patent airway or to adequately clear secretions.
2. Patient’s at risk for aspiration of gastric contents.
3. Acute sinusitis or otitis media may be a relative contraindication.
4. Patient noncompliance or unwillingness to cooperate.

Hazards/Complications:
1. Leaks, mask discomfort, skin breakdown, eye irritation. These may be avoided by ensuring proper mask fit.
2. Sinus congestion, oronasal drying.
3. Patient-ventilator dissynchrony.
4. Patient anxiety.

Equipment: Mechanical ventilator or BIPAP unit
Appropriate patient circuit
Appropriate size face mask or nasal mask
Head strap

Personnel: Respiratory Therapist I and II, Respiratory Therapy Technician I and II

Procedure: 1. Verify physician order for noninvasive positive pressure ventilation (or BIPAP). Order shall include FiO2, PEEP and pressure support level; or EPAP and IPAP (in the case of BIPAP).
2. Wash hands and put on appropriate personal protective equipment.
3. Explain procedure to patient.
4. Set parameters on ventilator and verify proper operation.
5. Attach mask to circuit and place on patient.
6. Adjust sensitivity (not adjustable on BIPAP) to respond to patients efforts without autocyling. Verify ventilator synchronizes with patient efforts.
7. Secure mask with headstrap. Tighten strap just enough to prevent leaks. A small leak in the BIPAP mask is allowable.
8. Set alarms appropriately to signal disconnect or mask malposition.
9. Chart on Cardiopulmonary Services ventilator flowsheet Q4hrs per CPS Proc3.9. (NOTE: For patient's on general ward, return CPS ventilator flowsheet to patient's chart. Do not leave it in the patient's room).
10. Re-assess the patient as needed in response to changes in physician orders, changes in patient condition, and in response to ventilator alarms.

NOTE: Nursing responsibility will include
- Notify Respiratory Therapist of changes in physician orders.
- Notify Respiratory Therapist of changes in patient's respiratory status.
- Respond to ventilator alarms, address any immediate needs, and notify Respiratory Therapist to re-assess the patient and alarm status.
- (The Respiratory Therapist can be contacted via the operator through the paging system.)

Infection Control:

1. Follow infection control guidelines per Proc4.1.
2. Ventilator circuits, masks, and headstraps are single patient use items. Discard after use.

References: 1. Consensus Conference: Noninvasive Positive Pressure Ventilation, Respir Care 1997;42(4),364-369

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