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BiPAP - Administration and Management of the Patient on Non-Invasive Ventilation

Site Applicability

LGH (ICU, PAR, ER) and PRGH

Practice Level

RN/RT - Specialized skill - Requires Critical Care background
Throughout the document wherever RT is mentioned, for facilities without an RT resource, the expectation is RN/MD shared role.

Policy Statement

1. BiPAP® must be ordered by an Emergency or ICU physician.
2. BiPAP® must only be utilized in PAR, ICU, ER and the patient must be monitored at all times.
3. BiPAP® patients must be NPO due to the high risk of gastric distension, vomiting and aspiration with this therapy. A physician's order is required to give sips of H2O with oral medications.

Need to Know

NOTE: Patients who are on BIPAP are generally very ill and have a high potential to become unstable, from both a respiratory and cardiovascular aspect. They are at risk for acute deterioration.

BiPAP® is a form of non-invasive positive pressure ventilation, and is a technique that can improve gas exchange by keeping alveoli open with positive pressure. It is considered non-invasive because the patient does not need to be intubated to receive this therapy.

BiPAP® delivers two levels of positive airway pressure, both inspiratory (IPAP) and expiratory (EPAP) through a face or nasal mask. When the machine senses patient inspiration it delivers a set amount of pressure (ranging from 5-25 cm H2O), which decreases the amount of muscular effort necessary for respiration. The IPAP level refers to the total amount of pressure during inspiration.

On expiration the machine will also supply a level of pressure (ranging from 5-15 cm H2O) to keep the airway and alveoli open. This can help prevent or treat atelectasis, and decrease fluid accumulation in the alveoli. The EPAP level refers to the total amount of pressure during expiration.

BiPAP® is designed to reduce a patient's work of breathing and to improve gas exchange. Oxygen can also be administered via the BiPAP® set up; on some machines the oxygen is tee'd in through a

flowmeter, and on others, the FiO2 is set internally in the machine. BiPAP® can reduce both respiratory rate and heart rate, and improve arterial blood gases, by helping to decrease levels of CO2 in the blood and to increase O2 levels.

Full face masks are often used with BiPAP® since patients in respiratory difficulty tend to breathe through their mouths. However, nasal masks may be used with patients who have central sleep apnea or who are more comfortable with this interface.

BiPAP® is not the same as CPAP (Continuous Positive Airway Pressure). CPAP only delivers one level of pressure and is most often used in conditions such as obstructive sleep apnea.

Indications:

- Hypercapnic Respiratory Failure
- Hypoxemic Respiratory Failure
- Impending Respiratory Failure
- Exacerbation of COPD
- Neuromuscular Disorders (e.g. Guillain-Barre , myasthenia gravis, ALS or MS)
- Sleep-Related Breathing Disorders
- Congestive Heart Failure
- Occasionally a patient who is not a candidate for intubation/mechanical ventilation will be placed on BiPAP® to ease work of breathing and to provide comfort.

Relative Contraindications:

- Excessive secretions
- Poor ability to protect airway
- Hemodynamic Instability/Lethal Arrhythmias
- High risk of aspiration
- **Uncooperative or agitated patient** (pt may be unable to keep mask on)
- Decreased level of consciousness
- Pneumothorax
- Inability to wear/tolerate mask d/t trauma or surgery (e.g. facial fractures)
- Unstable spinal injury

Absolute Contraindications:

- The presence of an artificial airway such as a tracheostomy tube or endotracheal tube.
- Any patient that does not have an adequate respiratory drive to breathe.
- Respiratory Arrest/Impending respiratory Arrest

Complications of BiPAP® Therapy:

Cardiovascular/Hemodynamic Instability and/or Pneumothorax

1. BiPAP® therapy involves higher than normal airway pressures during both inspiration and expiration, and increase the amount of intrathoracic pressures. Some of the complications of intrathoracic pressures include pneumothorax, tension pneumothorax and decreased cardiac output.

2. Monitor the patient for signs of hemodynamic instability, including hypotension, arrhythmias, heart rate, respiratory rate (high or low), and oxygen saturation. If the patient has a pneumothorax, breath sounds on the affected side will be very diminished, and in fact may not be audible at all. A patient with a large or tension pneumothorax will be very short of breath and will have compromised respiratory status.

3. If you suspect that your patient has developed either pneumothorax or hemodynamic instability contact the RT/MD immediately or call a Code Blue.

Respiratory Failure

1. While BiPAP® is used to treat respiratory failure, it sometimes is not enough to prevent further worsening of the patient's condition. For this reason continuous O2 saturation monitoring is vital. Assess for changing respiratory rate (<10 or >30), oxygen desaturation below parameters set by the MD, restlessness and/or agitation, and decreasing level of consciousness.

2. The RT may perform an arterial blood gas at this time to determine whether the patient's oxygen or carbon dioxide levels are within normal limits. If you believe that your patient is experiencing increased work of breathing or worsening respiratory failure, contact the RT/MD immediately or call a Code Blue as necessary.

Gastric Distention, Vomiting and Aspiration

1. Airway pressures delivered by the BiPAP® may cause forced opening of the esophageal sphincter and result in gastric distension. Gastric distention can in turn increase the risk of vomiting. Aspiration risk increases with vomiting, or with the intake of food or fluids while the BiPAP® is in use. Sips with PO meds may be permitted (consult physician). **Unless otherwise indicated the patient's HOB should be elevated at least 30° and preferably 45°.**

2. Some patients require BiPAP for longer term therapy (e.g. Guillain Barré, myasthenia gravis); for longer-term therapy (>3 days) consult Dietician regarding ongoing nutritional management.

3. **Wall suction unit complete with tubing and a yankuer catheter must be set up and immediately available to all BiPAP patients at all times.**

4. The patient should be awake enough to remove their own mask if they begin to vomit; for this reason **restraints are contraindicated.** If restraints are necessary the patient must be observed continuously. The patient should not be overly sedated. All BiPAP® masks have a safety release for easy mask removal in the event of vomiting. Be sure your patient knows how to remove the mask quickly if necessary. If the patient does begin to vomit, remove the mask immediately and orally suction the patient. Apply O2 if desaturation occurs and contact the RT.

Air Leak

1. When BiPAP® is initiated the RT will ensure that the mask is the right fit, and that the straps are properly adjusted. However, patient movement or changes in position can affect the fit of the mask. An air leak is the result.

2. An air leak can:
    - Impair BiPAP® effectiveness
    - Make it difficult for the patient to trigger a breath
    - Result in mucosal drying, especially around the eyes
    - Be heard or felt around the mask. It can also cause the machine to alarm.

3. If an air leak occurs, ensure that the mask is fitted snugly around the nose/mouth and that the straps are fitted properly. Reapplying the mask will usually resolve the air leak issues.

4. Call the RT if you are unable to re-establish a good seal.

Skin Breakdown

1. The BiPAP® mask can be very irritating to the skin around the mouth and nose, and the gases delivered through the mask causes dryness to the mucous membranes, increasing the risk of skin breakdown. The skin across the bridge of the nose is especially susceptible to skin breakdown. Remove the mask every two

hours and give mouth care while noting areas of irritation/breakdown. If you do note this, contact the RT, as a differently sized mask may be necessary.

2. Monitor the patient carefully when BiPAP® is removed for mouth care, and reapply mask immediately if respiratory distress increases or SpO2 decreases. If BiPAP is required to maintain Oxygen levels consider using a secondary oxygen source while the mask if off for mouth care.

Equipment and Supplies

BiPAP® can be utilized with or without a heated, humidified circuit. There are different circuit configurations required depending on whether there exists an indication for humidity. The circuitry may also differ with the type of BiPAP® machine used. The RT will determine the patient's needs and gather the supplies required for each individual BiPAP® administration.

Heated humidity should be considered for BiPAP® Vision or Critical Care Ventilators on noninvasive mode if the patient is expected to require BiPAP® for greater than 6 hours. This is recommended to prevent the drying of secretions that occurs with dry gas delivery and positive pressure ventilation.

Ensure your patient has oropharyngeal suction and continuous pulse oximeter set up at the head of bed. The RT will gather the following equipment:

- BiPAP® machine
- Corrugated tubing
- Whisper swivel (machine specific)
- Appropriately sized mask (nasal or full face)
- Headgear
- 100% oxygen tee-in (optional and machine specific)

Practice Guidelines

RN - ASSESSMENT AND MONITORING

Frequency and type of monitoring may depend upon the indications for BiPAP® therapy (e.g. sleep disorder vs. acute respiratory distress). All BiPAP® patients must be assessed frequently for complications (e.g. aspiration, pneumothorax, or cardiac instability) but those using the machines for chronic conditions such as neuromuscular disorders or sleep disordered breathing may require less frequent monitoring.

Vital Signs:

- **When the BiPAP® is first applied vital signs should be taken q1h x 2 hours until patient is assessed as tolerating the intervention, and more stable. While the BiPAP is being applied the patient should be observed continuously x 15mins either by RT or RN.**
- **BP, HR, RR Q2H minimum and prn**
- **Continuous pulse oximetry**

Note: Patients who are designated by a physician as receiving BiPAP for comfort measures (e.g. not appropriate for intubation/mechanical ventilation) may require less frequent vital signs (e.g. q4h), but will still require frequent assessment for development of complications. Consult with physician for parameters.
Regardless of patient's acuity, there should be a visual assessment q1h (e.g. hourly rounds) for assessment of comfort and complications.

Assessment:

- Physical assessment q4h **minimum and prn, especially with change in condition, e.g. decrease in level of consciousness, vomiting/aspiration, change in vital signs, cardiac instability.**

- Respiratory assessment
  - work of breathing
  - auscultation
  - chest expansion
- Cardiac assessment
  - hemodynamic stability
- Assess for mucosal or skin breakdown q2h & perform oral care at this time
- Assess LOC/ability to tolerate BiPAP® mask q2h and prn
- Keep HOB elevated >30-45º
- Patient NPO except for sips with meds (if physician's order).
- Triggering/cycling the machine (the patient's respiratory effort is triggering a response from the machine)
  - Put your hand on the patient's abdomen to detect respiratory efforts. Patient effort should coincide with machine breath. Check for leaks around mask if the machine is not cycling with patient effort, or call the RT
- Check functioning and setting of alarms (RT specific)

RT - ASSESSMENT AND MONITORING

The RT may check a baseline ABG prior to therapy, 30 minutes after initiation and PRN thereafter as ordered by the physician.

- Bipap monitoring q3h

Guidelines for Titration of Therapy (RT specific)

- Increase IPAP in increments of 2 cmH20 to reduce respiratory rate and/or stabilize PaCO2 by augmenting alveolar ventilation.
- Increase EPAP in increments of 2 cmH20 to increase functional residual capacity and improve PaO2.
- Communicate with physician

Communication

- **During BiPAP® therapy the patient's condition may deteriorate. Contact the RT immediately if this situation occurs, or call a Code Blue as necessary.**

Troubleshooting

O2 Therapy Manual, Respiratory Services (VCH)

There are several built in alarms on BiPAP® machines. If your patient's machine alarms, assess for these common reasons:

High Pressure Limit: this alarm will usually ring when the pressure limit set by the RT is exceeded, often by a kink in the tubing or by it being caught in the bedrails. A coughing patient may also trigger this alarm. Ensure that the tubing is free from kinks or other obstructions.

Low Pressure Limit: this alarm rings when the pressure within the system drops below the preset limit. This is usually caused by a disconnection in the system; for example, the mask may be too loose. Ensure that all connections within the system are tight and that the face mask fits snugly.

Apnea: this alarm will ring when the patient has a period of apnea that lasts longer than the time preset by the RT. This alarm may also ring if there is a large air leak in the circuit or the mask. Assess the underlying reason for this alarm, e.g. is the patient sedated? Has their level of consciousness decreased? Are they in respiratory or cardiac distress? **Call the RT if this alarm keeps ringing and treat the patient as necessary as other resources are called for assistance.**

If you cannot fix the source of any alarm after troubleshooting please contact the RT.

Expected Patient Outcome

Acute: The patient will experience an improvement in respiratory status without complications.
Palliative: The patient will experience greater comfort with respirations.

Patient Education

Instruct patient to inform nursing staff immediately if they experience increased work of breathing, shortness of breath, nausea or chest pain.

Communicate frequently with the patient re: BiPAP® therapy. A proper mask fit and good synchronization with the machine improves patient compliance with the device. Many patients will be relieved to have improvement in their symptoms. However, the therapy may be an uncomfortable and unfamiliar intervention for some patients so clear and open communication about its importance is vital. The patient and family may also be experiencing anxiety about their clinical condition.

Documentation

BiPAP® settings and alarm checks will be documented by the RT/RN *volumes, Rate, 02%, IPAD/EPAP

Assessment/vital signs to be documented as per hospital policy.

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