
Ventilation without Intubation in the Acute Care Setting

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Introduction:

Whenever a respiratory care practitioner (RCP), nurse, or physician encounters a patient requiring ventilatory support, the use of noninvasive positive pressure ventilation (NPPV) should always be considered. The RCP must have up-to-date knowledge, the skills, and proper equipment in order to give their patient the best chance of success.

NPPV should be separated into two different treatment categories: acute and chronic respiratory failure. The scope of this article will be NPPV in the acute care setting—intensive and emergency care.

Why should NPPV be attempted?

Invasive ventilation has a myriad of complications associated with just the artificial airway itself; ventilator-associated pneumonia, barotrauma, biotrauma, and airway trauma to name a few. Patients usually require more sedation and, in some cases, neuromuscular blockades and blood pressure medication when they are intubated. All of these situations will prolong the ventilator discontinuation process and are associated with a higher morbidity and mortality. Also, communication is very difficult and frustrating for these patients. On the contrary, if a patient has any contraindications to NPPV, fails a well attempted trial, or is in need of an artificial airway, intubation should not be delayed. Contraindications for NPPV therapy include patients with: cardiac and/or respiratory arrest, the inability to protect their airways, confusion and agitation, facial trauma or burns, hemodynamic instability, a high risk of aspiration, copious respiratory secretions, and impaired consciousness.

Which patients should be considered for NPPV therapy?

Generally speaking, any patient with a possibly reversible episode of respiratory failure who qualifies for NPPV is a candidate. At least two of the following criteria should be met: 1. respiratory distress with severe to moderate dyspnea, use of accessory muscles and abdominal paradox; 2) pH < 7.35 with a PaCO₂ > 45 torr; and 3) a respiratory rate ≥ 25 breaths per minute.

It is vital in the year 2004 for RCPs to use evidenced-based medicine. Guidelines, recommendations, studies, meta-analyses, reviews and case studies are abundant in the literature—especially in the last decade. This continues to be a highly studied area of critical care.

By far, the most studied patient population with the most evidence to support NPPV use are patients with an acute exacerbation of chronic

obstructed pulmonary disease (COPD). Several randomized-controlled trials show that most patients with this condition do well and avoid intubation when NPPV is utilized. These patients who present in the emergency department with shortness of breath and a pH 7.20-7.30 usually have the best success. Even if a patient-centered approach is used by the RCP and the patient is coached properly, statistically one out of four patients will still require intubation, but three out of four will not. That is why it is imperative for RCPs to have expertise and ample time to spend with these patients. This therapy is not usually required in non-acute COPD patients.

Patients presenting with congestive heart failure (CHF) in the emergency department have been successfully treated with mask continuous positive airway pressure (CPAP) and NPPV. Although CPAP is not a form of ventilation, it is usually discussed along with NPPV. Patients with CHF usually require mask CPAP or NPPV for a short time until other medications and treatments can take effect.

Patients with hypercapnic respiratory failure have greater success using NPPV than patients with purely hypoxemic respiratory failure. Although NPPV may be attempted for a short time with these patients, the clinician should monitor closely for the need to institute invasive mechanical ventilation.

What equipment should be used?

Each facility should have several types and sizes of interfaces. Most patients who require NPPV for acute respiratory failure tolerate a well fitted full-face mask. Nasal masks are occasionally used in patients who are extremely claustrophobic.

All ventilators are able to provide NPPV, some better than others. Positive pressure portable ventilators designed specifically to deliver NPPV tolerate inevitable leaks better than adapting a critical care ventilator for this purpose. If using a critical care ventilator, utilizing pressure assist control or pressure support are the best choices. If using pressure assist control, the time-cycle feature, determined by the RCP, will switch the patient from the inspiratory to the expiratory phase. Cycling with pressure support via flow can be enhanced with an adjustable flow-cycling parameter that is available on most new ventilators.

Patients with thick secretions and/or patients using NPPV longer than 4 hours can benefit from adding humidity by using a heated passover humidifier. This can increase the percentage of patients successfully tolerating NPPV.

Since most portable positive pressure ventilators (PPV) have bled in oxygen, oxygen delivery can be problematic. It is difficult to measure the amount the patient is receiving. At best, these machines may deliver up to only 50% oxygen. It is best to adjust the oxygen flow by monitoring the

patient's pulse oximetry continuously. This is not an issue in critical care ventilators or the Respronic's Vision PPV.

Initiating and managing NPPV parameters

RCPs must spend ample time with patients requiring NPPV. An unsuccessful trial is inevitable if the RCP places the mask on the patient and goes on to their next patient. It may take up to 2 hours of "hand holding" and coaching to have the best chances for success. If the patient is successful and avoids intubation, it is time (and money) well spent.

Each patient will require and tolerate different pressures. After explaining the therapy to the patient, begin with gently holding the mask to the patient's face. Begin with low settings and adjust up until the patient seems to be comfortable. Then, cautiously strap the mask on the patient.

The goals of NPPV are to unload the respiratory muscles and assist the patient in their ventilation. There are two pressures that need to be set and adjusted: inspiratory positive airway pressure (IPAP) and expiratory positive airway pressure (EPAP). IPAP is adjusted for proper chest rise and tidal volume. EPAP can be compared to PEEP used during invasive ventilation. This assists in oxygenation and may be increased to assist patient triggering of the ventilator by overcoming their auto-PEEP.

Patients with hypercapnic respiratory failure should begin to improve within an hour. At this point arterial blood gases should be obtained. The patient's respiratory distress should diminish fairly quickly. If the patient isn't improving despite optimal administration, the patient may need to be intubated.

Patients with hypoxemic respiratory failure, who do not improve and still require a high level of oxygen, should probably be intubated. Do not wait too long on these patients.

Other than anecdotal reports, there is little data on weaning patients from NPPV. As patients improve, settings may be lowered for comfort. Patients may request breaks from NPPV; these breaks can be considered weaning trials. Monitor the patient closely and restart therapy as needed.

Education

To have a successful NPPV program at your institution, education is essential. Nurses and physicians must be in-serviced on the equipment and the latest literature concerning NPPV. The emergency department is the first place most of these patients will be screened for NPPV or intubation. Their staff must be properly educated and updated on a regular basis to ensure a successful program. Each institution should monitor its program to find the problem areas in order for appropriate adjustments to be made.

Conclusion

If you don't offer NPPV for patients with acute respiratory failure at your facility, evidence-based standards in mechanical ventilation are not being followed. It takes just one proactive RCP to get a program started; conducting literature searches and investigating the latest equipment on the market is the best place to begin. Consult other respiratory departments that have NPPV programs. The literature supports NPPV and that will support you as you crusade through the red tape and politics that sometimes blocks progress at many hospitals.

As you implement NPPV, you will have a profound positive impact on your patients' lives and ultimately a profound impact on your job satisfaction as well.

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Information in these articles based on information contained within the book "Ventilator Management: A Bedside Reference Manual" by Dana Oakes and Sean Shortall.