Noninvasive Ventilation: Rationale and Indications

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Noninvasive ventilation (NIV) refers to the delivery of ventilatory support into the lungs without an invasive artificial airway (endotracheal tube or tracheostomy tube), usually through a mask [1].

Since the first studies of NIV in critical care around 1980, thousands of reports have been published exploring different clinical applications, modalities, interfaces, and comparisons with other therapies [2].

Before starting NIV, it is crucial to recognize if the patient is a good candidate. The indications for NIV vary according to the underlying cause, severity of illness, and complicating factors [1].

NIV can be used as ventilatory support for patients with acute or chronic respiratory failure. In fact, NIV is widely used in the acute care setting for acute respiratory failure (ARF) across a variety of etiologies. Its effectiveness has been proven for common clinical conditions in critical care, such as exacerbation of chronic obstructive pulmonary disease (COPD) with hypercapnic respiratory acidosis and acute cardiogenic pulmonary edema (ACPE). It is also used as a home care therapy in patients with other chronic pulmonary diseases or sleep disorders.

In ARF, inclusion criteria for NIV are dyspnea, tachypnea (respiratory rate > 25 breaths per minute), increased work of breathing, and hypercapnic respiratory acidosis ($PaCO_2$ > 45 mmHg, pH <7.35) [3].

In acute exacerbation of COPD, bilevel NIV should be started when pH <7.35 and $PaCO_2$ > 45 mmHg persist or develop despite optimal medical therapy. Bilevel NIV remains the preferred choice for patients with COPD who develop acute respiratory acidosis during hospital admission. There is no lower limit of pH below which a trial of NIV is inappropriate, but the lower the pH, the greater the risk of failure. Patients must be very closely monitored with rapid access to endotracheal intubation and invasive ventilation if not improving [4, 5].

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A. M. Esquinas et al. (eds.), *Upper Airway Disorders and Noninvasive Mechanical Ventilation*, https://doi.org/10.1007/978-3-031-32487-1_9

In ACPE, either bilevel NIV or continuous positive airway pressure (CPAP) improves respiratory mechanics and facilitates left ventricular work by decreasing left ventricular afterload.

In acute asthma, there is not enough evidence to support the use of NIV [4].

Surgery, particularly that approaching the diaphragm, may have deleterious effects on the respiratory system, causing hypoxemia, decrease in lung volume, and atelectasis. Bilevel NIV and CPAP are frequently used in these clinical situations [4].

CPAP is the first-line treatment for obstructive sleep apnea (OSA), because it eliminates obstructive apneic and hypopneic events, resulting in improved daytime symptoms and reducing adverse cardiovascular outcomes [1, 6].

NIV is considered a significant treatment option for patients with obesity hypoventilation syndrome (OHS). Volume-assured modes of providing NIV may be more effective when high inflation pressures are required [1].

Home NIV can be used in conditions that can lead to chronic ventilatory failure such as scoliosis, kyphosis, thoracoplasty, muscular dystrophy, and motor neuron diseases [1].

NIV is currently used in a wide range of settings, from the ICU to home care. The appropriate selection of patients and the capacity of the team and the patients to achieve a proper adaptation to the technique are the bottom line for success [7].

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