



REVIEW

Non-invasive ventilation in the treatment of sleep-related breathing disorders: A review and update



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PALAVRAS-CHAVE

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Abstract Non-invasive mechanical ventilation (NIV) was originally used in patients with acute respiratory compromises or exacerbations of chronic respiratory diseases as an alternative to intubation. Over the last thirty years NIV has been used during the night in patients with stable chronic lung diseases such as obstructive sleep apnea, the overlap syndrome (COPD and obstructive sleep apnea), neuromuscular disorders, obesity-hypoventilation syndrome and in other conditions such as sleep disorders associated with congestive heart failure.

In this review we discuss the different types of NIV, the specific conditions in which they can be used as well as the indications, recommendations, and evidence supporting the efficacy of NIV.

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Ventilação não invasiva no tratamento de distúrbios respiratórios do sono: análise e actualização

Resumo A ventilação mecânica não invasiva (VNI) foi originalmente usada em doentes com insuficiência respiratória aguda ou em exacerbações de doença respiratória crónica, como uma alternativa à intubação. Nos últimos trinta anos, a VNI tem sido usada durante a noite, em doentes com doenças pulmonares crónicas estáveis, como a apneia obstrutiva do sono, a síndrome de sobreposição (DPOC - doença pulmonar obstrutiva crónica - e apneia obstrutiva

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aéreas;
Pressão positiva em
dois níveis nas vias
aéreas

do sono), disfunções neuromusculares, síndrome de hipoventilação e obesidade, e em outras doenças como os distúrbios do sono associados a insuficiência cardíaca congestiva.

Nesta análise discutimos os diferentes tipos de VNI, as condições específicas em que cada um deles pode ser usado, assim como as indicações, recomendações e a evidência que comprova a eficácia da VNI.

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Background

Noninvasive mechanical ventilation (NIV) is any form of ventilatory support without an endotracheal tube. NIV was originally used in patients with acute respiratory compromises or exacerbations of chronic respiratory diseases, as an alternative to the endotracheal tube. Over the last thirty years NIV has been also used during the night in patients with stable chronic lung disease such as obstructive sleep apnea (OSA), chronic obstructive pulmonary disease (COPD), the overlap syndrome (COPD and obstructive sleep apnea), neuromuscular disorders, obesity-hypoventilation syndrome (OHS), and sleep disorders associated with congestive heart failure (Cheyne-Stokes respiration).^{1,2} In this review we discuss the different types of NIV, the specific conditions in which they can be used as well as the indications, recommendations and evidence supporting the efficacy of NIV.

Clinical conditions for NIV

Alveolar hypoventilation is a result of an imbalance between the capability of respiratory muscles to maintain ventilation and gas exchange and is characterized by hypercapnia assessed by blood gas analysis. If pathologies related to either peripheral and/or central nervous system dysfunction are excluded, the other conditions associated with developing alveolar hypoventilation are listed in Table 1.¹⁻³ Of note, alveolar hypoventilation primarily develops during sleep⁴; moreover, in all these entities daytime breathing abnormalities must be considered. These respiratory "daylight" deteriorations (particularly in patients with neuromuscular disorders) require an appreciation of the diagnosis, the progression of the disease, and the particular circumstances of the patient.¹⁻³

Obstructive sleep apnea-hypopnea syndrome (OSA)

OSA has an incidence of 2% in women and 4% in men.^{5,6} It is characterized by recurrent episodes of partial (hypopnea) or complete (apnea), obstruction of the upper airway during sleep, and is associated with episodes of arousal and/or oxyhemoglobin desaturation.^{7,8} Symptoms of the syndrome include excessive daytime sleepiness, choking episodes during sleep, frequent awakenings, unrefreshing and unstructured sleep, daytime fatigue, difficulty concentrating and short-term memory loss¹ (Table 2). The pathophysiology of OSA remains controversial. Obesity, the classic hallmark in OSA, is associated with obstruction of the

Table 1 Main diseases which can benefit from NIV classified according to the cause and progressiveness of the respiratory impairment.^{1,2}

Parietal disorders

Chest wall

Kyphoscoliosis	No worsening
Sequelae of tuberculosis	Slow worsening
Obesity hypoventilation syndrome (OHS)	Depends on obesity

Neuromuscular

Spinal muscular atrophy	No worsening
Acid maltase deficit	Slow worsening (>15 y)
Duchene dystrophy	Intermediate worsening (5–15 y)
Myotonic myopathy	Intermediate worsening
Amyotrophic lateral sclerosis	Rapid worsening (0–3 y)

Lung diseases

Chronic obstructive pulmonary disease Continuous worsening

Bronchiectasis and Cystic fibrosis Continuous worsening

Predominant ventilatory control abnormalities

Ondine's curse No worsening

Cheyne-Stokes breathing Depends on heart failure

Upper airway abnormalities

Pierre Robin syndrome No worsening

Obstructive sleep apnea No worsening

upper airways.⁹ Possible hypotheses include adipose tissue infarction of the tongue and/or the dilator muscles of the pharynx.² The upper airway becomes less efficient, reducing oropharyngeal space especially at the end of exhalation. As a result, at the beginning of the next inspiration the dilator

Table 2 Typical symptoms of OSA.^{1,2}

Snoring
Nocturia
Unrefreshing sleep
Choking
Daytime sleepiness
Decreased libido
Morning headache
Enuresis

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