Long-term Home Non-invasive Ventilation for the Management of Chronic Obstructive Pulmonary Disease: New European Respiratory Society Guideline

Respiratory failure, caused by progressive damage to the airways, is a common consequence of chronic obstructive pulmonary disease (COPD). Chronic respiratory failure is classified as hypoxemic, which is characterised by low blood oxygen levels, or hypercapnic, which is a build-up of CO₂. The latter is particularly problematic because it is associated with an increased risk of death, and patients with chronic hypercapnia are more likely to be admitted to hospital. Reducing hospital stays is an important treatment goal in COPD, because hospitalisation tends to have a negative impact on prognosis, with only 50% of patients still alive 5 years after hospital admission for COPD.

Non-invasive ventilation (NIV) has been found to be effective in life-threatening situations when a patient suffers hypercapnic respiratory failure. However, the role of NIV at home for the long-term management of COPD is less established, leading to confusion about whether it should be used at all. Therefore, a European Respiratory Society (ERS) Task Force has published a guideline providing evidence-based recommendations for the use of NIV at home. The main recommendations are summarised here and in Table 1.

Question 1: Should long-term home NIV be used in stable patients with COPD?

Recommendation: The ERS Task Force suggests that long-term home NIV should be used in patients with chronic stable hypercapnic COPD.

Despite the fact that no guidelines to date recommend the routine use of home NIV in patients with chronic stable hypercapnic COPD, it is increasingly being used in this setting. Early studies investigating its effectiveness had inconsistent findings, probably due to differences in study populations and variances in ventilator settings and usage. More recent studies have used high-intensity NIV, which appears to be more effective. Beneficial effects on survival, shortness of breath, exercise capacity and quality of life (QoL) have been reported. The use of NIV in these patients also appears to be cost-effective because it reduces exacerbations and hospitalisation.

Question 2: Should long-term home NIV be used after an episode of acute hypercapnic respiratory failure in patients with COPD rather than not using NIV?

Recommendation: The ERS Task Force suggests that long-term home NIV can be used in patients with COPD following a life-threatening episode of acute hypercapnic respiratory failure requiring acute NIV, if hypercapnia persists following the episode.

Patients with chronic respiratory failure who experience an acute episode of respiratory failure are likely to have a repeat episode requiring hospitalisation. Some studies have shown that the use of NIV after hospital discharge can reduce re-hospitalisation rates, and can improve breathlessness and some physiological parameters, including arterial partial pressures of CO₂ (PaCO₂) and oxygen, and mean pulmonary artery pressure. However, other studies have not demonstrated an advantage.

Question 3: When using long-term home NIV in patients with COPD, should the settings be adjusted to normalise or at least significantly reduce PaCO₂?

Recommendation: The ERS Task Force suggests titrating NIV to normalise or reduce PaCO₂ levels in patients with COPD.

No clinical trials have specifically targeted PaCO₂ as an endpoint, so the task force considered a subgroup analysis of a larger study. These data were not sufficient to provide definitive recommendations about benefit, but there was minimal evidence of harm. Therefore, the task force decided the balance of evidence was in favour of the intervention.
Question 4: When using long-term home NIV in patients with COPD, should clinicians use fixed-pressure support mode as first choice, rather than adaptive or auto-titrating pressure modes?

Recommendation: The ERS Task Force suggests using fixed-pressure support mode as the first-choice ventilator mode in patients with COPD using home NIV.

Classical modes of operating NIV are comprised of both pressure-targeted and volume-targeted modes. In the former, the inspiratory pressure is fixed, while the volumes delivered can vary. In the latter, the volume is fixed while the pressure can vary. Both modes have been found to be equally effective, although pressure-targeted NIV tends to be better tolerated by patients. Recent advances in NIV devices have enabled adaptive or auto-titrating modes that aim to combine the advantages of volume- and pressure-targeted NIV. However, no advantages in terms of QoL or patient-reported outcomes have been demonstrated. Importantly, there is a risk of harm in the event of an air leak, which could potentially lead to inappropriate low volumes being delivered. Since there is currently insufficient data to assess this potential risk, the task force cannot recommend the use of adaptive or auto-titrating modes at present.

Discussion
Because of the lack of strong evidence from clinical studies, all these recommendations were classified as weak and conditional, with the evidence being low or very low certainty (Table 1). This highlights the need for more well-designed clinical studies.

The guideline also discusses factors that may affect the benefits of long-term home NIV in patients with COPD. The task force reached the following conclusions:

- Age, while being associated with a poor prognosis, should not limit the use of long-term home NIV.
- Mental and physical disability are barriers to the effective use of NIV. Caregivers are needed to assist patients with disabilities.
- Comorbidities, such as cancer, heart disease, obesity, cachexia and obstructive sleep apnoea, are not contraindications to the use of NIV.
- Adherence is key to the effectiveness of NIV. Patients should aim to use NIV for 5 hours a day.
- Humidification may be useful for patients with mucosal dryness.
- Supplemental oxygen can be used in patients with hypoxaemia. The dose of oxygen required during the day may be insufficient at night.
- Pulmonary rehabilitation may increase exercise capacity and QoL.
- It is reasonable to prescribe mucolytics to patients with airway secretions that might be a barrier to NIV.

Finally, the guideline considered monitoring and follow-up of patients during long-term home NIV. Improvements in NIV software have allowed for improved monitoring, and can provide details on adherence, respiratory rate and leakages. A small study found that parameters recorded by NIV devices can even predict exacerbations. The task force recommended that clinical evaluation should focus on symptoms of nocturnal hypoventilation and patient discomfort.

In summary, the ERS guideline supports the use of long-term NIV in targeting a reduction in $\text{CO}_2$ in COPD patients with persistent hypercapnic respiratory failure.
References