

ERS pocket guidelines on long-term home non-invasive ventilation for management of COPD



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Question #1: Should long-term home (LTH) NIV be used in stable patients with COPD as compared to not using NIV?

Recommendation

The ERS TF suggests LTH-NIV be used for patients with chronic stable hypercapnic COPD

- **Conditional recommendation**
- **Low certainty evidence**

Evidence on benefits and harms

- NIV may have little positive effect on mortality and hospitalizations
- NIV decreases dyspnea scores, improves gas exchange, exercise capacity and health-related quality of life (HRQL)
- The effect of LTH-NIV on sleep quality is unclear due to a limited number of studies that applied heterogeneous sleep assessment methods
- Minor adverse events such as discomfort, skin damage, or rash are more common with NIV therapy

Rationale of recommendation

The recommendation is based on the favourable impact of LTH-NIV on patient's centred outcomes such as HRQL, dyspnea, and exercise tolerance. The evidence also suggests the possibility of a small reduction in mortality and hospitalizations achievable with LTH-NIV. Overall, the benefits are felt to outweigh the potential harms of NIV including its minor adverse events.

Implementation considerations

Although the presence of stable hypercapnia is one of the primary drivers to prescribe LTH-NIV in COPD, the published data showed only a limited effect of NIV upon PaCO₂ levels if the ventilator setting was not titrated to the target of normal PaCO₂ values.

NIV should be implemented based on patient-related factors, including individual values and preferences.

NIV may be cost-effective, especially in patients with frequent exacerbations and hospital admissions. The overall cost-effectiveness of NIV therapy depends on further variables such as strategy for initiating NIV and close monitoring and follow-up including home care. Economic constraints may strongly limit the applicability of LTH-NIV in less developed countries.

Question #2: Should LTH-NIV be used after an episode of acute hypercapnic respiratory failure in patients with COPD as compared to not using NIV?

Recommendation

The ERS TF suggests LTH-NIV 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

- **Conditional recommendation**
- **Low certainty evidence**

Evidence on benefits and harms

- Use of LTH-NIV after an exacerbation is not associated with a reduction in mortality but may reduce the rate of exacerbations and hospitalizations
- It is also associated with improvement in dyspnea and HRQL

Rationale of recommendation

The recommendation is primarily based upon the desirable effects of LTH-NIV after a life-threatening episode of acute on chronic respiratory failure, which suggest a small potential reduction in exacerbations and hospitalizations.

Similar drawbacks correlated with the heterogeneity of the studies have to be considered for the assessment of LTH-NIV effects both in stable and in post-exacerbated COPD patients

Implementation considerations

Early assessment for hypercapnia may lead to the inclusion of a subset of patients with spontaneously reversible hypercapnia. Therefore, reassessment of hypercapnia 2-4 weeks after the initial episode should be considered to identify those patients who are most likely to benefit from LTH-NIV.

Initiating NIV after exacerbation may be more feasible only for some centres that use clinical protocols for initiation of LTH-NIV after discharge.

Question #3: When using LTH-NIV in COPD patients, should NIV settings be titrated to normalise or at least cause a significant reduction in PaCO₂ as compared to titrating not according to PaCO₂ levels?

Recommendation

The ERS TF suggests titrating LTH-NIV to normalise or reduce PaCO₂ levels in patients with COPD

- **Conditionnal recommendation**
- **Very low certainty evidence**

Evidence on benefits and harms

- A reduction or normalisation of PaCO₂ level can be achieved by high-pressure and/or high-intensity NIV.
- There is no effect of high intensity NIV on HRQL, exercise capacity, and sleep comfort.
- The clinical significance of hemodynamic and cardiovascular effects of high intensity NIV needs further evaluation.

Rationale of recommendation

Even if a short term cross over physiologic study demonstrated the advantage of applying high-intensity/high pressure LTH-NIV in hypercapnic COPD patients, no long-term randomised controlled trial has shown the benefit of a strategy that aims to achieve the greatest PaCO₂ reduction comparing to a strategy that does not.

The suggestion of using high intensity/high pressure NIV is based on the consideration that even if the benefit of this strategy is uncertain, the potential harms of targeting NIV to maximize PaCO₂ reduction are minimal.

Implementation considerations

The use of high-pressure and/or high-intensity strategy is associated to a better compliance to LTH-NIV.

Targeting NIV to achieve the greatest degree of PaCO₂ reduction may require longer hospital stay and therefore costs to obtain patient's adaptation. Accordingly, the ERS task force recognises that this strategy is not feasible in all patients.

Question #4: When using LTH-NIV in COPD patients, should we use fixed pressure modes as compared to adaptive or auto-titrating pressure modes?

Recommendation

The ERS TF suggests using fixed pressure support mode as first-choice ventilator mode in patients with COPD using LTH-NIV

- **Conditionnal recommendation**
- **Very low certainty evidence**

Evidence on benefits and harms

- Fixed pressure support mode is the only mode that has been evaluated in long-term randomised controlled trial assessing the effects of LTH-NIV in COPD patients.
- The use of adaptive or auto-titrating modes of ventilation may have only a small advantage in terms of PaCO₂ reduction over fixed pressure modes without any benefits in terms of other outcomes such as sleep quality, exercise capacity or, HRQL.
- Adaptive or auto-titrating modes of ventilation may be harmful in presence of severe air leaks as in these circumstances the wrong estimation of tidal volume may result in patient's under-assistance with hypoventilation.

Rationale of recommendation

In consideration of the scanty advantages favouring the use of adaptive or auto-titrating mode of ventilation over fixed pressure support modes against the potential risks of the formed modes in case of severe air leaks (i.e. hypoventilation), the ERS task force suggests the application of fixed pressure support modes as first choice modality of ventilation for long-term treatment of COPD. Moreover, the wide range of algorithms underlying the software of adaptive or auto-titrating modes built in the different ventilators by the manufacturers makes the results obtained with one device not to be replicable with another one.

Implementation considerations

Patients with COPD who are candidates for LTH-NIV should be treated with a fixed pressure support mode. The use of other modes requires higher skills by the clinician with a particular attention to the monitoring of leaks according to the software of the chosen device.

Narrative Question #1: Do other factors impact the effectiveness of LTH-NIV in COPD?

Patient related factors

- Adherence to therapy (>5 hours) has a key role in the efficacy of LTH-NIV
- The initiation of LTH-NIV in patients with advanced COPD requires a high amount of motivation and cooperation and it is necessary to allow the patient sufficient time to adapt to NIV
- Older age is not a contraindication for LTH-NIV
- Obese patients and patients with overlap syndrome (COPD and OSAS) make up the subgroup that may benefit the most from LTH-NIV
- Cachectic COPD patients who usually suffer from severe dyspnoea and weakness of the respiratory muscles may benefit from LTH-NIV
- Mental and/or physical disability and a lack of sufficient help of caregivers may significantly impair the efficacy of LTH-NIV

Equipment related factors

- Many technical details with home ventilators, masks, tubes and humidification can decrease tolerance, efficacy and produce secondary effects, affecting adherence to the treatment
- Oronasal masks are used more often as interface but the choice should be carefully tailored to the patient choice
- Home ventilators can be used with a single circuit ventilation system with vented masks or circuits with expiratory valves
- Active humidification is sometimes suggested for NIV for patient comfort and improved adherence
- NIV device with an internal battery should be considered for patients using NIV for longer periods of time

Narrative Question #2. How clinicians monitor and follow-up patients during LTH-NIV?

- The key point is to document a reduction in PaCO₂ during NIV
- Clinicians should aim to monitor NIV therapy especially for
 - Compliance of patient and possible discomfort problems
 - Symptoms for nocturnal hypoventilation
 - Gas exchange (transcutaneous oxygen saturation and carbon dioxide tension)
- New developments in technology enables data transfer from devices, such as compliance, respiratory rate and leaks, which may be helpful during follow-up of these patients