Storgaard LH, Hockey H-U, Laursen BS, Weinreich UM.
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Long-term effects of oxygen-enriched high-flow nasal cannula treatment in COPD patients with chronic hypoxemic respiratory failure

AIM:

To determine the long-term effects of adjunct nasal high flow (NHF) home therapy in patients with chronic obstructive pulmonary disease (COPD) with chronic hypoxemic respiratory failure treated with long-term oxygen therapy (LTOT)

METHOD:

Patient group

Outpatients with chronic hypoxemic respiratory failure previously prescribed LTOT at least 3 months prior to the start of the study

Study design

- Prospective, randomized comparison of LTOT (control group) versus LTOT plus NHF therapy delivered at home
    - Four outpatient clinics in the North Jutland Region of Denmark

Primary outcome measure

- Rate of acute exacerbation of COPD (AECOPD)
    - Defined as worsening of symptoms (worsening of dyspnea, cough, and sputum production) for more than 2 consecutive days leading to treatment with systemic glucocorticoids or antibiotics
    - Evaluated from patients' diary cards and hospital admission records

Secondary outcome measures

- Hospital admissions
- Dyspnea was evaluated by the modified Medical Research Council (mMRC) score
- Quality of life was assessed using the St. George's Respiratory Questionnaire (SGRQ)
- Partial pressure of arterial carbon dioxide ($PaCO_2$)
- Exercise performance was assessed by the 6-minute walk test (6MWT)
- All-cause mortality

Treatment regimen

- LTOT (control group) with a flow rate of 1.6 L/min at baseline

OR

- LTOT plus NHF home therapy delivered by Airvo™ via Optiflow™ nasal cannula (both from Fisher & Paykel Healthcare) at a flow rate of 20 L/min
    - NHF was initiated at 15 L/min, and flow was titrated over 30 minutes at the baseline visit
    - Patients were instructed on the use of NHF therapy and recommended to use it for 8 hours/day (preferably at night), however there were no restrictions in the duration of use nor time of day
- Both groups received medical care by their usual healthcare providers during the study period, including treatment for AECOPD
- The usual providers of LTOT homecare (AGA, Linde Healthcare, Dronninglund, Denmark) delivered and serviced the NHF system during regular home visits

RESULTS:

Intent-to-treat patients

- 200 outpatients were randomized to:
  - LTOT (n = 100; 63% female, mean age 70.4 years, LTOT for a mean of 33.5 months prior to study inclusion) OR
  - LTOT plus NHF home therapy (n = 100; 56% female, mean age 71.0 years, LTOT for a mean of 28.9 months prior to study inclusion)
- There were no statistical differences between the two groups, apart from the mMRC score, which was higher in the NHF-treated patients (3.3 versus 2.9; P = 0.008)
- The mean oxygen flow during LTOT remained unaltered at 12 months in both groups (1.6 L/min in the NHF home-therapy group and 1.7 L/min in the control group)

NHF outcomes

- On average, NHF home therapy was used for 248 days for 6 hours/day
  - Within the first month, 14% of NHF home-therapy-treated patients stopped therapy
  - The remaining 86% used NHF home therapy for 286 days for 7 hours/day on average
  - By the end of the study, 33% of the NHF-treated patients and 29% of patients in the control group had left the study

Primary endpoint

- AECOPD rates (primary outcome) were significantly lower in the NHF therapy group than the control group (3.12 versus 4.95 per patient/year; P < 0.001)
  - A reduction in AECOPD occurred with increasing use of NHF (P < 0.001)

Secondary endpoint

- There was no significant difference in hospital admission rates in the NHF therapy group compared with the control group (1.08 versus 1.22 per patient/year; P = 0.373)
  - However, modeled hospital admission rates (using actual days of use of NHF therapy as an explanatory continuous variable) predicted that hospital admissions were reduced with NHF home therapy use (0.79 versus 1.39 per patient/year for 1 year of use versus zero use; P < 0.001)
- The mMRC scores were significantly improved at 3 months from baseline in the NHF home-therapy group (P < 0.05 versus baseline)
  - From 3 months onward, the mMRC scores were significantly lower in the NHF group than the control group (P < 0.001)
- The SGRQ total score was better in the NHF therapy group than in the control group at 6 months (P = 0.002) and 12 months (P = 0.033)
- $PaCO_2$ was significantly lower (P = 0.005) and 6MWT significantly higher (P = 0.005) in the NHF home-therapy group than in the control group at 12 months
- There were no significant differences in baseline-adjusted changes in FVC%, FEV_1/FVC, pH, PaO_2 or SaO_2 between the treatment groups at 6 or 12 months
  - There was a trend toward increased FEV_1% in NHF home-therapy-treated patients, compared with the control group, at 6 and 12 months (P = 0.084 and P = 0.056, respectively)
- There was no significant difference in all-cause mortality between NHF home-therapy-treated patients and the control group (15% versus 12%, P = 0.636)

CONCLUSION:

In patients with COPD and hypoxic failure treated with LTOT, adjunct use of NHF home therapy reduced AECOPD, symptoms and the modeled hospital admission rates

KEY POINTS:

In patients with COPD and hypoxic failure treated with LTOT:

- Adjunct long-term use of NHF home therapy reduced AECOPD in patients
- Adjunct NHF home therapy significantly reduced the mMRC scores and preserved the SGRQ and 6MWT
- Adjunct long-term use of NHF home therapy significantly reduced $PaCO_2$
- Adjunct NHF home therapy did not significantly affect all-cause mortality rates

NOTE:
Fisher & Paykel Healthcare contributed equipment, administration costs, and statistical analysis costs.