Impact of outpatient adaptation to home mechanical ventilation on health-related quality of life in patients with COPD: the OutVent study

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Abstract

Background Home mechanical ventilation (HMV) is indicated in patients with severe hypercapnic COPD. Initiation of HMV commonly occurs during an inpatient period, but there has been increasing interest for outpatient adaptation. This study aimed to evaluate the outpatient initiation and adaptation of HMV and its impact on health-related quality of life (HRQoL) in patients with severe COPD.

Methods A single-group pre-test–post-test study was conducted in an outpatient ventilation clinic of a tertiary hospital in Portugal. Patients with severe COPD and symptoms of chronic respiratory failure with daytime partial pressure of carbon dioxide (P_{CO_2}) ⩾50 mmHg in a stable condition or with persistent hypercapnia ⩾53 mmHg >14 days following an exacerbation with mechanical ventilation were included. After 3 months of HMV, patients completed the severe respiratory insufficiency (SRI), the S3-noninvasive ventilation (S3-NIV) and a patient experience questionnaire.

Results 53 patients (73.6% male, median 71 (p25–p75 61–77) years), with a median forced expiratory volume in 1 s of 35 (29–40)% and a median baseline P_{CO_2} of 53.5 (51.9–56.5) mmHg completed the study. At 3 months patients had a median HMV usage of 6.5 h and decreased their P_{CO_2} by 6.0 mmHg. After 3 months, there was a significant improvement in the SRI summary scale (+5.7), above the minimal clinically import difference of five. Patients who used HMV for more than 5 h had higher S3-NIV total score (6.8 *versus* 5.7, p=0.04) and S3-NIV sleep and NIV-related side effects subscore (7.1 *versus* 5.7, p=0.03).

Conclusion Our findings might indicate that outpatient initiation and adaptation of HMV has a positive impact in short-term HRQoL in patients with COPD and that this approach is perceived as a positive experience by the patients.

Introduction

COPD is the third-leading cause of death globally and its burden is projected to increase in the coming decades due to continued exposure to risk factors and an ageing population [1]. Improved awareness, availability of diagnostic techniques and treatment of the disease and comorbidities will lead to longer survival periods and an increasing number of patients with chronic respiratory failure. In addition, most recent studies suggest a trend towards a wider range of indications for home mechanical ventilation (HMV) in patients with stable COPD [2, 3]. It is therefore expected that a large number of patients with COPD will require HMV during their lifetime. In a resource-limited system, it is thus anticipated that exclusive inpatient initiation, adaptation and follow-up of HMV treatment may not be feasible [4].

In most studies on HMV in COPD, initiation of HMV occurred during an inpatient period [5–9]. The aim of nocturnally controlling HMV is to reliably assess overnight physiological responses when HMV is typically applied. Although it is the gold standard for HMV adaptation, it implies extensive night-time measurements, high demand for hospital beds and specialised staff, generating delays and increasing costs. The HOT-HMV trial demonstrated improvement in the 12-month risk of readmission or death in patients with persistent hypercapnia 2–4 weeks after an acute exacerbation of COPD [6]. However, in resource-limited settings (especially bed availability) it will probably be quite difficult to guarantee these timings.

Patients with COPD under HMV also require regular follow-up visits, which are inevitably needed to monitor HMV efficiency, adherence to treatment and associated problems (technical or clinical). These follow-up visits are also sometimes performed in an inpatient setting, which is an added burden for patients and the system.

There is increasing interest and evidence for outpatient initiation and follow-up of patients with COPD requiring long-term HMV [10, 11]. Using telemedicine, home adaptation to HMV has been described as a valuable and noninferior alternative to inpatient adaptation in patients with COPD [12], a restrictive chest wall and neuromuscular diseases [13].

The outpatient setting has demonstrated cost-effectiveness for COPD patients, primarily attributed to reduced hospitalisation rates [12]. However, implementing telemonitoring protocols may necessitate additional dedicated physician and nurse time due to the intensive nature of telemonitoring and the need for experienced staff. This requirement poses challenges in resource-limited settings and may present difficulties for integration into routine clinical practice [14].

There is a reduced number of studies addressing outpatient adaptation to HMV and mostly in patients with restrictive diseases such as neuromuscular [14–18], obesity hypoventilation syndrome [14, 15, 19] and/or restrictive chest wall disease [14–16]. A Spanish trial [14] was the first to also include patients with COPD and its results suggest the effectiveness and cost reduction of this strategy. However, only one patient with COPD was included in each arm [14]. Studies on larger or exclusive samples of patients with COPD are lacking.

The importance of health-related quality of life (HRQoL) has increased in recent years and it is now one of the most common end-points in randomised controlled trials (RCTs). A recent guideline on long-term HMV for the management COPD defined it as a critical outcome in all its questions [20]. We hypothesised that many stable COPD patients could benefit from an adaptation to HMV in an outpatient hospital setting with close follow-up to ensure patient safety and that this model might have a positive impact in patient-reported outcomes such as HRQoL and symptom burden. This model has not been the subject of many studies, and those that have been conducted have focused more on the feasibility of the model and less on the patient experience [16].

Therefore, the main aim of this study was to evaluate the impact of outpatient initiation and adaptation of HMV on HRQoL in patients with COPD. As secondary objectives, we aimed to investigate whether there are significant differences between initiation following an exacerbation or in stable disease and to evaluate patient experience with the outpatient initiation.

Methods

Study design

This was a prospective quasi-experimental study, with a single-group pre-test–post-test design, conducted in the Outpatient Ventilation Clinic of the Pulmonology Department at the Centro Hospitalar de Vila Nova de Gaia/Espinho, a tertiary care teaching hospital in Portugal. The study was conducted between January 2021 and June 2023 and was approved by the Ethics Committee of the Centro Hospitalar de Vila Nova de Gaia/Espinho (reference 264/2019-1). Participation in this study required a previous informed consent signed by the patient or his/her legal representative.

Participants

Adult patients with COPD grade 3 and 4, defined by Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines [1], and chronic respiratory failure (CRF) with daytime partial pressure of carbon dioxide (P_{CO_2}) ⩾50 mmHg in a stable condition [3] or persistent hypercapnia ⩾53 mmHg for more than 14 days following an exacerbation requiring mechanical ventilation were included [6].

Exclusion criteria were refusal to participate or refusal to initiate HMV, significant obesity (body mass index (BMI) ⩾35 $kg \cdot m^{-2}$), presence of significant concurrent obstructive sleep apnoea in patients with a

clinically compatible scenario (as defined with an apnoea–hypopnea index (AHI)>15 events·h^{-1} in an outpatient level 3 or level 1 polysomnography) and the presence of an acute exacerbation (severe worsening of symptoms during the last 2 weeks, a respiratory rate >30 min, a pH<7.35 or with signs of respiratory infection) [5, 6].

Intervention

The HMV Outpatient Clinic is part of the Pulmonology Department and it works similarly to a day hospital, with multiple patients being evaluated and/or ventilated at the same time. The team consists of a pulmonologist, a respiratory nurse and a healthcare worker from the home respiratory care company (provider of HMV in Portugal).

After receiving information about the disease and treatment, willing patients were adapted and titrated to HMV during the daytime with the ventilator and interface that they will afterwards use at home. We performed limited monitoring such as oximetry, heart rate and blood pressure during ventilation. The ventilator settings and adjustments were aimed at correcting hypoventilation within patient tolerance and controlling side effects. To that effect, expiratory positive airway pressure (EPAP) was started at 4 cmH_2O per protocol.

At baseline, inspiratory positive airway pressure (IPAP) was titrated during the daytime for at least 1 h with blood gas analysis (BGA) and/or capnography (Sentec digital monitoring system).

Patients and caregivers (if present) were instructed in the proper handling and maintenance of the ventilator and interface. Patients were instructed to use the hospital main telephone number to contact the Outpatient Clinic if there was any problem or doubt.

After 1 month, the parameters were adjusted according to the patients' symptoms and tolerance, analysis of night-time oximetry with HMV, BGA and ventilator data software. If hypercapnia was present and, as tolerated by the patient, the IPAP was increased aiming to normalise the P_{CO_2}. EPAP was increased in case of significant upper airway obstruction/desaturation.

Patients were reassessed at 3 months, as per the usual clinic protocol.

Data collection

The primary end-points at 3 months were successful HMV initiation and improved HRQoL, as measured by the severe respiratory insufficiency (SRI) questionnaire. Treatment side effects and patients' experience were only assessed at 3 months using the S3-noninvasive ventilation (S3-NIV) questionnaire and a patient-reported experience.

SRI

The SRI questionnaire [21] is self-administered and addresses seven subscales: respiratory complaints (SRI-RC), physical functioning (SRI-PF), attendant symptoms and sleep (SRI-AS), social relationships (SRI-SR), anxiety (SRI-AX), psychological well-being (SRI-WB) and social functioning (SRI-SF). The summary score and subscales range from 0 to 100, with a high score indicating a good HRQoL [21]. The Portuguese version used in this study has been validated with good psychometric properties [22]. A minimal clinical important difference (MCID) of five points has been estimated for patients with severe COPD [23].

S3-NIV

The S3-NIV [24] is a self-administered, short and simple questionnaire assessing disease and treatment impact, while also addressing respiratory complaints, sleep and side effects. It has been validated for the Portuguese population showing a good internal consistency [25]. The questionnaire has two subscores: the "respiratory symptoms" subscore and the "sleep and side effects" subscore. It contains 11 items answered on a five-point Likert scale. The lowest possible score (0) corresponds to the highest impact of disease and treatment.

Patient experience questionnaire

This self-administered questionnaire includes 12 questions regarding autonomy of handling HMV, perspectives regarding information at initiation, time until adaptation, side effects and benefits related to HMV, perspectives regarding treatment impact on disease and personal well-being. The questionnaire was designed by the research team as a multiple-choice format, with items related to information and perceived side effects and benefits allowing multiple answers (and open-ended options for the latter two items) [26].

Other measurements

Demographic and physical information (age, sex and BMI) was collected at enrolment. Daytime arterial blood gas (ABG) analysis was performed according to standard recommendations: assessed in sitting patients without ventilation and without supplemental oxygen at enrolment and at 3 months [27]. Pulmonary function test data were obtained from the electronic health records if obtained in the previous 12 months or performed before patient enrolment (Masterscreen Body®, Jaeger, Germany). If a patient presented with a clinical suspicion of concomitant sleep apnoea, a sleep study was performed (Alice PDx, Philips®, The Netherlands) and AHI and percentage time saturation of oxygen <90% was recorded.

ABG analysis was repeated after 1 month. Ventilator parameters and daily usage were recorded by the readout of the ventilator's built-in software (ResMed AirView® and Philips Care EncoreAnywhere® platforms).

Ventilation parameters and daily usage were recorded by the readout of the ventilator's built-in software.

Sample size estimation

A minimal clinically important difference of five points on the SRI questionnaire has been proposed in patients with severe COPD [23]. To detect this difference, for a matched-pair design, pre- and post-assessment, assuming an SD of 14, 50 patients would be needed to provide 80% power, with a one-sided significance level of 0.05.

Statistical analysis

Data are presented as mean and SD or median and 25th and 75th percentiles (p25–p75), depending on the data distribution, for quantitative variables and as absolute frequencies and percentages for categorical variables. Normality was assessed using the Kolmogorov–Smirnov test. The paired samples t-test or the Wilcoxon signed-rank test was used to compare the SRI summary scale and subscales at baseline and 3 months. Pearson or Spearman correlations (depending on the data distribution) were performed to evaluate the correlation between the SRI and S3NIV summary and subscales and median ventilator use and P_{CO_2} measurements. Statistical calculations were performed using IBM SPSS Statistics for Windows, version 25.0 (IBM Corp., Armonk, NY, USA). Two-sided or one-sided (where appropriate) significance was assumed for $p<0.05$.

Results

Participants

70 patients were screened, 59 were enrolled and 53 completed the study (figure 1). During the study period, three exacerbations and two hospitalisations were reported. The latter in patients with low adherence and refusal to continue HMV, who ultimately died. During the follow-up period, five patients died, two of them refused to continue HMV and the remaining three patients had very low adherence at the 1-month evaluation (median usage from 20 min to 1 h 20 min).

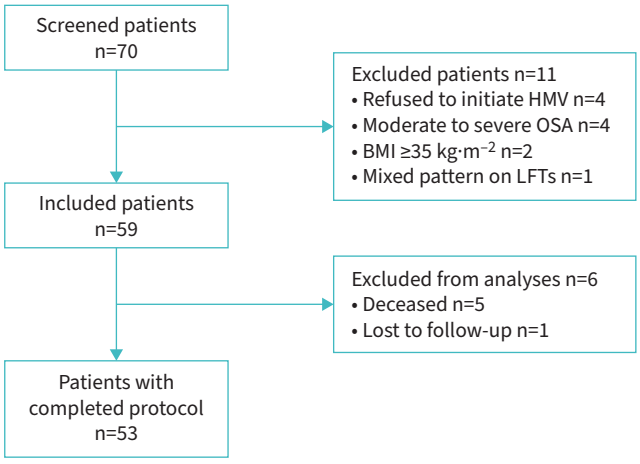

FIGURE 1 Flowchart diagram. HMV: home mechanical ventilation; OSA: obstructive sleep apnoea; BMI: body mass index; LFTs: lung function tests.

TABLE 1 Baseline patient characteristics (n=53)

Male, n (%)	39 (73.6)
Age, years	71 (61–77)
BMI, kg·m^{-2}	27 (22.5–28.5)
Smoking status	
Current or former smoker, n (%)	45 (84.9)
Pack-years	35 (25–50)
Lung function	
FEV_1 (% predicted)	35.0 (28.7–40.0)
FVC (% predicted)	66.0 (55.0–74.7)
TLC (% predicted)	112.0 (96.0–29.0)
RV (% predicted)	170.0 (144.0–205.0)
Apnoea–hypopnea index (events·h^{-1})$^{\#}$	5.8 (1.6–10.2)
⩾1 exacerbations in the previous year, n (%)	27 (50.9)
Median exacerbations in the previous year	1.0 (0–1.0)
⩾1 hospital admission in the previous year, n (%)	19 (35.8)
Median admissions in the previous year n	0 (0–1.0)
Blood gas analysis	
pH	7.39 (7.37–7.41)
P_{O_2} mmHg	60.7 (55.7–65.3)
P_{CO_2} mmHg	53.5 (51.9–56,5)
HCO_3 mmol·L^{-1}	30.3 (28.8–32.1)

Data are presented as n (%) or median (25th–75th percentiles), unless otherwise indicated. BMI: body mass index; FEV_1: forced expiratory volume in 1 s; FVC: forced vital capacity; TLC: total lung capacity, RV: residual volume; P_{O_2}: partial pressure of oxygen; P_{CO_2}: partial pressure of carbon dioxide. $^{\#}$: Only 24 patients performed the sleep study.

Patients' sociodemographic and clinical characteristics are shown in table 1. Patients were predominantly male (73.6%), with a median age of 71 (p25–p75 61–77) years. They had a median post-bronchodilation forced expiratory volume in 1 s of 35 (29–40)% predicted and a baseline P_{CO_2} of 53.5 (51.9–56.5) mmHg (table 1). Half of patients (50.9%) had at least one exacerbation (median 1.0, 0–1.0) and one-third (35.8%) had been hospitalised in the previous year (median 0, 0–1.0).

HMV adherence and ventilation parameters

At 3 months, patients had a median HMV usage of 6.5 h and improved their P_{O_2} by 7.0 mmHg and decreased their P_{CO_2} by 6.0 mmHg (table 2). At 3 months, 39 patients (73.6%) were using their ventilator for at least 5 h.

HRQoL

Table 3 presents the results of HRQoL. There was an overall improvement in the SRI questionnaire, being statistically significant in the summary scale (+5.7 (95% CI 2.4–9.1)) and respiratory complaints

TABLE 2 Blood gas analysis and ventilation parameters at 3 months (n=53)

Blood gas analysis	At 3 months	Change from baseline	p-value
P_{O_2} mmHg	65.9 (60.6–73.2)	7.0 (1.9–10.1)	<0.001
P_{CO_2} mmHg	48.1 (45.5–50.4)	−6.0 (−8.6– −3.5)	<0.001
Ventilation parameters			
IPAP, cmH_2O	19.0 (16.0–22.0)		
EPAP, cmH_2O	4.0 (4.0–4.0)		
BURR, cpm	16 (14–16)		
Oronasal mask, n (%)	53 (100)		
Usage (h)	6.5 (4.3–7.9)		
Night-time oximetry			
Mean S_{aO_2}	92.0 (91.0–93.2)		
% time S_{aO_2} below 90%	3.2 (1.0–14.6)		

Data are presented as median (25th–75th percentiles), unless otherwise indicated. P_{O_2}: partial pressure of oxygen; P_{CO_2}: partial pressure of carbon dioxide; IPAP: inspiratory positive airway pressure; EPAP: expiratory positive airway pressure; BURR: back-up respiratory rate; cpm: cycles per minute; S_{aO_2}: arterial oxygen saturation.

TABLE 3 Health-related quality of life measured by the severe respiratory insufficiency questionnaire (SRI), at baseline and after 3 months of home mechanical ventilation (n=53).

	Baseline mean (SD)	At 3 months mean (SD)	Change mean (95% CI)	p-value
SRI-RC: respiratory complaints	59.4 (20.5)	68.1 (23.5)	+8.7 (4.0–13.3)	<0.001
SRI-PF: physical functioning	51.8 (25.2)	56.8 (23.5)	+5.0 (−1.3–11.3)	0.121
SRI-AS: attendant symptoms and sleep	55.9 (23.9)	64.1 (20.8)	+8.2 (2.7–13.7)	0.004
SRI-SR: social relationships	78.5 (19.6)	84.5 (17.5)	+6.0 (1.7–10.2)	0.007
SRI-AX: anxiety	44.9 (29.2)	51.3 (29.0)	+6.4 (−1.1–14.0)	0.093
SRI-WB: psychological well-being	61.2 (28.2)	65.4 (25.1)	+4.2 (−0.8–9.2)	0.100
SRI-SF: social functioning	61.5 (23.6)	63.2 (23.5)	+1.7 (−3.6–6.9)	0.534
SRI-SS: summary scale	59.1 (18.2)	64.8 (16.6)	+5.7 (2.4–9.1)	0.001

(+8.7 (95% CI 4.0–13.3)), attendant symptoms and sleep (+8.2 (95% CI 2.7–13.7)) and social relations subscales (+1.7 (95% CI −3.6–6.9)) (table 3).

Treatment side effects and patients' experience

At 3 months, patients reported an S3-NIV questionnaire total score of 6.6 (SD 1.8) with a respiratory symptoms subscore of 6.3 (SD 2.4) and a sleep and NIV-related side effects subscore of 6.8 (SD 2.1). Patients' experience regarding initiation HMV and perceived health-related benefits and side effects of long-term HMV are described in supplementary tables 1 and 2. The most common perceived health-related gains were shortness of breath reduction (63.3%), reduction of tiredness (55.1%), a quieter sleep (55.1%) and a reduction in cough (49.0%) and daytime sleepiness (49.0%). The most common side effects were mucosal dryness (71.4%), interface unintentional leaks (51.0%) and mask sores (49.0%). More than two-thirds of patients reported improved health status and well-being after starting HMV and all but two would recommend the treatment to a relative or friend if indicated.

HMV adherence and outcomes

Patients who used HMV for 5 h or more had significant higher S3-NIV total score (6.8 *versus* 5.7; p=0.04) and S3-NIV sleep and NIV-related side effects subscore (7.1 *versus* 5.7; p=0.03) (table 4). No other differences were found.

We found no statistically significant difference in changes in SRI scales between patients who used HMV for 5 h or more and patients who used their ventilator for <5 h at 3 months (supplementary table S3).

15 patients (28.3%) had previously experienced NIV during an acute exacerbation, but only 4 did so in the previous month (7.5%). We found no statistical difference in these groups of patients regarding improvement in SRI questionnaire and S3-NIV score. There was a nonsignificant better daily ventilator usage in patients who had previously experienced NIV (7.3 *versus* 5.6, p=0.051).

Discussion

In this study we demonstrate that the outpatient initiation and adaptation of HMV had a positive impact on HRQoL in patients with COPD and that this approach was perceived as a positive experience by the patients.

TABLE 4 Differences in outcomes based on a cut off daily ventilator usage of 5 h (n=53)

	Total	Usage ⩾5 h	Usage <5 h	p-value
n (%)	53 (100)	39 (73.6)	14 (26.4)	
Change in P_{CO_2} (mmHg)	–6.0 (5.7)	–6.4 (5.4)	–4.6 (6.6)	0.33
Change SRI-SS: summary scale	+5.7 (12.2)	+6.7 (12.3)	+3.0 (11.8)	0.33
S3-NIV total score	6.5 (1.8)	6.8 (1.7)	5.7 (1.9)	0.04
S3-NIV respiratory symptoms subscore	6.3 (2.4)	6.5 (2.5)	5.7 (2.4)	0.28
S3-NIV sleep and NIV-related side effects subscore	6.8 (2.1)	7.1 (1.7)	5.7 (2.6)	0.03

Data are presented as mean (SD). NIV: noninvasive ventilation; P_{CO_2}: partial pressure of carbon dioxide.

Previous studies have demonstrated the benefits of HMV on HRQoL [5, 6, 12, 28], also using condition-specific questionnaires such as the SRI. Our results show not only a statistically significant improvement in the SRI summary scale and in three of its subscales, but also this improvement was above the estimated MCID of five for patients with COPD [23]. It is noteworthy that this improvement was achieved in a shorter period (3 months) than other studies (6 [12] to 12 months [5]).

There are currently few studies that have prospectively evaluated the trajectory of HRQoL among HMV users in the long term with repeated measures. After an improvement from baseline due to treatment response (short-term, up to 3 months), studies with longer follow-up periods have conflicting results. The Kohnlein study showed a stabilisation of HRQoL in COPD in the medium term (6 months).

In HOT-HMV, early HRQoL benefits (SRI and St. George's Respiratory Questionnaire) were observed among HMV users at 6 and 12 weeks post-setup, but these were not sustained at 6 or 12 months [6].

Other RCTs have shown improvements in the SRI in the medium term (6 months) [12] and long term (12 months) but data are only presented at two points (before and after intervention), thus, we cannot speculate on the HRQoL trajectory during that period.

Data from a prospective study by Markussen *et al.* [29] described improvements at 6 years in the total score of SRI in all disease groups, except in patients with COPD, who inclusively had a reduction in five of seven SRI subscales.

A recently published study from our group showed that HRQoL (measured with the SRI) remained stable in surviving patients with HMV at 5 years, including in COPD patients (supplementary data) [30].

The results from the S3-NIV questionnaire at 3 months are similar to the Portuguese validation cohort [25] in terms of total score and respiratory symptoms subscore. It is interesting to note that our results at 3 months are similar to the COPD group of the original validation cohort [24] in terms of total score (6.6 (95% CI 6.1–7.0) *versus* 6.1 (95% CI 5.7–6.5)) and sleep and NIV-related side effects subscore (6.8 (95% CI 6.2–7.3) *versus* 7.0 (95% CI 6.6–7.4)) but slightly higher for the respiratory symptoms subscore (6.3 (95% CI 5.6–6.9) *versus* 5.0 (95% CI 4.5–5.5)). Patients in the original validation study had been on HMV for a median of 45 months for all diseases, but there is no description of lung function tests or time on HMV specific for COPD, so we cannot make judgements on potential reasons for this difference.

In terms of patient experience, most patients described themselves as autonomous with the ventilator, citing good communication with the physician and health team and education about ventilation management at initiation. More than two-thirds of patients reported feeling adapted or comfortable with the ventilator in the 15 days following adaptation. Comparing this study population with a patient-reported experience measure (PREM) study [26] in patients with CRF due to different diseases and using long-term HMV (median 35 months), we found a slightly lower description of health-related benefits and slightly higher reported treatment side effects. Our patients also reported less improvement in health status and global well-being, reinforcing the idea that patients may take longer times to experience the full benefits of HMV. Patient experience measures are gaining momentum as they capture patient experience and their interactions with healthcare systems and clinicians, but a validated PREM specific for HMV is lacking [31]. A COPD-specific PREM is available, but unfortunately specialised care such as HMV is not included, being more focused on everyday life, usual care and self-management [32].

The results from this study show that the outpatient setting can be a viable alternative for the classic inpatient setting and the newly described domiciliary setting for COPD patients. In Portugal there is a large clinical experience in adapting stable COPD patients in the outpatient setting, but prospective studies are lacking [33]. This study demonstrates that the outpatient setting is not only both safe and effective for adaptation of COPD patients to HMV, but also translates into a positive patient experience. It also provides the first prospective national data on this topic, which may inform future national guidelines on how to best select patients for outpatient initiation. Future studies investigating the impact of outpatient HMV adaptation on HRQoL and including cost-effectiveness analysis are the natural step forward.

However, the research team also recognises some potential limitations of the study, such as the single-centre study design and the lack of a control group, the short follow-up and the small sample size. These limitations are however a result of an effort to conduct a real-world study demonstrating the benefits of HMV outpatient initiation, which is becoming increasingly more common in clinical practice. Also, we cannot discard potential biases commonly associated to nonblinding of intervention and patient-reported

questionnaires. Although conclusions must be drawn in this context, the authors believe that this real-world study can inform the design of future multicentre studies, with more robust methods to confirm our findings. The use of a PREM questionnaire designed by the research team can also be seen as a potential limitation. Nevertheless, in the absence of an international validated PREM for this specific population, it was a mitigate measure to include the assessment of patient perspective. Future studies should assess both patients and caregiver perspectives and experience.

It can then be hypothesised that a model such as the outpatient setting, which combines advantages of both the inpatient setting (the specialised teams and possibility of monitorisation and measurements and the possibility of adapting many patients at the same time) and the home setting (no need for hospital admission), may be beneficial for both patients and caregivers.

Regarding outpatient initiation, we believe the main drawback during daytime outpatient adaptation is the unavailability to correctly analyse sleep under HMV and taking a longer time for titration. However, regarding tolerance, we do not know whether it would actually be better for patients to have their ventilator slowly titrated, as some studies suggest [12, 13].

Future research comparing the three strategies and addressing patient- and caregiver-reported outcomes, costs and delays are needed.

Conclusion

Our findings indicate that outpatient initiation and adaptation of HMV could have a positive impact on short-term HRQoL in patients with COPD and that that this approach was perceived as a positive experience by the patients. Long-term and controlled studies are needed to confirm these findings.

Provenance: Submitted article, peer reviewed.

Ethics statement: This study was approved by the Ethics Committee of the Centro Hospitalar de Vila Nova de Gaia/Espinho (reference 264/2019-1). Participation in this study required a previous informed consent signed by the patient or their legal representative.

Conflict of interest: C. Ribeiro reports honoraria for presentation from Vitalaire Portugal outside the submitted work; and travel support and registration for congresses from Vitalaire Portugal, Nippon Gases, Vivisol and Linde Saude, outside the submitted work. C. Jácome has nothing to disclose. P. Oliveira has nothing to disclose. M. Luján reports consulting fees and is a member of the clinical advisory board for Breas outside the submitted work; and honoraria for lectures from Breas, ResMed, Fisher Paykel and Philips, outside the submitted work. S. Conde has nothing to disclose.

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