

Effect of Nurse Home Visits on Extent of Follow-Up of Patients on Long Term Oxygen Therapy

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Abstract

Introduction: Guidelines recommend that patients on home oxygen therapy should be followed up regularly.

Study objective: To compare rate of follow-up at hospitals with opportunity to visit patients on home oxygen therapy at home to the rate of follow-up at hospitals without this facility.

Design and setting: A prospective study of patients on home oxygen therapy from five large hospitals. At three hospitals, a respiratory nurse followed up patients (n=774) either in the outpatient clinic or at home. At two hospitals, home visits of patients on home oxygen therapy (n=438) were not an opportunity. Study period was 4 months.

Results: Compared to hospitals without home visits, hospitals with home visits had followed up significant more patients (41.9% versus 23.3%; $p < 0.001$). Among patients with a follow-up, the majority 388 (91.1%) had chronic obstructive pulmonary disease. Hospitals with home visits checked their patients more frequently in the study period (1.37 versus 1.05; $p < 0.001$), compared to hospitals without home visits. Hospitals with home visits followed up more immobile patients who needed transport on a stretcher.

Patients with chronic obstructive pulmonary disease had higher mortality when they had a home visit compared to patients seen in the outpatient clinic despite the opportunity of home visit (50.6% versus 28.9% deaths; $p = 0.009$), and higher mortality compared to patients with a follow-up by hospitals without the opportunity of home visits (50.6% versus 36.1% deaths; $p = 0.017$).

One hundred sixty patients stated continuous oxygen therapy (15-24 hours/day) in the study period. Forty-three patients had oxygen therapy for at least 3 months without the recommend follow-up 15 (16.7%) versus 23 (40%) from hospitals with and without home visits, respectively.

Conclusion: More patients on home oxygen therapy are followed up, if the hospital has the opportunity to visit the frailest patients at home. This is likely to result in a more optimal oxygen therapy.

Keywords: COPD; Oxygen therapy; Follow-up; Home visit

Introduction

Continuous oxygen therapy (COT) improves survival in hypoxaemic COPD patients [1,2]. The guidelines state that before considering COT the patient should be clinically stable and on optimal medical treatment. In practice, stable hypoxaemia should be assessed at least twice, 3 weeks apart, and within 90 days of discharge from hospital [3,4]. When the patient fulfils the criteria for COT, follow-up once or twice annually is necessary in order to ensure optimal flow rate, correct hypoxaemia, check the compliance of oxygen administration, ensure non-smoking status, and to assess needs of oxygen equipment and proper service from the oxygen supplier [4,5]. However, several studies have shown that very few patients are follow-up sufficiently, and many patients are not follow-up at all [6-10]. One explanation could be that weak COPD patients find transportation to the outpatient clinic too cumbersome. The British Thoracic Society recommends follow-up by a respiratory health worker visiting the patient's home [5]. In various countries, the follow-up in the clinic is combined with home visits by a respiratory nurse [11-14]. The randomized study by Farrero et al. found this practice cost-effective with a decrease in hospital costs used [13]. A lot of COPD patients on COT have no outdoor activity, and therefore have difficulties with follow-up in outpatient clinics [15]. The practice of home visits may improve compliance with follow-up. The aim of the present study was to compare rate of follow-up at hospitals with opportunity to visit patients on oxygen therapy at home with the rate of follow-up at hospitals without this facility, and to describe patients on oxygen therapy that were followed-up in the two schemes. The primary focus of the analyses is the patients with COPD.

Methods

Patients on home oxygen therapy from five large Danish hospitals were included in a prospective study. At two hospitals (Hvidovre and Aalborg), patients on oxygen therapy were only followed up in the outpatient clinic (home visits are not an option), and at three hospitals (Gentofte, Skive, and Aarhus), patients were followed up either in the outpatient clinic or at home by a respiratory nurse (home visits are a part of the home oxygen programme). At all hospitals, pulmonary specialists were responsible for the oxygen therapy.

Measurements in the two settings

Follow-up at both places (home visit and outpatient clinic): changes in underlying respiratory symptoms, spirometry, pulse oximetry breathing room air and supplemental oxygen, respiratory medicine (include inhalation technique), sputum collected when suspected for bacterial infection, arterial blood gases when suspicious

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of hypercapnia or normalization of arterial oxygen tension before stopping home oxygen therapy.

Follow-up only at the outpatient clinic: ECG when suspicious of arrhythmia or ischemic heart disease, chest radiography when pulmonary symptoms change, blood samples when symptoms change.

Follow-up only at home: The patients are checked on their own stationary oxygen system, and the nurse can examine whether it is positioned properly.

Home visits were performed by respiratory nurses under supervision of a chest physician. The nurse made a report of each visit. Changes in the patient's condition were discussed with the chest physician.

Three groups of patients were studied

1) All patients on home oxygen therapy due to cardio-pulmonary disease from the five hospitals in the study period 31.12.2003 to 31.03.2004 (n=1.212). The oxygen companies gave information on all patients on home oxygen therapy from each of the five hospitals.

2) All patients with at least one follow-up within the study period 31.12.2003 to 31.03.2004 (n=426). At each follow-up the respiratory nurse completed a questionnaire on diagnosis relevant for home oxygen therapy, whether the patients were controlled at home or at the hospital (for the hospitals with opportunity to check patients at home), and used transportation to the outpatient clinic. If the patient was visited at home, the respiratory nurse estimated the transport form, which was necessary if the patient was examined at the hospital.

3) All patients who started COT (15-24 hours/day) in the 4-months study period (n=160).

Outcomes

The extent of follow-up (number) in the outpatient clinic or at home with focus on oxygen therapy. Transportation of the patients to the hospital was divided into 4 categories: 1) private transportation by the patients themselves, 2) hospital arranged transportation in a small bus together with other patients, 3) hospital arranged transportation sitting in a car alone (direct from home to hospital and return), and 4) hospital arranged transportation in an ambulance. Vital status of the patients was ascertained by the National Health Services Central Register up to 20th of November 2005. In the survival analyses, the mean follow-up time was 24.6 months (range 21.6 to 26.6 months) and 652 (53.4%) deaths were observed.

Statistics

The chi-squared, two sample t-tests and Mann-Whitney U tests were used as appropriate to compare differences between groups. Kaplan-Meier plot was used to compare survival. Cox regression model

was used to determine whether hospital setting (with or without home visits) and follow-up (yes or no) were individual predictors of survival. Covariates in the multivariate analyses were age (continuous), gender, and diagnosis relevant for home oxygen therapy (COPD, cancer, other pulmonary disease, or heart disease). The results of regression analyses are given in terms of estimated relative risks (hazards ratios) with corresponding 95% confidence intervals (CIs). Data analysis and descriptive statistics were performed with the statistical package for the social sciences (SPSS) ver. 13.0 (SPSS Inc., Chicago, USA). A p-value of <0.05 was considered statistically significant.

Results

Group 1

In the study period 774 and 438 patients were prescribed home oxygen therapy from hospitals with and without home visits, respectively (Table 1). COPD was the most frequent reason for oxygen therapy (64% of those with known diagnosis). Compared to hospitals without home visits, hospitals with home visits treated slightly more COPD patients and had followed up significantly more patients (41.9% versus 23.3%; p<0.001). Survival in the two groups was not different (median 1.7 versus 1.8 years; p=0.33). After correction for gender and age, the risk of dying was 1.03 (95% confidence interval: 0.88-1.22) for patients from hospitals with home visits compared to patients from hospital without home visits. Patients with follow-up were older, more frequently females, had more COPD, and had better survival than patients without follow-up (45.3% versus 58.4% deaths, Log Rank 35.0, p<0.001; Table 2).

When adjusting for age, gender, and diagnosis, patients with at least one follow-up had the same risk of dying compared to patients without a follow-up with hazard ratios 1.21 (95% confidence interval: 0.99-1.50); p=0.057.

Group 2

Among patients with a follow-up the majority 388 (91.1%) had COPD (Table 2). Hospital with home visits checked their patients more frequently in the study period (1.37 versus 1.05; p<0.001), compared to hospitals without home visits (Table 3). Hospitals with home visits followed up more immobile patients who needed transportation on a stretcher (Table 3). Hospitals with the possibility of visiting patients at home chose to follow up 63 (21.6%) COPD patients in the outpatient clinic - mainly patients who didn't need transportation by ambulance (Table 4). COPD patients had higher mortality when they had a home visit (n=228+25) compared to patients seen in the outpatient clinic despite the possibility of home visit (n=38) (50.6% versus 28.9% deaths; Log Rank 6.8; p=0.009), and higher mortality compared to patients with a follow-up by hospitals without the possibility of home visits (n=97) (50.6% versus 36.1% deaths; Log Rank 5.7; p=0.017) (Figure 1).

	All patients, n=1,212	With home visits, n=774	Without home visits, n=438	P-value	
Age, mean, years (SD)	71.4 (11.6)	71.8 (11.7)	70.6 (11.3)	0.08	
Female	59.2%	57.0%	63.2%	0.03	
Diagnosis relevant for home oxygen therapy	COPD (%1)	730 (64.0%)	453 (61.7%)	277 (68.2%)	0.03
	Cancer (%1)	178 (15.6%)	118 (16.1%)	60 (14.8%)	0.56
	Heart disease (%1)	40 (3.5%)	28 (3.8%)	12 (3.0%)	0.45
	Other lung disease (%1)	192 (16.8%)	135 (18.4%)	57 (14.0%)	0.06
	Missing (%)	72 (5.9%)	40 (5.2%)	32 (7.3%)	0.13
Follow-up	35.1%	41.9%	23.3%	<0.001	

Table 1: Follow-up, age, gender and diagnosis of patients with home oxygen therapy in the study group depending on whether they were administered by a hospital with or without home visits by a respiratory nurse.

	With home visits, n=774		Without home visits, n=438		P-value		All patients, n=1,212		
	Follow-up, n=324	No follow-up, n=450	Follow-up, n=102	No follow-up, n=336	Follow-up	No follow-up	Follow-up, n=426	No-follow-up, n=786	P-value
Age, mean, years (SD)	73.3 (9.4)	70.8 (12.9)	73.3 (8.5)	69.8 (12.0)	0.99	0.8	73.3 (9.2)	70.4 (12.5)	<0.001
Female, %	61.4	53.8	72.5	60.4	0.04	0.06	64.1	56.6	0.012
Diagnosis relevant for home oxygen therapy									
COPD, % ¹	89.8	39.5	95.1	59.2	0.10	<0.001	91.1	47.9	<0.001
Cancer, % ¹	0.9	28.0	1.0	19.4	1.0	0.008	0.9	24.4	<0.001
Heart disease, % ¹	0.6	6.3	0	3.9	1.0	0.16	0.5	5.3	<0.001
Other lung disease, % ¹	8.6	26.1	3.9	17.4	0.13	0.006	7.5	22.4	<0.001
Missing, %	0	8.9	0	9.5	NA	0.76	0	9.2	NA

¹among patients with known diagnosis

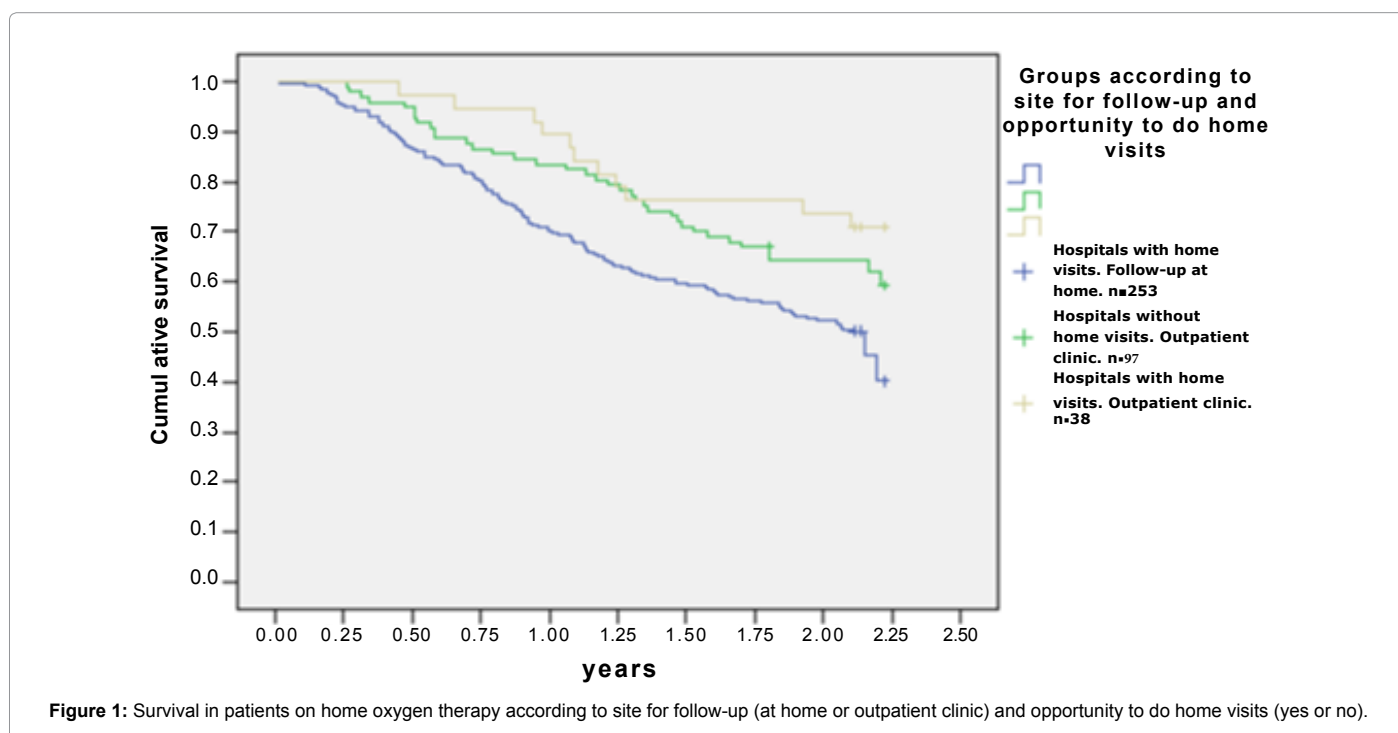
Table 2: Age and gender of patients with home oxygen therapy in the study group depending on whether they were administered by a hospital with or without home visits by a respiratory nurse, and whether they were followed up or not. ¹among patients with known diagnosis; NA: not applicable.

		With home visits, n=291	Without home visits, n=97	p-value	All, n=388
Number of visits per patient (minimum-maximum)		1.37 (1-5)	1.05 (1-3)	<0.001	1.29 (1-5)
Age, mean, years (SD)		73.9 (8.8)	73.8 (7.6)	0.99	73.9 (8.5)
Females, %		61.2	73.2	0.032	64.2
Transport	Lying in an ambulance	83 (28.6)	10 (10.3)	<0.001	115 (23.2)
	Sitting in an ambulance	39 (13.4)	19 (19.6)	0.14	80 (16.1)
	Small bus with other patients	123 (42.4)	38 (39.2)	0.58	208 (41.9)
	By patients themselves	45 (15.5)	30 (30.9)	0.001	93 (18.8)

Table 3: Characteristics of patients with COPD on home oxygen therapy and need of transport according to setting with and without home visits.

		Home visit, n=228	At hospital, n=381	Combination of home visit and at hospital, n=25
Age, mean, years (SD)		74.2 (8.5)	71.4 (10.8)	73.1 (7.8)
Females, %		58.8	57.9	88.0
Transport	Lying in an ambulance	74 (32.5%)	5 (13.5%)	4 (16.0%)
	Sitting in an ambulance	31 (13.6%)	4 (10.8%)	4 (16.0%)
	Small bus with other patients	94 (41.2%)	17 (45.9%)	12 (48.0%)
	By patients themselves	29 (12.7%)	11 (29.7%)	5 (20.0%)

Table 4: Characteristics of 291 COPD patients from hospitals with the opportunity of doing home visits according to the place for follow-up. ¹Necessary type of transport was not known in one patient.



	With home visits, n=90	Without home visits, n=70	P-value	All, n=160
No follow-up and oxygen therapy ≥ 3 months (%)	15 (16.7)	28 (40.0)	0.001	43 (26.9)
No follow-up and oxygen therapy <3 months (%)	39 (43.3)	30 (42.9)	0.94	69 (43.1)
Follow-up within 3 months (%)	36 (40.0)	12 (17.1)	0.002	48 (30.0)

Table 5: Follow-up within three months in patients who started continuous oxygen therapy (15-24 hours per day) depending on whether the hospital has the chance to carry out home visits. 1Included only patients who had oxygen therapy at least three months.

Group 3

One hundred sixty patients stated COT (15-24 hours/day) in the 4-months study period. Forty-three patients had COT at least 3 months without the recommend follow-up -15 (16.7%) versus 23 (40%) from hospitals with and without home visits, respectively (Table 5).

Discussion

Several studies have shown that very few patients on COT are followed up sufficiently [6-10]. In fact, many patients are not followed up at all [6-10], and the extent and the quality of follow-up is very poor when a non-respiratory physician is responsible for the oxygen therapy [7,8]. This is the first study to show that hospitals with an option of visiting patients on oxygen therapy at home followed up more patients than hospitals without this facility. COPD patients, who were visited at home, had more severe disease illustrated by higher mortality rate and less opportunity to deal with transportation to the hospital. Among patients on home oxygen therapy, we have previously shown that lack of outdoor activity among patients on home oxygen therapy is associated with increased mortality [16].

As the majority of the patients start home oxygen therapy immediately after a hospitalization reassessment is recommended after 1-3 months treatment [3,4,8,17-20]. In our study, this reassessment was not performed in 40.0% of the patients from hospitals without home visits and in 16.7% of the patients from hospitals with home visits. We have no information on the quality of this assessment, so the number of patients with poor assessment may be even higher.

This is not a randomized controlled study, and patients on home oxygen therapy in the two settings (with and without home visits) might be different. Age and survival were not different, but the proportion of women and COPD patients was slightly greater among hospitals without home visits compared to hospitals with home visits. However, the strength of this study is the inclusion of several hospitals and a large number of patients.

A lot of patients on oxygen therapy have no outdoor activity [16]. If our patients should be assessed at the hospital, about half of them needed hospital-arranged transport either on a stretcher or sitting alone in a car. Reasons for limitation of outdoor activity are numerous: severe dyspnoea, disturbances of vision, dizziness, and locomotive disorders. Despite portable oxygen some patients do not leave their house with oxygen because they are ashamed or complain of heavy weight of the oxygen system [21]. Beyond the control of more patients, there are also other benefits of home visits. The patients are checked on their own stationary oxygen system and the optimal flow rate necessary to correct hypoxaemia is assessed. The respiratory nurse can examine whether oxygen is positioned properly and assess the need for other aids. Home visits by a respiratory nurse may be supplemented by tele-assistance. A recent randomized controlled trial reported decreases in use of health services in COPD patients needing home oxygen therapy and/or mechanical ventilation treated with a nurse-centred tele-assistance programme (supported by the continuous availability of a 24-h call centre and pulse oxygen device) [22]. In conclusion, this study

demonstrates that more patients on home oxygen therapy are followed up when the hospital has the opportunity to visit the frailest patients at home. This is likely to result in a more optimal oxygen therapy.

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