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Drop-out and attendance in pulmonary rehabilitation: The role of clinical and psychosocial variables

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Summary
Background: In spite of the well-demonstrated benefits for patients with COPD, pulmonary rehabilitation programmes show considerable drop-out and suboptimal attendance rates. The purpose of this prospective study is to examine causes for drop-out and non-attendance during a 12 week multidisciplinary pulmonary rehabilitation programme, and to investigate whether sociodemographic and medical factors as well as patients' perception of their illness are related to drop-out and non-attendance.
Methods: Two hundred and seventeen patients with COPD who were referred to a rehabilitation centre participated in this multicentre study. Prior to treatment, patients received a questionnaire, which included the Illness Perception Questionnaire-Revised. Clinical data were drawn from medical records. Drop-out and attendance were recorded during the programme.
Results: Fifty patients (23%) did not complete the rehabilitation course, of which half was due to medical reasons (e.g. exacerbations, hospitalisations). Non-completion could not be predicted by baseline sociodemographic, clinical or psychological variables. Patients who declined treatment did not differ from patients who dropped out due to medical reasons. On average, patients attended 92% of all scheduled appointments. Of all missed appointments, approximately 20% were accountable to factors beyond patients' control (e.g. absent

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therapists, hospitalisations). Smoking, living alone, a lower fat free mass and lower confidence in treatment increased the chance of patients not attending an appointment during rehabilitation.
Conclusion: In general, adherence in rehabilitation is high. However, paying attention to patients' nutritional status and creating a positive expectation of treatment during referral and intake appear to be important if one aims to optimise patients' attendance during rehabilitation.

Introduction

Multidisciplinary pulmonary rehabilitation programmes have become an important non-pharmacological treatment modality for patients with chronic obstructive pulmonary disease (COPD),[1] with beneficial effects on exercise tolerance, fat free mass, quality of life and perceived fatigue and dyspnea.[1,2] Unfortunately, a considerable proportion of the eligible patients does not complete the rehabilitation programme. Studies with larger study samples ($N > 100$) and a minimum duration of 7 weeks show that non-completion rates usually vary between 20 and 40%,[3–6] although non-completion rates of over 70% have also been reported.[7] Attendance rates during rehabilitation have seldom been reported but appear to vary around 90% for intensive short-term programmes (<12 weeks) with three training sessions a week.[8–10]

High drop-out and non-attendance rates lead to ineffective use of training staff and equipment. Whereas drop-out or non-participation prevent patients from experiencing the potential benefits of rehabilitation, poor attendance is associated with less favourable outcomes of treatment.[11,12] Although drop-out and non-attendance may in some cases be unavoidable (e.g. hospitalisation, transportation difficulties), they can also result from a deliberate decision. According to Leventhal's Common Sense Model,[13] individuals have acquired lay theories about health and illness. These illness schemata, which consist of underlying specific illness cognitions (e.g. the controllability of the illness), guide the individual's actions in order to cope with the health threat. As such, it is not the objective disease characteristics but rather the perception of the illness that results in a specific action. Using their common sense, patients will adhere to a certain treatment only if they consider it a sensible thing to do (i.e. expected to be effective in diminishing the threat to one's health). Interpretation, coping efforts and evaluation of the effectiveness of these efforts can be considered as a cyclical process of self-regulation. Recently, we detailed the contribution of illness perceptions to outcomes in COPD-patients.[14]

The purpose of this prospective study is to investigate drop-out and attendance rates during rehabilitation programmes for patients with COPD and to provide an overview of reasons for drop-out and non-attendance. A second aim of this study is to investigate whether patients' illness perceptions add to the prediction of drop-out and non-attendance after controlling for sociodemographic and medical variables.

Methods and materials

Procedure

Between November 2005 and November 2007, all consecutive patients diagnosed with COPD who had been referred to a centre for pulmonary rehabilitation (Rehabilitation Centre Breda (RCB), Sint Franciscus Gasthuis (SFG), Rijnland Rehabilitation Centre (RRC)) were invited to participate in this study. Patients who consented were contacted before the start of the rehabilitation. Participating patients received a questionnaire and were requested to return it before the start of the rehabilitation. After being informed, patients were asked to give written permission to obtain information from their medical files. Patients who had already started rehabilitation or had primary lung conditions other than COPD were excluded from the study. Patients who stopped attending appointments before the end of the formal rehabilitation programme and who missed the functional follow-up tests were regarded as non-completers. Attendance was derived by comparing patients' weekly appointment schedules with the daily work logs of the individual therapists. Reasons for non-completion and non-attendance were extracted from work logs and patients' medical files. The study was approved by the LUMC and SFG ethics committees and subsequently by the boards of the rehabilitation centres.

Rehabilitation programme

All programmes had a duration of 12 weeks. The rehabilitation programme consisted of supervised exercises (strength and endurance training, activities of daily living (ADL) training), relaxation training, breathing exercises and group education. Additional counselling was tailored to the individual patient's needs and included support by a psychologist or social worker, nutritional interventions, occupational therapy, speech therapy and smoking cessation counselling. All rehabilitation centres offered an outpatient programme of 3 days a week. In Breda an intensive programme of 5 days a week (outpatient or inpatient) was also available.

Baseline assessment

Participants were asked to fill out a questionnaire which included sociodemographic questions (age, sex, education, relational status, smoking status and pack years) and the

Illness Perception Questionnaire-Revised (IPQ-R),[15] a validated and reliable instrument used to assess patients' representations of illness which has been used previously in respiratory research.[16,17] The questionnaire comprises eight subscales: identity (the number and type of symptoms patients associate with their illness), timeline acute/chronic (how long patients think their illness will last), timeline cyclical (whether patients think their condition is always present or is cyclical), consequences (perceived consequences for patients and their social network), illness coherence (the degree to which patients feel they understand the condition), emotional representations (the emotional response to the illness), personal control (how much control patients perceive they have over the illness and symptoms) and treatment control (the strength of belief that the treatment is effective in controlling the disease).

Baseline pulmonary function tests included post-bronchodilator expiratory flow rates and vital capacity. A classification of disease severity (GOLD stage) was made according to international guidelines.[18] A maximum exercise test was performed with a cycle ergometer following the ERS/ATS recommendations.[19] A field exercise test was performed by means of the 6 min walking test. Dyspnoea and perceived exertion (Borg CR10) were assessed after the walk test.[20] Patients' body mass index (BMI) and fat free mass index (FFMI) give an indication of the systemic effects of the disease. The Medical Research Council (MRC) dyspnoea scale was used to assess patients' level of breathlessness during daily activities.[21]

Statistical analyses

Descriptive statistics (frequencies, mean and standard deviation) are used to present patients' background and medical characteristics, drop-out and attendance rates, as well as reasons for drop-out and non-attendance. *T*-tests, Chi-square tests, and analyses of variance are applied to study differences between subgroups of patients. Kruskal—Wallis was used where assumptions for parametric tests had been violated. Using hierarchical logistic regression analyses with forced entry it was tested whether illness perceptions added to the prediction of drop-out and high vs. poor attendance after entering sociodemographic and clinical variables which showed at least borderline univariate association with the outcome variable ($p < 0.1$).

Results

A total of 331 patients gave permission to be contacted by the researcher. Of these, 263 patients (79%) who had not started their treatment agreed to participate in this study and received a questionnaire. Medical charts showed that nine patients had a diagnosis other than COPD (e.g. lung cancer, cystic fibrosis). Of the 254 remaining patients, 217 (85%) returned the questionnaire. There were no significant differences between patients who returned the questionnaire and those who did not in sociodemographic or clinical variables. Our study population consisted of slightly more men (56 vs. 44%, see also Table 1). Most patients had a partner (76%) and had stopped working (82%). Most patients were ex-smokers (self-report). There was a large variation in pack years ranging from 3 to 126 years. Nearly 40% of the patients suffered from severe COPD (stage III, GOLD international classification of disease severity). On average, patients walked 378 m in 6 min (range 250—648 m).

Table 1 Baseline characteristics of study sample ($N = 217$).

	Mean	(SD)	*N*	%
Age	63.4	(9.4)		
Sex				
Female			95	44
Male			122	56
Education				
Elementary school			54	25.4
Lower vocational training			97	45.5
Secondary educational training			45	21.1
Higher vocational training or university			17	8.0
Relational status				
Partner			163	75.5
Single			53	24.5
Working status				
Active			39	18.1
Retired			176	81.9
Smoking status				
Never smoker			18	8.4
Stopped smoking			167	77.7
Infrequent smoker			12	5.6
Daily smoker			18	8.4
GOLD stage				
I			17	8.0
II			61	28.6
III			82	38.5
IV			53	24.9
FEV_1 (l)	1.27	(0.64)		
$FEV_{1\%}$pred	46.0%	(20.7)		
SaO_2 rest %	94.7%	(2.4)		
VO2max (ml/min)	1102	(360.5)		
VO2%pred	64.7%	(21.2)		
Wmax	62.2	(34.7)		
Wmax %pred	46.2%	(22.4)		
6MWD (m)	378	(117.0)		
Borg exertion Post6MWD	4.3	(2.3)		
Borg dyspnoea Post6MWD	4.8	(2.1)		
BMI (kg/m^2)	27.8	(5.5)		
FFMI (kg/m^2)	16.9	(2.7)		
Pack years	39.8	(22.9)		

FEV_1, forced expiratory volume in 1 s; $FEV_{1\%}$pred, percentage of predicted FEV_1; SaO_2 rest %, oxygen saturation; VO2max maximal oxygen uptake; VO2% pred percentage of predicted VO2max; Wmax, max work load (cycle ergometer): Wmax %pred, percentage of predicted Wmax; 6MWD, 6 min walk distance: BMI, Body Mass Index; FFMI, Fat Free Mass Index.

Drop-out

One hundred and sixty-seven patients (77%) completed the rehabilitation course, with no significant difference across

the rehabilitation sites (76–81%). Causes for non-completion were: exclusion during the clinical assessment in the rehabilitation centres ($n = 14$), drop-out due to medical reasons ($n = 24$), and patients declining rehabilitation ($n = 12$).

Exclusion of patients by the rehabilitation centre occurred when patients were perceived to be insufficiently motivated, had physical or psychosocial contraindications ($n = 11$)) or were expected to have little chance of improvement (e.g. patients demonstrated adequate coping with their illness ($n = 3$)).

Medical drop-out was frequently due to COPD-related causes, mainly exacerbations ($n = 15$). Non-COPD causes for drop-out were cardiac infarction ($n = 2$), neuromuscular problems ($n = 3$), eye surgery ($n = 1$) and tumours ($n = 2$). One patient had died during the rehabilitation period.

Patients who decided they would not commence or continue in rehabilitation did so mainly because of other activities which they did not want to give up (e.g. part-time job, hobbies ($n = 3$)) or dissatisfaction with aspects of the programme organisation (e.g. having to share a bedroom with another patient, inconvenient appointment times ($n = 4$)). Other reasons for decline such as homesickness, relocation or financial difficulties were mentioned only occasionally.

Patients who completed the rehabilitation course did not differ from non-completers with respect to sociodemographic or clinical variables (data not shown). There was a trend towards a higher education ($p = 0.06$) and lower MRC score ($p = 0.09$) among those who completed the course. Non-completers had no different perceptions of their illness than patients who completed the programme (F (9, 193) $= 1.08$, $p > 0.1$). A logistic regression analysis predicting non-completion with education and MRC dyspnoea as independent variables did not significantly predict drop-out.

Within the group of non-completers, there were also no differences in the abovementioned sociodemographic and clinical variables between patients who were excluded, patients who declined or those who dropped out due to medical reasons (all univariate ANOVA's/Kruskal–Wallis $p > 0.05$). Patients who declined rehabilitation also did not have different perceptions of their illness than patients who dropped out or those who were excluded (F (18, 72) $= 1.48$, $p > 0.1$).

Attendance

Attendance data could be retrieved from 161 of the 167 completers. Patients who completed the course attended on average 114 appointments during their rehabilitation programme. Eighty-eight of these appointments were exercise related. Only 14 patients (9%) attended all appointments. Overall, 91.9% of all scheduled appointments were attended (range 61–100%).

Many causes are responsible for patients' non-attendance during scheduled appointments (Fig. 1). A little over 20% of missed appointments were due to causes that were beyond patients' control (white bars in Fig. 1). When patients cancelled an appointment or did not show up, COPD-related complaints (e.g. dyspnoea, exacerbations) were the most frequent reported causes for non-attendance (Fig. 1). Non-COPD medical reasons (e.g. muscle aches) accounted for 9% of absenteeism. Other activities (e.g. birthday, holiday) and attending a funeral or taking care of an ill family member were responsible for non-attendance in 9 and 5%, respectively. Some exercises performed in a therapeutic swimming pool were not attended when patients were afraid of water or could not swim. Only seldom (2%) did patients not show up because they chose to skip a single appointment scheduled on a day (e.g. one educational meeting) or left early during the training day because they had to wait too long between appointments.

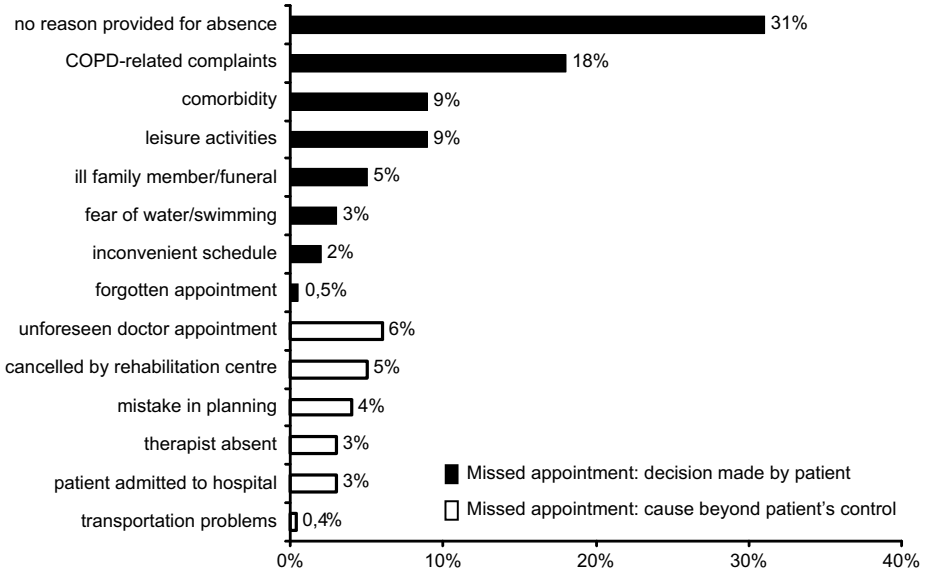

Figure 1 Causes for missed appointments.

With the aim of constructing a measure of patient attendance, the number of appointments cancelled by patients (not including uncontrollable absenteeism represented by the white bars in Fig. 1) was divided by the number of appointments patients did attend. Twenty patients had a ratio of zero (indicating they had not cancelled any appointment themselves). The maximum value for this ratio was 0.46 (approximately one in every two appointments cancelled by the patient). To examine differences between 'high' and 'poor' attenders, two groups were created based on a median split (ratio non-attendance/attendance 1:20), resulting in two groups with equal sample size ($n = 79$ vs. $n = 80$). Patients in the high attendance group had a higher BMI (28.1 vs. 26.3 kg/m^2, respectively) and a higher FFMI (17.6 vs. 16.5 kg/m^2, respectively) than patients in the poor attendance group (Table 2). Furthermore, in the poor attendance group there were more females, current smokers and patients living without a partner.

The poor and high attendance group differed in their illness perceptions (MANOVA F (8, 142) = 2.47, $p < 0.05$) (Table 3). Eight patients had incomplete data on one or more of the IPQ-subscales, which explains the lower number of patients in Table 3, as compared to Table 2. Univariate analysis showed that patients who missed more appointments had less confidence in the effectiveness of their treatment (F (1, 149) = 4.54, $p < 0.05$)). Patients' treatment control perceptions were not related to FFMI, sex, marital status or smoking status. Female patients had a lower FFMI (but not BMI) than men (16.4 vs. 17.4, $p < 0.05$).

To study the relative relationship of independent factors on patients' attendance (which was positively skewed), a hierarchical logistic regression analysis was deemed appropriate. The analysis showed that FFMI is an important predictor of non-attendance (Table 4) (BMI was not entered in the regression analysis due to its high correlation ($r = 0.87$) with FFMI). The treatment control subscale of the IPQ-R, which was entered in the last step of the regression analysis, added to the prediction of non-attendance.

Discussion

The present study showed that patients' adherence to a pulmonary rehabilitation programme is high. More than 75% of the referred patients who participated in this study completed the rehabilitation course. Patients who completed the programme attended on average more than 90% of all scheduled appointments. Non-completion and non-attendance were often attributable to medical causes. Where the patient decided not to start or continue the rehabilitation programme, reasons were often practical (e.g. time constraints) or related to dissatisfaction with the organisation of care. Drop-out or decline was not related to medical and psychosocial variables. Patients' attendance however, was related to their fat free mass and their perception of effectiveness of the treatment.

Whereas the percentage of patients who drop-out due to medical reasons is similar to other multidisciplinary rehabilitation programmes finding drop-out rates varying from 0 to 11%, the proportion of respondents declining rehabilitation appears to be lower than in other studies (9–37%).[4,22,23] The obtained attendance rate in our study appears to confirm findings by others.[8–10] General parameters of disease severity did not differentiate between completers and non-completers. We also did not find differences between patients who declined rehabilitation, patients who dropped out due to medical reasons and patients who were excluded by the rehabilitation centre. These results are consistent with other studies[24–26] and suggest that functional performance and pulmonary functioning play only a modest role in predicting patients' drop-out during rehabilitation.

With regard to attendance during rehabilitation, female patients, patients who lived alone and current smokers were more inclined to cancel an appointment. Sex, marital

Table 2 Characteristics of high vs. poor attendance group (t-test).

	High attendance ($n = 79$)	Min–max	Poor attendance ($n = 80$)	Min–max	p-value
Sex					
Female	37%		50%		
Male	63%		50%		0.09#
Age	64.3		61.9		0.10
Education (range 1–5)	2.19	1–5	1.96	1–5	0.13
Living with partner	82%		66%		0.02#
Current smoker	7.8%		16.5%		0.06#
Pack years	38.4	4–126	42.9	3–113	0.26
Travel distance (km)*	13.9	1–75	10.8	1–45	0.20
Travel time (min)*	24	5–60	21	5–60	0.20
FEV_1 (l)	1.30	0.51–3.07	1.24	0.43–3.09	0.47
$FEV_{1\%}$pred	47.1%	20%–88%	44.8	12%–98%	0.44
6MWD (m)	378	108–575	389	119–612	0.53
BMI (kg/m^2)	28.1	18.9–52.3	26.3	13.1–41.5	0.04
FFMI (kg/m^2)	17.6	11.6–33.6	16.5	11.8–23.7	0.01
MRC dyspnoea (range 1–5)	3.36	1–5	3.24	1–5	0.54

Chi^2-test; *outpatients only. FEV_1, forced expiratory volume in 1 s; $FEV_{1\%}$pred, percentage of predicted FEV_1; 6MWD, 6 min walk distance; BMI, Body Mass Index; FFMI, Fat Free Mass Index.

Table 3 Differences in illness perceptions between high adherent and poor adherent group.

	High attendance ($n = 78$)	Poor attendance ($n = 73$)	p-value
Identity (range 0–15)	5.2	5.7	0.27
Consequences (range 6–30)	21.0	20.7	0.67
Timeline chronic (range 6–30)	26.5	26.6	0.89
Timeline cyclical (range 4–20)	12.9	13.3	0.49
Illness coherence (range 5–25)	17.2	18.1	0.18
Emotional representations (range 6–30)	15.4	14.3	0.19
Personal control (range 6–30)	18.9	19.3	0.56
Treatment control (range 5–25)	16.3	15.4	0.04

MANOVA F (8, 142) = 2.47, $p = 0.015$.

status and smoking status have mainly been investigated in relation to drop-out but apparently they also appear to be related to patients' attendance. Most studies support our finding that smokers and patients who live alone are likely to be less adherent in rehabilitation.[4,5,10,26,27] However, in contrast to our findings, Emery and colleagues found that males were less adherent than females.[28]

The results from our regression analysis showed that patients' belief in the effectiveness of treatment and their fat free mass index were the strongest predictors of attendance. Whereas perceived treatment effectiveness has previously been demonstrated to be a strong predictor of patients' adherence behaviour in rehabilitation,[29–31] the relation between FFMI and attendance, to the best of our knowledge, has not been previously investigated. Sabit and coworkers have found an association between BMI and attendance but did not investigate patients' FFMI.[10] However, FFMI may more accurately express disease severity than BMI,[32] and two explanations can be presented for the relationship between FFMI and attendance. First, lower FFMI is associated with worse functional performance (6MWD, MRC dyspnoea, handgrip strength), decreasing chances of patients to comply with the training schedule.[32,33] Furthermore, in muscle-wasted patients maximal and submaximal exercise are related to a heightened systemic inflammatory reaction. Because these inflammations may be a predictor of exacerbations, a decline in fat free mass can lead to an increase in exacerbation frequency, negatively influencing patients' attendance.[34–36] The lower average FFMI in women may also explain the spurious relation between sex and attendance.

This study is one of the few, which has focused on causes and predictors of drop-out and non-attendance from a biopsychosocial perspective. The present study has been conducted in three rehabilitation centres, which increases the generalisability of our findings. However, we have to acknowledge that self-selection may have caused a bias in our sample. We cannot rule out the possibility that patients who agree to participate in a scientific study have a tendency towards socially desirable behaviour, leading to greater adherence during treatment. Furthermore, the subgroups of patients who decline rehabilitation or drop-out due to medical reasons may have been too small for us to discover significant differences among the subgroups of non-completers.

Smoking cessation counselling and nutritional interventions are integrated into comprehensive rehabilitation programmes. Although there are no indications that smokers profit less than non-smokers from pulmonary rehabilitation,[1] our data support Young and colleagues' statement that: ''non-adherence with a rehabilitation programme may be a reflection of non-adherence with other management strategies''.[26] Interventions to assist patients in refraining from smoking are not only beneficial

Table 4 Hierarchical logistic regression analysis predicting poor attendance during pulmonary rehabilitation.

	Variables	Odds ratio	95% CI	p-value	Correct prediction	Significance of step
Block 1	Living with partner	0.54	0.24–1.20	0.13	62.1%	$p = 0.052$
	Stopped smoking	0.49	0.17–1.42	0.19		
	Male sex	0.70	0.34–1.43	0.33		
Block 2	Living with partner	0.56	0.25–1.28	0.17	64.1%	$p = 0.033$
	Stopped smoking	0.65	0.22–1.92	0.43		
	Male sex	0.75	0.36–1.57	0.45		
	Fat free mass index	0.87	0.76–1.0	0.05		
Block 3	Living with partner	0.56	0.25–1.29	0.18	66.0%	$p = 0.023$
	Stopped smoking	0.63	0.21–1.90	0.41		
	Male sex	0.75	0.36–1.58	0.45		
	Fat free mass index	0.87	0.76–1.0	0.04		
	IPQ Treatment control	0.87	0.76–0.99	0.03		

Final model $Chi^2 = 17.4$, $p < 0.01$.

for patients' pulmonary functioning but may also increase the cost-effectiveness of the rehabilitation.[37] In similar fashion, nutritional interventions for muscle-wasted patients during pulmonary rehabilitation can produce a desirable by-effect. Some studies have shown an increase in patients' fat free mass using nutritional supplementation during rehabilitation.[38,39] Studying the effects of nutritional interventions on patients' attendance during pulmonary rehabilitation may therefore be a fruitful area for future investigation.

Finally, the results of this study demonstrated a relationship between attendance during rehabilitation and patients' perceptions about the effectiveness of treatment. These perceptions are influenced by the patient-provider interaction,[29,40] which suggest that communication between patient and healthcare provider may profit from an exploration and discussion of patients' illness and treatment perceptions during the referral or intake phase. Although on average patients demonstrate high attendance, creating a positive yet realistic expectation of the rehabilitation appears to be an important objective if one aims to optimise patients' adherence during rehabilitation.[41]

Conflict of interest statement

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