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Respiratory rehabilitation in chronic obstructive pulmonary disease: predictors of nonadherence

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Respiratory rehabilitation in chronic obstructive pulmonary disease: predictors of nonadherence. P. Young, M. Dewse, W. Fergusson, J. Kolbe. ©ERS Journals Ltd 1999.

ABSTRACT: Rehabilitation is now an integral part of chronic obstructive pulmonary disease (COPD) management. The objective of the study was to determine predictors of nonadherence to a COPD rehabilitation programme.

Patients attending a COPD clinic were invited to participate in a 4 week, hospital-based, outpatient, COPD rehabilitation programme conducted predominantly by respiratory physiotherapists. All potential participants undertook an interviewer administered questionnaire addressing social, economic, psychological and health-care factors, and underwent baseline physiological measures. Subsequently they were classified as: 1) "adherent" group who completed the total programme (n=55) or 2) "nonadherent" group who refused or began but did not complete the programme (n=36).

The nonadherent group compared to the adherent group were more likely to be divorced (22 *versus* 2%, p<0.005), live alone (39 *versus* 14%, p<0.02), and to live in rented accommodation (31 *versus* 6%, p<0.005). There were no differences between the two groups in terms of baseline physiological parameters (forced expiratory volume in one second, forced vital capacity, 6-min walk distance, oxygen saturation, perceived dyspnoea), quality of life domains (Chronic Respiratory Disease Questionnaire), or indices of COPD-related morbidity. The nonadherent group were more likely to be current smokers (28 *versus* 8%, p<0.02) and less likely to use inhaled corticosteroids (16 *versus* 42%, p<0.005). The nonadherent group was not significantly likely to be depressed, anxious, prone to hyperventilation or to have had previous emotional counselling and was more likely to be dissatisfied with disease-specific social support (51 *versus* 2%, p<0.001).

In conclusion, a substantial proportion of eligible subjects who did not participate in a chronic obstructive pulmonary disease rehabilitation programme were not more physiologically impaired, but were more likely to be: socially isolated, lack chronic obstructive pulmonary disease-related social support, still be smoking and be less compliant with other healthcare activities. Identification of one or more of these factors reliably allows prediction for nonadherence to a rehabilitation programme.

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Rehabilitation is regarded as an integral component of a comprehensive management programme for chronic obstructive pulmonary disease (COPD) [1–3]. However, studies on adherence to COPD rehabilitation programmes are lacking. Most reports do not include details of the total population screened nor the refusal rate. However, it is clear from some prospective controlled studies that a large proportion of those screened were deemed ineligible [4, 5] and that a further substantial proportion of eligible patients refused participation in the programme [4]. Adherence to therapy may be predicted by sociodemographic, psychological, physiological and quality-of-life factors [6]. Whether these parameters predict adherence to rehabilitation programmes has not previously been addressed.

The aim of this project was to determine whether persons who declined participation in, or failed to complete, a COPD rehabilitation programme differed significantly in terms of sociodemographics, physiological parameters or psychological factors, from those who completed the programme.

Subjects and methods

A cross-sectional study of patients referred to a COPD clinic based in a hospital containing regional respiratory services was undertaken.

Subjects

All patients aged >50 yrs with moderate-to-severe COPD referred by specialists or general practitioners to a COPD clinic were considered potentially eligible for the programme. Criteria for moderate-to-severe COPD included a forced expiratory volume in one second (FEV_1) <60% predicted, FEV_1/ forced vital capacity (FVC) <65% and <20% improvement in FEV_1 with inhaled bronchodilators. All subjects had a ≥20 pack-yr smoking history. Patients were considered ineligible only if they had severe comorbidity which significantly interfered with their ability to participate in the programme, *e.g.* unstable or severe

angina pectoris, severe left ventricular dysfunction, severe leg claudication, or their survival over 1 yr was likely to be adversely influenced.

Data collection

After optimalization of pharmacological therapy by respiratory physicians, patients were invited to participate in a rehabilitation programme and completed an interviewer administered questionnaire which included: 1) sociodemographic characteristics; 2) details of socioeconomic status, including whether in paid employment and ownership of domicile; 3) current management of COPD, including drug and oxygen therapy; 4) COPD morbidity, in terms of hospital admissions and courses of oral corticosteroids for COPD in the last 6 months; 5) physiological parameters including FEV_1, FVC (expressed in absolute terms and as percentage predicted), oxygen saturation at rest and during exercise, 6-min walk distance [7] and dyspnoea during exercise (modified Borg Scale [8, 9]); 6) quality of life, assessed by the Chronic Respiratory Questionnaire (CRQ), which is an interviewer administered questionnaire that has been shown to be reproducible and valid as a primary outcome measure for patients with COPD [10, 11]. It evaluates four domains *viz* dyspnoea, fatigue, emotional function and patients feeling of control over the disease (mastery); 7) presence of hyperventilation, assessed by the Nijmegan questionnaire [12]. A score of >24 is regarded as indicating a high likelihood of disordered breathing/hyperventilation syndrome; 8) level of anxiety and depression, using the Hospital Anxiety and Depression (HAD) Scale [13] (which is specific for distress in physically ill subjects). A score of >10 was regarded as indicating a case of anxiety and depression. State and trait anxiety were assessed on a visual analogue scale; 9) social support, measured by a modification of the scale of O'Reilly and Thomas [14] which was originally designed to evaluate social support in patients with cardiac disease. The modified scale included an assessment of general support, as well as disease-specific support, both day-to-day and during attacks. This was similar to the scale modified for use in asthma [15, 16]. The group rated as having inadequate support were defined as those who could name no support person, or whose support person was unavailable, whose help was unsatisfactory or with whom there had been high levels of conflict in the previous year. The remaining group was considered to have adequate support; and 10) life events, using a validated modification for New Zealand of the life event scale of Tenant and Andrews [17].

Instruments 7–10 have previously been used in a number of clinical situations and in different ethnic groups and found to be feasible, acceptable and reliable for patients with asthma [15, 16, 18].

Respiratory rehabilitation

Details of the programme have been described previously [19]. Those completing the programme had improvements in exercise capacity, reduction in percieved dyspnoea and improvements in quality of life [19] of similar or greater magnitude to that described in randomized controlled trials [4].

Adherence and nonadherence

Eligible attendees of the COPD clinic were approached to participate in the rehabilitation programme. Patients were stratified into two groups based on their willingness to participate in, or to complete, a rehabilitation programme. Those defined as "nonadherent" either declined participation in the programme or began but did not complete the 4 week programme. As a corollary, those who agreed to participate and completed the 4 week programme were defined as "adherent".

Statistics

Data are expressed as mean±SD. Those defined as adherent were compared with the nonadherent group. Unpaired Student's t-tests and Wilcoxon signed-rank test were carried out on parametric and nonparametric data, respectively, to test the differences between the two groups. The Chi-squared test was used to test the differences in proportions between the two groups. A logistic regression model was developed using forward stepwise procedures to independently predict adherence based on baseline variables. A p-value of <0.05 was regarded as statistically significant.

Results

Fifty-five patients completed the 4 week programme (adherent group). Thirty patients declined to take part in the programme and six began but did not complete the programme; together these (n=36) comprised the nonadherent group. Reasons given by the patients for nonparticipation included transport difficulties (n=10), work commitments (n=3), considered themselves to be too ill (n=3), considered the programme to be too difficult (n=3), considered the programme unlikely to be helpful (n=1), musculoskeletal problems (n=1) and other reasons (n=12). Reasons for noncompletion of the programme included transport difficulties (n=3), acute exacerbations of COPD (n=2) and personal/social reasons (n=1). (Three patients began the programme but were prevented from completing the programme for reasons outside their control and unrelated to their COPD; two sustained injuries and one underwent elective surgery. These three were excluded from further analysis.)

Selected sociodemographic variables are shown in table 1. Those in the nonadherent group were: more likely to be widowed or divorced and less likely to be currently married ($p<0.001$), more likely to live alone (39 *versus* 14%, $p<0.02$), and more likely to live in rented accommodation (31 *versus* 6%, $p<0.002$). The nonadherent group were more likely to be current smokers (28 *versus* 8%, $p<0.02$).

There was little difference in management of COPD between the two groups with similar proportions of the

Table 1. – Selected sociodemographic variables by group (adherent and nonadherent) at initial evaluation

Variable	Adherent (n=52)	Nonadherent (n=36)
Male %	59	47
Age yrs	66.1±7.6	68.0±9.0
Race %		
European	96	92
Maori	2	8
Pacific Islander	2	0
Marital status %		
Single	6	6***
Married	82	36***
Widowed	10	31***
Divorced	2	22***
De facto	0	6***
Lives alone %	14	39#
Retired %	80	72
Domicile %		
Rented	6	31+
Owned	94	69+
Phone available %	100	92
Smoking status %		
Current	8	28#
Former	92	69#
Never	0	3#

#: p<0.02; +: p<0.005; ***: p<0.001, differences between the two groups.

nonadherent and adherent groups having previous specialist input (92 and 88%, respectively) and being on long-term oxygen therapy (8 and 12%, respectively). Daily use of a peak flow meter was lower in the nonadherent group (18 *versus* 39%, p=0.09). Drug therapy was similar in the two groups; 14 and 12% using ≥7.5 mg prednisone·day^{-1} (NS) and 25 and 12% taking oral theophylline (NS), nonadherent and adherent group, respectively. However, the nonadherent group were less likely to be using high doses (>1,000 μg of beclomethasone diproprionate or equivalent) of inhaled corticosteroids (16 *versus* 42%, p<0.005). Table 2 demonstrates the lack of difference in baseline physiological variables and in any of the indices of COPD morbidity. Table 3 demonstrates a general lack of difference in baseline psychosocial parameters and quality-of-life domains between the two groups. Although the incidence of clinically significant depression (6 *versus* 0%, p=0.09), previous emotional counselling (25 *versus* 16%, NS), hyperventilation (28 *versus* 22%, NS) and inadequate social support for emotional problems (33 *versus* 20%, p=0.14) are higher in the nonadherent group, these differences do not reach statistical significance. Inadequate social support for COPD-related problems (51 *versus* 2%, p=0.001) was more common in the nonadherent group.

Table 2. – Physiological parameters by group (adherent and nonadherent) at initial evaluation

Variable	Adherent (n=52)	Nonadherent (n=36)
Physiological parameters		
Body mass index	24.8±5.3	28.7±3.6
FEV_1 L	0.9±0.3	0.9±0.4
% pred	33.1±13.3	35.8±13.8
FVC L	2.1±0.6	1.9±0.6
6-min walking distance	374.5±129.1	350.7±120.9
O_2 saturation at rest	94.8±2.4	94.8±2.8
Dyspnoea	3.9±2.0	4.3±1.8
Morbidity		
COPD hospital admissions		
Ever	1.6±2.7	2.1±4.0
Last 6 months	0.6±1.0	0.4±0.9
Courses of steroids	1.6±1.9	1.3±1.4

Data are presented as mean±SD. FEV1: forced expiratory volume in one second; FVC: forced vital capacity; COPD: chronic obstructive pulmonary disease.

Table 3. – Psychosocial parameters by group (adherent and nonadherent) at initial evaulation

Variable	Adherence (n=52)	Nonadherent (n=36)
Anxiety		
State	1.9±1.3	2.2±1.6
Trait	2.4±1.5	2.7±1.7
HAD anxiety score	6.0±3.5	5.9±3.5
Score >10	16	17
Depression		
HAD depression score	3.5±2.3	4.0±2.8
Score >10	0	6+
Hyperventilation		
Nijmegan score	14.7±10.5	19.6±11.1
Score ≥24	22	28
Life events total	1.7±15.8	1.7±1.5
Chronic Respiratory Questionnaire		
Total	91.5±15.8	83.8±23.6
Dyspnoea	17.0±5.0	16.0±4.6
Emotional	36.9±7.6	35.0±9.3
Fatigue	16.7±4.7	16.0±5.4
Mastery	21.0±5.0	19.2±5.4
Previous emotional counselling	16	25
Lack of satifactory social support		
For emotional problems	20	33
For COPD-related problems	2	51***

Data are presented as means±SD or percentages. HAD: Hospital Anxiety and Depression score; COPD: chronic obstructive pulmonary disease. +: p=0.09; ***: p<0.001.

The results are summarized in table 4, in which the odds ratio for adherence to the rehabilitation programme for the various independent factors are shown. If the risk factors of current smoking, being divorced or widowed and lack of COPD-related social support are considered, any two factors were found in 12 (33%) of the nonadherent group but in none of the adherent group (p=

Table 4. – Odds ratio and 95% confidence intervals for predicting adherence with a respiratory rehabilitation programme for chronic obstructive pulmonary disease (COPD)

Variable	Odds ratio	95% confidence interval
Married*	7.2	2.8–18.5
Current smoker+	0.3	0.1–0.9
Own house#	7.7	2.0–29.7
Lack of COPD social support‡	0.1	0.0–0.3

*: Married=0, not married (divorced or widowed)=1; +: current smoker=0, exsmoker=1; #: own house=0, rented or other=1; ‡: lack of, or inadequate COPD-related social support=0, satisfactory level of COPD-related social support=1.

0.01), while any one factor was found in 53% of the nonadherent group and 20% of the adherent group (p= 0.015).

Discussion

This study demonstrates that a substantial proportion of otherwise eligible patients refuse to participate in, or fail to complete, a respiratory rehabilitation programme. While some studies document a significant withdrawal rate [20], others merely report the data on subjects completing a programme [21]. In the prospective controlled study of GOLDSTEIN *et al.* [4], there was an eventual participation rate of 34%, while RIES *et al.* [5] had a 36% participation rate. Thus, patients who entered and/or completed the pulmonary rehabilitation programmes were not necessarily representative of the total eligible COPD population, even those with moderate-to-severe disease.

However, the eligible patients in this study were also not necessarily representative, having been selected as a result of their attendance at a COPD clinic. As a result of their willingness to attend the clinic one might have expected them to be more likely to adhere to a rehabilitation programme; the nonattendance rate for this COPD clinic is <10% (unpublished observation). The proportion of the total eligible community-based patients referred to the clinic is unknown and the factors associated with clinic nonattendance in patients with severe COPD are also unknown, although intuitively one would suspect that similar factors may be involved.

In this study, being divorced or widowed, and living alone were predictive of nonadherence. Similar factors predicted nonadherence with long-term home nebulizer therapy for COPD [6], and in the Lung Health Study [22] the most consistent predictor of inhaler compliance was marital status; married persons were likely to adhere. Certainly reinforcement by family members and peers has been shown to enhance adherance [23]. In the present study, nonadherence was strongly associated with deficient disease-specific social support (tables 3 and 4), but not with lack of general support. Thus, whilst general emotional support is no doubt important, patients require support specifically to help manage their disease and its consequences. One aim of a management programme should be to provide support persons with the skills to provide better quality disease-specific support. Also it makes intuitive sense that more settled patients would be more likely to undertake strategies that require adjustment to their activities of daily living. In as much as attendance at a group rehabilitation programme could be regarded as a social activity, then it is likely that those who are socially isolated would be less likely to take part.

Those who were nonadherent were more likely to live in rented accommodation. While this may be a reflection of socioeconomic disadvantage, there were no independent indicators of socioeconomic disadvantage in this study; partly owing to the difficulty of assessing socioeconomic status in an age range in whom the majority are retired. Further research is certainly justified in this area in view of the impact of socioeconomic factors in the self-management of asthma [16] and such research should focus on the mechanisms through which socioeconomic deprivation may operate rather than merely classifying patients according to a socioeconomic scale.

Nonadherence with the rehabilitation programme may be a reflection of nonadherence with other management strategies. Although both groups were clinic attenders, the nonadherent group had a higher rate of continued smoking (table 1). Cigarette smoking is associated with nonadherence with therapy for hypertension [24], cardiac rehabilitation [25] and COPD [6]. In the current study, too few patients were taking oral theophylline for serum theophylline levels to be a variable to assess adherence [6]. The lower use of inhaled corticosteroids in the nonadherent group may also reflect a general unwillingness to adhere to management strategies. Acknowledging that the role of inhaled corticosteroids in the management of COPD remains undefined, the high rate of use in the adherent group may have been an indicator of better quality ongoing medical care rather than of adherence. However, this contention is not supported by the lack of differences in other indicators of quality of medical care such as the use of other drugs, the supply of peak flow meters or the checking of inhaler technique.

There were no differences between the groups in terms of any of the physiological parameters measured. This contrasts with the results of the study of TURNER *et al.* [6] in which more severe dyspnoea and lower FEV_1 were predictive of adherence to nebulized therapy. More disabled patients may have obtained immediate and apparent benefit from the nebulized therapy, as opposed to the longer term and possibly less apparent benefits associated with rehabilitation. Virtually all patients in the study had severe impairment of pulmonary function (table 2) within a relatively narrow range, and thus parameters such as FEV_1 are much less likely to discriminate between groups.

Those in the nonadherent group were more likely to have had previous emotional counselling (25 *versus* 16%, NS) and be more likely to have clinically significant depression (6 *versus* 0%, p=0.09), but there was no convincing evidence of a poorer psychological well-being in this group. Consistent with the results of others, psychological variables were not predictive of adherence [6, 23]. Nor were the dimensions of the CRQ predictive of adherence. MORGAN *et al.* [26] showed that mood, attitudes and beliefs were of importance in predicting exercise tolerance. The patients perception of their illness and its management might have a greater effect on the perceived need for rehabilitation and the benefits that might accrue, than the dimensions of the CRQ, life events, or levels of anxiety or depression. Measurement of attitudes and beliefs are of particular value in chronic disorders in which physical and psychological factors interact [20]. The lack of a comprehensive and well-validated instrument for use in COPD meant that this important issue was not satisfactorily addressed in this study.

In this study, the nonadherence was not homogeneous, comprising those who declined to participate as well as those who began but failed to complete the programme. It is possible that these two groups have different characteristics, and thus the predictors for nonadherence may differ. No differences between the two subgroups were discernible in this study, and re-analysis using only those who declined participation did not materially affect the results.

The rehabilitation programme used in this study was hospital-based and it is possible that adherence would have been better with a home-based programme [27]. However, in view of the fact that a prominent risk factor for nonadherence was social isolation, this seems intuitively unlikely. It should also be noted that the factors associated with successful interventions for increasing physical activity in the elderly have not been well studied [28].

Patients recruited into rehabilitation programmes are a highly biased sample of chronic obstructive pulmonary disease patients. This study identified factors strongly associated with nonadherance *viz* current smoking, being widowed or divorced, living alone or lacking chronic obstructive pulmonary disease-specific social support. Identification of one or more of these factors fairly reliably allowed the prediction of those likely to be nonadherent with a rehabilitation programme.

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