Pulmonary rehabilitation: delivery and evaluation of care

S26 BARRIERS TO ATTENDANCE AND ADHERENCE AT PULMONARY REHABILITATION

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C Hayton, A Clark, A M Wilson. *University of East Anglia, Norwich, Norfolk, UK*

Background Pulmonary rehabilitation (PR) is a multidisciplinary programme which has been shown to improve symptoms and exercise tolerance in patients with COPD and is recommended by national guidelines. Attendance at pulmonary rehabilitation following referral is low and many patients drop-out of the programme before completion. The aim of this study is to obtain quantitative data to assess predictors of attendance and adherence at PR.

Methods We performed a retrospective analysis of a database of patients with COPD, who had been invited to attend a pulmonary rehabilitation programme over a 5-year period. Data was obtained from 727 patients. Patients were divided into three groups based on the number of sessions attended; non-attendance (0% attendance), non-adherence (1%−63% attendance), adherence (>63% attendance). Data were compared between attenders vs non-attenders and adherers vs non-adherers to identify predictors (Gender, Smoking status, pack years, cohabitation, referral route, employment status, body mass index, forced expiratory volume in 1 s (FEV_1), FEV_1% predicted, oxygen therapy (LTOT), oxygen saturations at rest, lung information needs questionnaire*, shuttle walk distance*, previous hospitalisation and year of referral) of attendance and adherence to be identified. *Included in adherence analysis only.

Results 31.8% of patients referred for PR did not attend and a further 28.3% were non-adherent. Univariate predictors of attendance were male gender (OR=1.53 95% CI (1.05 to 2.25)), cohabitation (1.77 (1.17 to 2.67)) ex-smoker (2.29 (1.50 to 3.50)). Predictors of adherence were age (64−70: OR 1.99 (1.20 to 3.30); 71−76: 2.57 (1.48 to 4.45)) ex-smoker (4.86 (3.18 to 7.41)), FEV_1 (higher more likely), FEV_1% predicted (higher more likely), LTOT (0.54 (0.30 to 0.96)). Multiple logistic regression revealed that LTOT (OR 0.39 (0.18 to 0.84)) and cohabitation (1.84 (1.03 to 3.30)) were independent predictors of attendance. Multiple logistic regression revealed that only ex-smoker was predictive of adherence (OR 5.68 (3.33 to 9.7)).

Discussion This large quantitative study has reaffirmed previous smaller observations regarding attendance at pulmonary rehabilitation. Disease severity and lack of potential supportive partner also has a negative impact on attendance. Smoking status appears to be a strong factor in predicting attendance and adherence to sessions. Contrary to previous observations, we found no association between type of professional referring and attendance at pulmonary rehabilitation.

S27 MRC GRADE 2: IS THERE A DIFFERENCE IN ACTIVITY AND EXERCISE CAPACITY BETWEEN COPD AND HEALTHY CONTROLS?

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V Warrington, K Wagg, S Harrison, S Singh. *Glenfield Hospital, University Hospitals of Leicester NHS Trust, Leicester, UK*

Introduction COPD patients are often assessed by MRC scale and comparisons made to a healthy population. MRC grade of a healthy population is not usually reported and assumed to be 1, however this may not be accurate. The characteristics of COPD individuals with MRC grade 2 aren't well defined and furthermore it has not been established if physical activity is impaired, compared to a similar healthy population.

Aim To establish if there is a difference in activity and exercise capacity between COPD individuals and healthy controls, who all have assessed themselves as MRC grade 2.

Methods We recruited 75 patients with COPD (prior to a rehabilitation intervention) and 22 healthy controls (target age 40−90 years), with a self-selected MRC of 2. They wore a Sense-Wear activity monitor (AM) for 12-waking hours for 2 weekdays. The AM records total energy expenditure (EE), step count and time spent above different MET levels. Demographic data were recorded, spirometry performed and participants completed 2 Incremental Shuttle Walk Tests (ISWT). Individuals with COPD completed an endurance shuttle walk test (set at 85% VO_2 peak, measured from ISWT) which is used to prescribe a walking programme, while wearing AM to determine their prescribed METS level.

Results Abstract S27 table 1 shows baseline characteristics and between group differences for COPD individuals (42 males) and healthy controls (10 males). Adjusting for baseline age, step count and ISWT remained significant, (ANCOVA, p<0.05). 9 (40.91%) healthy controls achieved the recommended 10 000 steps/day compared to only 6 (8.0%) COPD individuals. Although COPD individuals achieved more than 30 min of recommended moderate activity daily, they only achieved 24.07 (36.11) min of activity at an intensity above their individually prescribed METS level.

Abstract S27 Table 1 Baseline characteristics, exercise capacity and physical activity for COPD subjects and healthy controls

	COPD mean (SD)	Healthy controls mean (SD)	p Value
Age (years)	67.93 (9.41)	61.91 (10.17)	<0.05
BMI	27.16 (4.98)	28.24 (4.10)	NS
FEV_1 (l)	1.58 (0.56)	2.71 (0.69)	<0.00
FEV_1/FVC (%)	51.52 (12.09)	78.34 (5.50)	<0.00
Prescribed METS level	4.31 (0.81)	-	N/A
Best ISWT (m)	421.73 (131.94)	642.38 (164.53)	<0.01
Total EE (Kcals)	1480.76 (435.36)	1638.27 (477.72)	NS
Step count	6062.13 (3292.81)	9075.57 (4158.29)	<0.01
Sedentary activity (<3 METS, mins)	638.88 (88.43)	616.45 (65.26)	NS
Moderate activity (3−6 METS, mins)	73.48 (62.12)	100.23 (60.81)	0.078
Vigorous activity (6−9 METS, mins)	3.53 (16.10)	2.48 (7.59)	NS

Conclusions Exercise capacity and physical activity were significantly reduced in those with COPD compared to those with no respiratory disease, despite both groups categorising themselves as equally functionally limited on the MRC scale. This highlights the importance of interventions to increase physical performance for COPD individuals, especially for those who would not normally be referred to activity/exercise promotion schemes. Early intervention may help prevent the downward disability spiral commonly seen within respiratory disease and reduce functional decline.

S28 IS A PULMONARY REHABILITATION PROGRAMME FOR PATIENTS UNDERGOING CURATIVE LUNG CANCER SURGERY FEASIBLE?

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[1]A Bradley, [2]J Gillies, [1]K Parker, [1]P Agostini, [1]L Stone-hewer, [3]E Bevan-Smith, [1]E Bishay, [1]M Kalkat, [1]R Steyn, [1]P Rajesh, [4]B Naidu. *[1]Heart of England NHS foundation Trust, Birmingham, UK; [2]Pan Birmingham Cancer Network, Birmingham, UK; [3]NHS Worcestershire, Worcester, UK; [4]University of Warwick, Coventry, UK*

Introduction and objectives The new BTS lung cancer surgery guidelines mention patient optimisation to reduce risk. Our aim was to develop a multi-stranded pragmatic rehabilitation programme for this group of patients, apply it in a pilot study and look at

feasibility, process indicators, outcome measures, local adaptability, compliance and potential cost benefit.

Methods An outpatient based complex intervention was developed by doctors, allied health professional and patients to optimise physical status, prepare for inpatient journey and support through recovery after surgery. Tested in an enriched cohort study over 11 months 45 patients received the intervention compared to 198 who received standard care.

Results Potential surgical candidates at a regional thoracic unit were identified early at lung cancer multidisciplinary team meetings and enrolled on a COPD-type rehabilitation programme which included exercise classes, smoking cessation, dietary advice and patient education. Patients attended exercise classes twice a week until surgery, (which was not delayed). On average patients waited 7 days (range 0−29) to be seen in a rehabilitation class and attended on 5 sessions (range 1−12) resulting in 39 m improvement in 6-minute walk test. The education classes were delivered by lung cancer nurse and addressed diet, smoking, lifestyle change, inpatient expectations, preparation for discharge, and pain management. Six patients identified as potentially or at risk of being malnourished received nutritional supplementation. 5 out of 10 current smokers agreed to be fast tracked into locally available smoking cessation pathways and were biochemically proven to have given up. In the two referring hospitals one delivered classes in outpatient individualised setting while the other in community based group class. An additional four patients following further investigations did not receive surgery. Both groups were matched for age, lung function comorbidity and type of surgery and outcomes are presented in Abstract S28 table 1. The intervention resulted in cash releasing saving to the PCT of £938 per patient.

Abstract S28 Table 1

	Intervention (n = 45)	Non Intervention (n = 198)	p Value
PPC rate %	11.1	16.2	0.08
ITU admission %	2.2	3	
Hospital LOS	5	5	
Readmission rate %	4.4	13.6	0.08

Comparison of primary outcome measures of enriched cohort study in patients who received the intervention compared to those who received standard care.
Readmission to hospital within 30 days due to complications secondary to surgery.
PPC, postoperative pulmonary complications defined by Melbourne group scale; LOS, length of stay.

Conclusion A viable outpatient based complex intervention pathway of enhanced recovery/pulmonary rehabilitation has been developed and tested. Initial results are promising but a multicentre randomised controlled trial is warranted to test efficacy.

S29 | **ASSESSING THE EDUCATIONAL IMPACT OF PULMONARY REHABILITATION IN NON-COPD PATIENTS USING THE LUNG INFORMATION NEEDS QUESTIONNAIRE**

R P Fowler, D Ardelean, K I Ingram, A L Clark, P L Marns, S S C Kon, J L Canavan, W D-C Man. *Harefield Pulmonary Rehabilitation Team and Respiratory Biomedical Research Unit, Royal Brompton & Harefield NHS Foundation Trust, London, UK*

Background There is increasing evidence to suggest that pulmonary rehabilitation (PR) improves exercise capacity, health status and dyspnoea in non-COPD chronic respiratory disease patients. However it is not clear how to assess the education component of PR on these patients. The Lung Information Needs Questionnaire (LINQ) is a self-complete tool, which assesses, from the patient's perspective, the information they need to adequately understand their lung disease and to maximise their self-management skills. This has been validated in COPD patients (Hyland *et al, Resp Med*

2006), and improves significantly with PR in COPD (Jones *et al, Resp Med* 2008). We hypothesised that the LINQ would also be sensitive to change with PR in non-COPD patients.

Methods In 77 non-COPD patients referred to the Harefield Pulmonary Rehabilitation programme, the LINQ and other measures (incremental shuttle walk, Hospital Anxiety Depression scale and Chronic Respiratory Disease Questionnaire) were measured pre- and post-PR. A group of 128 COPD patients completing PR at the same time acted as controls. Within group pre- to post- PR changes in mean LINQ score were compared using paired t tests. Between group changes were compared using unpaired t tests.

Results The composition of the non-COPD group comprised 31 interstitial lung disease, 15 asthma, 16 bronchiectasis, 7 post-lung cancer surgery, and 8 extra-thoracic restriction patients. PR improved mean (SD) LINQ score from 10.34 (3.71) to 5.53 (2.91) (95% CI −4.01 to −5.60; p<0.001) in the non-COPD group with large effect size (t=12.07, df=75, r=0.81). Pre- to post-PR changes in LINQ were not significantly different between non-COPD and COPD patients (95% CI −1.45 to 0.70; p=0.49). ISW, HAD-A, HAD-D and CRDQ all significantly improved with PR in the non-COPD group.

Conclusion The LINQ is sensitive to change after PR in non-COPD patients, and may be a useful tool to assess the educational needs of non-COPD patients.

S30 | **AN EVALUATION OF THE SYSTEMIC INFLAMMATORY RESPONSE TO ENDURANCE WALKING IN PATIENTS WITH COPD: COMPARISON WITH HEALTHY INDIVIDUALS**

[1]J L Canavan, [2]M Moreton-Clack, [1]A Lewko, [3]B Linton-Willoughby, [1]A Jewell, [4]R Garrod. [1]*Faculty of Health & Social Care Sciences, St George's University of London, London, UK;* [2]*Analytical Unit, Division of Cardiac and Vascular Sciences, St George's University of London, London, UK;* [3]*Department of Anaesthetics, Bedford Hospital NHS Trust, Bedford, UK;* [4]*Physiotherapy, Kings College NHS Foundation Trust, London, UK*

Introduction Chronic low grade systemic inflammation is well described in stable COPD and may affect exercise tolerance in this population (Broekhuizen *et al*, 2006). Some studies investigating the systemic inflammatory (SI) response to exercise in COPD have reported increased cytokine responses to exercise in COPD patients (Rabinovich *et al*, 2003) and all have used protocols where the individual patient and healthy comparator perform exercise at a percentage of their own maximal oxygen consumption or muscle strength. This inevitably leads to discrepancies in exercise duration and absolute intensity between COPD and healthy groups, meaning we are unable to determine the effect of COPD on the exercise-induced cytokine response. We hypothesised that COPD patients would have an enhanced systemic inflammatory response compared with healthy comparators completing an identical walking protocol.

Method 16 clinically stable COPD patients (5M: 11F) completed one treadmill endurance walking test at 85% VO_2max until volitional exhaustion. Following this 16 age, sex-matched healthy participants completed identical walking protocols (speed, distance, duration) to that achieved by the 16 COPD patients. The concentration of systemic inflammatory markers (CRP, IL-6, TNF-α, IL-17) were analysed from venous blood taken at rest and post-walk. The exercise induced CRP and cytokine response was evaluated within groups using paired t tests or Wilcoxon sign tests. Comparison of the cytokine response data between groups was analysed using Wilcoxon sign tests.

Results Results are presented as median (25th, 75th percentile) or mean change (95% CI). Baseline concentrations of the systemic inflammatory markers were not significantly different between the COPD (FEV_1 50 (38 to 87) %) and healthy participants (Abstract S30 table 1). IL-6 increased significantly post-walk in the COPD group