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

doi:10.1136/thoraxjnl-2011-201054b.29

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

doi:10.1136/thoraxjnl-2011-201054b.30

[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

(0.25 (95% CI 0.49 to 0.008) but not in the healthy participants. TNF-α, IL-17 and CRP were not significantly increased with exercise in either group. No significant differences were found between groups for the change (pre- to post-walk) in any inflammatory markers (CRP: p=0.07; IL-6: p=0.51; TNF-α: p=0.22; IL-17: p=0.44).

Abstract S30 Table 1 Baseline and post-walk systemic inflammatory mediators in patients with Chronic Obstructive Pulmonary Disease (COPD) and healthy comparators

Marker	Rest concentration	Post walk concentration	p Value
COPD (n=16)			
CRP (mg/l)	3.77 (1.67 to 8.49)	4.75 (1.99 to 11.08)	0.56
IL-6 (pg/ml)	2.80 (2.00 to 3.25)	2.95* (2.03 to 3.63)	0.04
TNF-α (pg/ml)	8.25 (5.80 to 10.13)	7.10 (4.95 to 10.03)	0.64
IL-17 (pg/ml)	52.52 (35.92 to 82.61)	55.16 (47.85 to 79.17)	0.62
Healthy (n=16)			
CRP (mg/l)	1.15 (0.61 to 2.60)	1.60 (0.68 to 2.60)	0.72
IL-6 (pg/ml)	2.70 (2.00 to 3.00)	2.00 (2.00 to 2.95)	0.73
TNF-α (pg/ml)	5.15 (4.00 to 9.18)	7.05 (4.00 to 9.08)	0.64
IL-17 (pg/ml)	65.50 (52.20 to 82.43)	70.40 (57.78 to 88.28)	0.31

*p<0.05 compared with rest concentration in the COPD group; all baseline concentrations (between groups) and other pre-post changes (within groups) were not significantly different (p>0.05).
COPD, chronic obstructive pulmonary disease; CRP, C-reactive protein, IL-6, Interleukin-6, TNF-α, IL-17, Interleukin-17; mg/l, milligrammes per Litre; pg/ml, picogrammes per millilitre.

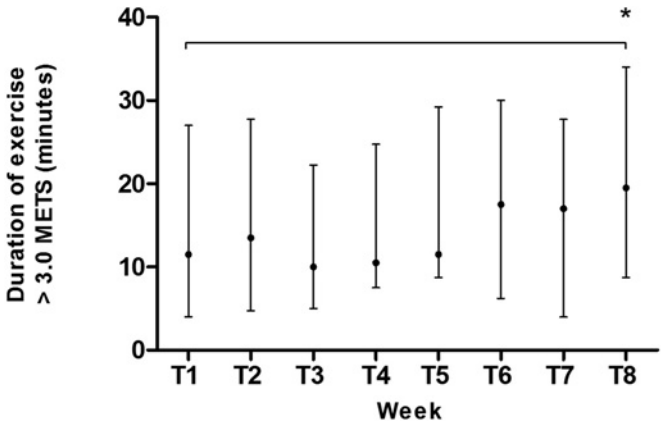
Conclusion Despite a significant increase in IL-6, the magnitude of the systemic inflammatory response to matched absolute workloads in COPD patients is not greater than in healthy comparators.

S31 ENERGY EXPENDITURE AND PHYSICAL ACTIVITY LEVELS DURING AN 8-WEEK PULMONARY REHABILITATION PROGRAMME

doi:10.1136/thoraxjnl-2011-201054b.31

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

Introduction The IMPRESS standards for pulmonary rehabilitation (PR) recommend that programmes should include two supervised exercise sessions per week for at least 4 weeks, and written prescriptions of exercise training with evidence of progress reported in training diaries. However, subjective self-reported assessment is associated with bias, and may not accurately represent actual exercise intensity and duration. Patients require familiarisation with equipment and training regimes during a PR programme. We hypothesised that active energy expenditure and time spent in at least moderate physical activity, measured objectively with a validated activity monitor (SenseWear armband—SWA), would show no significant increase within the first 4 weeks of a PR programme.
Method 34 COPD patients (17M: 17F), starting an 8-week outpatient PR programme consisting of two supervised exercise sessions per week, consented to wearing SWA for one entire exercise training session each week for the whole PR programme (T1—T8). Output from the SWA includes active energy expenditure (AEE) and time spent in at least moderate intensity physical activity (PA time) that is, >3.0 METS. AEE and PA time recorded at T1, T4 and T8 were evaluated using Friedman tests. Incremental shuttle walk (ISW) and COPD Assessment Test (CAT) were measured before (T0) and after (T9) PR. Differences in pre to post-outcome measures were assessed using paired t tests.
Results Results are presented as median (25th, 75th percentile). There was no significant difference in PA time or AEE between T1 (11.5 (4.0 to 27.0) min; 43.5 (19.5 to 124.3) Kcal) and T4 (10.5 (7.5 to 24.8); 48.5 (32.3 to 106.0) Kcal, p>0.05) despite progress documented in training diaries. PA time significantly increased from T1 to T8 (19.5 (8.8 to 34.0) min, p=0.02), as did AEE (92.0 (37.0 to 146.3) Kcal, p=0.006). Following PR there was also a significant improvement in ISW (52.1 (95% CI 29.2 to 75.1) m, p<0.001) and CAT score (−3.0 (95% CI 0.3 to 5.8) p=0.03).
Conclusion 4-week PR programmes may be insufficient in duration for patients to become familiarised with equipment and exercise regimes.



Abstract S31 Figure 1 PA time during pulmonary rehabilitation classes over an 8-week outpatient programme. Data presented as median (IQR) *p<0.05 significant difference compared to week 1.

Novel mechanisms driving airway inflammation in asthma

S32 LOSS/INHIBITION OF THE aVb5 INTEGRIN REDUCES ALLERGEN-INDUCED INCREASES IN AIRWAY SMOOTH MUSCLE MASS IN IN VIVO MODELS OF ASTHMA

doi:10.1136/thoraxjnl-2011-201054b.32

[1]A L Tatler, [1]A E John, [1]L Jolly, [1]A Habgood, [1]J Porte, [1]A J Knox, [2]X Huang, [2]D Sheppard, [1]G Jenkins. *[1]University of Nottingham, Nottingham, UK; [2]University of California San Francisco, San Francisco, USA*

Airway remodelling is a common feature of severe asthma. Transforming growth factor-ß (TGF-ß) is a pro-fibrotic, pleiotropic cytokine implicated in airway remodelling. TGF-ß is sequestered in the extracellular matrix as a latent complex and requires activation to function. We have previously shown that contraction agonists cause aVß5-mediated TGF-ß activation by human airway smooth muscle cells. The study aims were to investigate the role of the aVß5integrin in airway remodelling in vivo using two distinct mouse models of asthma. A blocking antibody directed against the aVß5 was used in the ovalbumin (OVA) model of asthma. Mice were sensitised with OVA/Alum on days 0 and 12, then challenged byoropharyngeal administration of OVA 10 times over 2 weeks. The anti-aVß5antibody or an isotype matched control antibody was administered for the duration of the OVA challenges. The second invivo model utilised *itgb5*$^{-/-}$mice. *Aspergillous fumigatus* antigen preparation was administered intra-nasally (10 µg/mice) to *itgb5*$^{-/-}$ and wild type controls 9 times over a 21-day period. a-Smooth muscle actin (a-SMA) was quantified in lung sections from both studies by immunofluorescence. Murine airway smooth muscle cells express aVß5 integrin and can activate TGF-ß in vivo in response to allergen challenge as measured by αvβ5 and phospho-Smad2 immunostaining. Treatment with both OVA and *Asp.f* resulted in an increase in a-SMA staining around the smaller airways. The aVß5blocking antibody significantly reduced a-SMA staining compared with the