dysfunctional breathing (Cochrane 2013) and only one observational study which shows a reduction in Emergency Room attendance (Hagman 2011) as a measure of the efficacy widely reported in clinical practice.

Method Using all consecutive unselected patients referred to a single Respiratory Physiotherapy Unit with 2 experienced practitioners between April 2012 – April 2013, a historical control was used to examine the healthcare utilisation of this group. The incidence of all cause new Out Patient referrals, A+E visits, and admissions in the six month period prior to treatment was compared to the six months after the study period. Extraction of data was by review of notes and computerised search of hospital events with anonymised patient data. In addition to this information on baseline characteristics, response to treatment, and comorbidities were also examined.

Results 67 patients were recorded, 2 were duplicate referrals and excluded from further analysis. The majority were referred by the Respiratory Service, but 27 by General Practice and senior nurses. Mean age was 58 (SD 15.6) and male to female ratio 30 to 37 respectively. 93% had one or more comorbidities, the most frequent being asthma in 49%. 58 patients attended for breathing retraining with an average Nijmegen score of 26.31 (SD 10.28).

In the 6 months after physiotherapy, new outpatient referrals fell by 56% (from 70 to 31), A+E visits fell by 17% (30 to 25) but admissions rose by 35% (20 to 27). The overall reduction of secondary care visits was 31% (120 to 83). Exploratory analysis using Wilcoxon matched-pairs signed rank test showed statistical significance in the outpatient referral group only ($p < 0.01$).

Conclusion While this is crude data based on limited numbers in a single site, the size of effect is noteworthy, suggesting efficacy of intervention. Healthcare utilisationwasnot restricted to Respiratory presentation, in keeping with the multi-symptomatic nature of this condition. The rise in admissions is in contrast but did not relate to respiratory symptoms in this ageing population over a 24 month period. Further study is warranted.

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P143 ASSOCIATIONS BETWEEN QUADRICEPS ISOKINETIC ENDURANCE AND EXERCISE TEST PARAMETERS IN COPD PATIENTS

[1]TJ Hargreaves, [2]JP Fuld, [2]KP Sylvester. [1]*University of Cambridge School of Clinical Medicine, Cambridge, UK*; [2]*Addenbrooke's Hospital, Cambridge, UK*

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Background Skeletal muscle dysfunction is a clinically relevant extra-pulmonary manifestation of COPD.[1] While muscle strength is undoubtedly important in functional performance, the ability to perform extended physical activity is also dependent upon muscular endurance. While previous studies have shown a correlation between quadriceps endurance and exercise test performance,[2] we wished to investigate the same correlation across a wider range of functional outcomes. In addition, we have previously explored the clinical meaning of a "distance-desaturation product" in field tests and data have indicated increased clinical value of the measure. We hypothesised, therefore, that measures of skeletal muscle isokinetic endurance might add clinical value to measures of strength, especially in day-to-day or submaximal activities.

Methods A prospective cohort of 11 patients with COPD (age median 66, range 58–79; FEV_1 median 0.81 L, range 0.68–1.41 L) was studied. We compared all 11 patients' performance in functional tests (6-minute walk test (6MWT), incremental CPET, endurance CPET, and activity data) with the following measures of isokinetic quadriceps function:

- Endurance (the peak torque of voluntary quadriceps contraction after 40 maximal reps, as a fraction of initial peak torque).
- A putative "strength-endurance product" (SEP), as a novel measure to better reflect the overall functional performance of the musculature.

Results Somewhat surprisingly, isokinetic quadriceps endurance was not significantly associated with any parameter across all 4 exercise tests. Furthermore, combining strength and endurance in the SEP yielded only a minor improvement: only resting energy expenditure was significantly correlated ($p < 0.05$).

Discussion Understandably it appears that quadriceps endurance is a poor predictor of performance in exercise tests, however

Abstract P143 Table 1 Table showing the strength of the relationship between quadriceps function (endurance and SEP) and parameters across a number functional tests

		Isokinetic Endurance				Strength-Endurance Product			
Functional parameter		r	r^2	p > 0.05	p < 0.05	r	r^2	p > 0.05	p < 0.05
6MWT	Distance	-0.185	0.034			0.507	0.257		
	Minimum SpO_2	-0.519	0.269			-0.185	0.034		
	Desaturation	0.470	0.221			0.447	0.200		
	Maximum perceived breathlessness	0.558	0.312			-0.099	0.010		
	Distance-saturation product	-0.285	0.081			0.156	0.024		
Incremental CPET	Peak VO_2 (L)	-0.217	0.047			0.544	0.296		
	Peak VO_2 (ml/kg)	-0.364	0.133			0.049	0.002		
	VO_2 @ anaerobic threshold (L)	-0.064	0.004			-0.075	0.006		
	VO_2 @ anaerobic threshold (ml/kg)	-0.563	0.317			-0.069	0.005		
Endurance CPET	Peak VO_2 (ml)	-0.275	0.075			0.407	0.166		
Activity data	Physical activity level	-0.312	0.097			-0.356	0.127		
	Total energy expenditure	-0.179	0.032			0.289	0.084		
	Resting energy expenditure	0.189	0.036			0.610	0.373		
	Active energy expenditure	-0.336	0.113			-0.178	0.032		

limited added value of a combined "SEP" was evident. The clinical meaning of endurance measures remain unclear.

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P144 A COMPARISON OF SHUTTLE WALKING TEST ENDPOINTS IN EXERCISE STUDIES IN PATIENTS WITH COPD

[1]S Singh, [2]F Maltais, [3]L Tombs, [4]WA Fahy, [4]M Vahdati-Bolouri, [4]JH Riley. *[1]Centre for Exercise and Rehabilitation Science, University Hospitals of Leicester NHS Trust, Glenfield Hospital, Leicester, UK; [2]Centre de Pneumologie, Institut Universitaire de Cardiologie Et de Pneumologie de Québec, Université Laval, Sainte-Foy, Canada; [3]Precise Approach LTD (Contingent Worker Who Is Working on Assignment at GSK), Uxbridge, UK; [4]GlaxoSmithKline, Uxbridge, UK*

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Background The Minimal Clinically Important Difference (MCID) for pharmacotherapy for the endurance shuttle walking test (ESWT) has been reported by Pepin *et al*.[1] Two performance measures, change in time (45–85 s), and percentage change from baseline (13–15%) are investigated here.

Objective To review endurance outputs in two exercise studies combined in this post-hoc analysis, and compare two different measures of performance MCID, exercise time in seconds and as a percentage change.

Methods The effect of umeclidinium (UMEC 62.5 mcg)/vilanterol (VI 25 mcg), VI (25 mcg) and UMEC (62.5 mcg) compared with placebo on exercise endurance, using the ESWT across two 12-week cross-over studies enrolling hyperinflated COPD patients (FRC >120%) was investigated. All ESWTs were performed at 80% VO_2 max derived from a baseline incremental SWT. ESWT time (in seconds) and% change from baseline were reported and compared at Day 2 and 84, 3 h post-dose. Analysis was performed using a repeated measures model with covariates of study, period walking speed, mean walking speed, period, treatment, visit, smoking status, centre group, visit by period walking speed, visit by mean walking speed and visit by treatment interactions.

Results Baseline exercise endurance times (EET) and on-treatment change from baseline as seconds and percentage are presented in Table 1. UMEC/VI showed mean changes (95% CI) from placebo at Day 2 of 53.0s (33.4, 72.6) and 18.4% (10.1, 26.8) both $p < 0.001$ and at Day 84 of 43.7s (15.5, 72.0) $p = 0.002$ and 16.4% (4.8, 27.9) $p = 0.005$. Adverse events were similar between treatments.

Conclusions UMEC/VI was associated with improvements in both measures of exercise endurance, as were UMEC and VI to a lesser magnitude. An improvement greater than the MCID for percentage change from baseline was observed for UMEC/VI vs placebo at both timepoints, whereas for change from baseline EET only the Day 2 analysis vs placebo showed a result greater than the MCID. MCID as percentage change from baseline may be a more meaningful measure of response to bronchodilators than MCID in seconds because it reflects a patient's baseline exercise tolerance. No additional safety concerns were identified.

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Abstract P144 Table 1

	UMEC (62.5mcg) N = 89	VI (25mcg) N = 140	UMEC/VI (62.5/25mcg) N = 282	Placebo N = 321
Baseline EET, seconds (SD)	297.1 (159.4)	303.5 (130.4)	307.7 (162.6)	328.1 (182.1)
Day 2				
LS mean change from baseline EET, seconds (SE)	36.4 (13.7)	37.5 (11.1)	66.8 (7.9)	13.8 (7.4)
LS mean change from baseline EET, % (SE)	15.7 (5.8)	14.9 (4.7)	26.5 (3.3)	8.1 (3.1)
Day 84				
LS mean change from baseline EET, seconds (SE)	44.6 (18.9)	27.9 (15.5)	62.9 (10.8)	19.2 (10.4)
LS mean change from baseline EET, % (SE)	20.4 (7.7)	12.6 (6.3)	27.3 (4.4)	10.9 (4.2)

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Asthma treatment

P145 USING FRACTIONAL EXHALED NITRIC OXIDE (FENO) SUPPRESSION AND INHALED COMPLIANCE ASSESSMENT (INCA) TO IDENTIFY AND MANAGE NON-ADHERENCE IN DIFFICULT ASTHMATICS

LG Heaney, KJ Hetherington. *Queen's University Belfast, Belfast, UK*

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Introduction The identification of intentional and non-intentional non-adherence in patients with "difficult" asthma and establishing who should respond well to inhaled steroid treatment is essential to prevent the inappropriate escalation of inhaled corticosteroids (ICS) and the initiation of complex biological therapies. One week FeNO suppression testing can identify non-adherence and ascertain which patients who should achieve good asthma control with better adherence to standard treatment. Combining this test with simple remote technology it can be determined whether they are intentionally or non-intentionally non-adherent, and can show technique and timing errors.

Methods The INCA device was developed by Professor Richard Costello in conjunction with Vitalograph and is designed to work with the Accuhaler inhaler. The INCA device time and date stamps the activation of a microphone and records a sound file of the inhaler being used; these sound files can then be transferred to the computer and uploaded onto a server where they are analysed by an algorithm. Within the Belfast City Hospital 40 patients have carried out the one week FeNO suppression testing, 20 of those in combination with INCA technology. This testing is relatively simple and is part of the Medical Research Council funded Refractory Asthma Stratification Programme and is currently being piloted in five specialist Difficult Asthma Centres in the UK.