risk of embolic stroke. Currently, with a sensitivity in excess of 98%, thoracic CT is the 'gold standard' for detecting PAVMs but involves a significant radiation exposure.[1] Hence screening tools without a radiation burden such as oxygen shunt studies or cardiac bubble echo (CBE) are often considered as first line investigations for right-to-left shunts. With the recent introduction of CBEs to our hospital we collected data on patients who underwent both CBE and oxygen shunt studies. We looked retrospectively at 11 patients with suspected HHT (as defined by the Curacao criteria[2]) investigated over the last 5 years and aimed to determine the sensitivity and specificity of each screening test compared to thoracic CT (Abstract P40 Table 1). The oxygen shunt study had a sensitivity of 57% and specificity of 75%. CBE had 100% sensitivity (in five patients) but two studies were positive in the absence of detectable PAVMs on CT. Our data suggest that oxygen shunt studies are not sufficiently sensitive to be used as a screening tool for PAVMs. CBE is a useful initial screening test. A negative CBE combined with a negative chest x-ray has been shown to have a negative predictive value of 100% for PAVMs.[3] This screening strategy is especially useful when the risk of CT irradiation is considered unacceptably high, for example in younger women. All patients with a positive CBE should undergo further imaging with thoracic CT to confirm the presence of PAVMs and to determine their size prior to consideration for embolisation therapy.

Abstract P40 Table 1 Patients with suspected HHT arranged by CT thorax result with outcomes of other screening studies

Patient	HHT clinical diagnosis	CT thorax	Cardiac bubble echo	Oxygen shunt study
1	Definite	+	+	–
2	Definite	+	NR	+
3	Definite	+	+	–
4	Definite	+	+	+
5	Definite	+	+	+
6	Definite	+	NR	+
7	Possible	+	+	–
8	Possible	–	NR	+
9	Probable	–	+	–
10	Possible	–	+	+
11	Probable	–	NR	+

"+" = positive study, "–" = negative study, "NR" = Study not requested.

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Pulmonary rehabilitation

P41 THE COPD ASSESSMENT TEST (CAT) USED TO EVALUATE OUTCOME IN PULMONARY REHABILITATION

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Introduction Outcomes in pulmonary rehabilitation (PR) can be evaluated using exercise performance tests and health status measures such as the St George's Respiratory Questionnaire (SGRQ) and Hospital Anxiety and Depression Score (HADS). The SGRQ and HADS are timing consuming and difficult to analyse and may dissuade patients from attending. The COPD Assessment Test (CAT) is a shorter, simpler questionnaire for assessment and monitoring of health status in COPD. Scores range from 0 to 40. A high score indicates poor health status. CAT score correlates with SGRQ ($r>0.8$)[1].

Objective To determine if the CAT score could replace existing measures of health status in the evaluation of pulmonary rehabilitation.

Method 70 patients underwent standard PR in community and hospital based programs. 45 were men and 25 were women. The mean age was 69. The vast majority of patients attending had COPD, confirmed by spirometry and clinical assessment. They had MRC score of 3 or more. All patients completed CAT, SGRQ questionnaires and did a modified shuttle walk test (MSWT) at the beginning and end of the program.

Results After PR mean SGRQ score reduced by 5.54 (CI: 2.6 to 8.4, $p<0.001$). CAT score reduced by 2.08 (CI: 0.8 to 3.3, $p=0.001$). MSWT distance increased by 75.7 metres (CI: 55.7 to 95.8, $p<0.001$). Anxiety and depression scores reduced by 1.64 (CI: 0.6 to 2.6, $p= 0.002$) and 1.02 (CI: 0.17 to 1.88, $p= 0.02$) respectively. At baseline, the CAT score correlated moderately with SGRQ ($r=0.48$), shuttle walk ($r=0.47$), and HADS ($r=0.43$). The change in CAT before and after PR correlated weakly ($r=0.38$ $p=0.001$) with the change in SGRQ, and MSWT ($r=0.45$ $p<0.001$), and not significantly with change in HADS ($r=0.28$ $p=0.059$).

Conclusion Jones et al. have evaluated the CAT in pulmonary rehabilitation.[2] Their study reported an improvement in CAT of 2.2. At baseline, CAT correlated well with CRQ (Chronic Respiratory Questionnaire) domain scores. Change in CAT correlated with change in CRQ domain scores. Our study confirms CAT score can detect improvement in health status after PR. However, the lack of stong correlation with SGRQ & HADS suggests CAT should not be assumed to be equivalent in the evaluation of PR.

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P42 COMPARISON OF A 1- AND 2-WALK PROTOCOL FOR THE ENDURANCE SHUTTLE WALK TEST WHEN MEASURING CHANGE DUE TO THERAPEUTIC INTERVENTION IN COPD PATIENTS

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Introduction The endurance shuttle walk test (ESWT) is an externally paced field endurance walking test. To perform the ESWT requires two incremental shuttle walk tests (ISWTs) to determine the walk speed for the ESWT, a practise ESWT (pESWT) and a repeat ESWT. The minimum important clinical difference (MCID) has been reported as 68%.[1] Limits of agreement between ESWT carried out with and without a practise walk on the same day have

Abstract P42 Table 1 Results of comparison between two ESWT protocols

	2-walk protocol	1-walk protocol
Baseline completion	71%	88%
Baseline and discharge completion	54%	71%
Ceiling effect	7.3%	12.2%
Floor effect	4.9%	4.9%
Baseline limits of agreement	± 88 s (95% CI±32)	
Limits of agreement for change	± 80% (95% CI±25.6)	

been shown to be ±100 s^2 and it is proposed the practise walk may not be needed. Completing the standard ESWT protocol presents a considerable burden to patients and clinicians alike; being able to drop the practise walk would be of benefit. This study investigated the need for a pESWT when measuring change after 8 weeks.

Method A retrospective analysis of the data collected from ESWTs performed as part of another study was carried out. A 2-walk and a 1-walk protocol were defined. Both protocols required 2 ISWTs; the 2-walk protocol used 2 ESWTs, the longest taken as the outcome, the 1-walk protocol used the first walk as the outcome. Completion rates, floor and ceiling effects, same-day limits of agreement, and limits of agreement for change over 8 weeks were calculated for the protocols.

Results 41 COPD patients (26 male) were recruited; mean (SD) age 68(11) years, FEV1% predicted 47(15.80)%. Results of comparison of protocols are given in Abstract P42 Table 1. At 80%, the limits of agreement for the protocols was less than the 92% change expected from pulmonary rehabilitation[3] and less than that described[2] as 'somewhat better' (113%) but greater than the MCID of 68%.[2] The 1-walk protocol had superior completion but higher ceiling rates.

Conclusion The data presented here suggests that, in clinical practice when measuring change related to an exercise intervention, only one ESWT is required. For research purposes, particularly for non-exercise interventions, the standard protocol should be retained as it is more likely to identify marginal difference and demonstrates less of a ceiling effect.

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P43 DO CHANGES IN OBJECTIVE OUTCOME MEASURES MATCH PATIENT-REPORTED EXPERIENCE OF PULMONARY REHABILITATION?

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Introduction There are a variety of different objective outcome measures that are currently used to assess patients' response to pulmonary rehabilitation (PR) and the effectiveness of service delivery. Most of these measures have well defined minimal clinically important difference (MCID) thresholds, including the Incremental Shuttle Walk (ISW), Chronic Respiratory Questionnaire (CRQ) and the Hospital Anxiety and Depression scale (HAD). However, it is not clear how many outcome measures are needed to encapsulate patient-reported improvement following PR.

Methods 101 patients, completing an 8 week supervised outpatient pulmonary rehabilitation programme, were asked to rate their response with the following question: 'How do you feel your overall condition has changed after rehabilitation?' Responses were categorised according to a Likert scale ranging from 1 'I feel much better' to 5 'I feel much worse'. All patients were blinded to the results of their objective assessments. For every patient responding category 1, we determined whether the MCID was achieved for each of seven different outcome measures: the ISW (>48 m), the four domains of the CRQ (mean change >0.5 per domain), HAD-anxiety (<−1.5) and HAD-depression (<−1.5).

Results 64 patients (63%) recorded a response of 'I feel much better'. Of these, the proportion of patients achieving the MCID for the seven different outcome measures is seen in Abstract P43 Table 1 below. 6 patients (9%) achieved the MCID for all outcome measures tested, whilst one patient (1.6%) did not achieve the MCID in any of the outcome measures. Four patients (6.25%) did not achieve the MCID in either the ISW or any of the CRQ domains.

Abstract P43 Table 1 Percentage of patients achieving MCID, who rated their overall condition as being 'much better' after a course of pulmonary rehabilitation

	ISW	CRQ-D	CRQ-F	CRQ-E	CRQ-M	HAD-A	HAD−D
%	50	61	69	61	64	44	55

Discussion Patient-reported positive response to PR is probably determined by several factors, which differ from individual to individual, and cannot be captured by use of only one outcome measure. More than 98% of patients who reported feeling much better following pulmonary rehabilitation achieve the MCID in at least one of ISW, CRQ domains or HAD.

P44 COPD PATIENTS DERIVED BENEFITS FROM ATTENDING PR: 'THIS HAS GIVEN ME MY LIFE BACK'

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Objectives The effectiveness of Pulmonary Rehabilitation (PR) diminishes over time. Little is known about the role of patients' beliefs and experiences of PR in the maintenance of outcomes. The aim of this study was to explore COPD patients' experiences of PR in completers and non-completers.

Methods Purposive sampling was employed to recruit COPD patients referred to an outpatient PR. Participants were interviewed pre (n=15) and post (n=10) PR, approximately 1−2 weeks after the programme. Eight participants completed PR, two dropped out and five were lost to follow-up. Data were analysed using Thematic Analysis.

Results A strong theme to emerge was '*empowerment through attending PR*' as physical improvements derived from PR gave participants a sense of freedom and inspired the motivation to re-engage with life again. Participants regained greater control over the condition, and improvements in mood prompted a renewed sense of optimism and hope for the future. Social re-engagement was often the most highly valued aspect of PR, which provided companionship and normalised the condition. Collectively, positive outcomes inspired determination and '*efforts to maintain the benefits*'. Peer support was vital in motivating participants to continue exercise regimes. Potential barriers to maintaining exercise were discussed. '*Improvements to service provision*' were felt necessary to facilitate long-term maintenance, in the form of formalised follow-up sessions and telephone calls. A few had ongoing issues with anxiety, suggesting the need for individual counselling. '*Reasons for drop-out*' included a threatened sense of autonomy and control, negative illness perceptions, inappropriate timing of PR as well as practical and medical issues. These participants were still smokers, and lacked desire for behaviour change. Participants who didn't attend displayed overwhelming scepticism about PR effectiveness.

Conclusions These findings indicate that immediately following PR, patients feel empowered to continue exercising, due to perceiving multiple benefits. The value placed on peer support demonstrates that this is an important motivator in promoting maintenance. This study highlights COPD patients' preferences in terms of how service provision aimed at facilitating long-term maintenance of outcomes could be improved, and has implications for the development of psychosocial interventions for patients who are reluctant to attend.