

**Study Title:** A feasibility study assessing the inclusion of Physical Activity Promotion to standard care pulmonary rehabilitation and cognitive behavioural therapy in patients with COPD who are anxious and depressed.

**Summary:**

In patients with COPD, daily physical activity is reduced compared with that in healthy age-matched individuals. Furthermore, it is well documented that reduced levels of physical activity in patients with COPD are associated with a faster rate of disease progression, greater risk for exacerbation of COPD (ECOPD), leading to increased rates of hospital admissions and mortality. Global guidelines endorse pulmonary rehabilitation as an integral non-pharmacological component in COPD management. However, while supervised pulmonary rehabilitation programs improve exercise capacity and health related quality of life in people with COPD, these findings have not consistently progressed into improvements in daily physical activity.

Physical activity is a complex health behaviour that is modified by behavioural change interventions such as identification of barriers, goal setting, self-efficacy, motivation, self-monitoring and feedback. Physical activity promotion through interventions, which combine the use of wearable monitors (i.e. pedometers, accelerometers) with goal setting, can increase daily physical activity in COPD patients. A recent systematic review and meta-analysis addressed the addition of physical activity promotion strategies to standard pulmonary rehabilitation, failing to demonstrate consistent improvements in daily physical activity along with improvements in exercise capacity and quality of life. This is principally due to diverse interventions that have lacked an emphasis on individualised goal setting and patient feedback, with only a small number of contact sessions to discuss strategies for consistently improving activity levels and affecting motivation towards behaviour change.

Alongside physical activity promotion, the incorporation of cognitive behavioural modification (CBM) strategies is also important in terms of reversing physical inactivity in COPD. CBM addresses several behavioural barriers including anxiety, depression and physical inactivity, an important component in the management of COPD to improve engagement with pulmonary rehabilitation and physical activity promotion strategies.

Accordingly, we propose to perform a feasibility study assessing patient adherence to a pulmonary rehabilitation programme that concomitantly promotes daily physical activity and behavioural changes. We will compare patients' adherence to pulmonary rehabilitation including physical activity promotion and behavioural changes with pulmonary rehabilitation alone. Our major outcome will be adherence to the combined intervention over 16 sessions of PR.

**Literature background:**

COPD is a debilitating and progressive disease, primarily affecting the respiratory system. In many patients, it also has adverse extra-pulmonary effects, such as skeletal muscle dysfunction and weakness [1]. Pulmonary and skeletal muscle metabolic abnormalities enhance the ventilatory requirement during exercise, resulting in exercise-associated symptoms such as breathlessness and leg discomfort. These symptoms make every day physical activity an unpleasant experience, which many patients try to avoid [2]. Physical activity levels are therefore remarkably lower in COPD patients than healthy age-matched individuals, presenting a major predictor of mortality and hospitalisation in these patients [3]& [4].

Implementation of exercise training as part of Pulmonary Rehabilitation aims to reserve the systemic consequences of COPD, in particular skeletal muscle dysfunction and weakness [2]. Currently pulmonary rehabilitation programs have shown substantial improvements in exercise tolerance; however, these findings have not consistently progressed into improvements in daily physical activity [5]. One reason for this may link to physical activity in COPD being a complex health behaviour [2].

Physical activity promotion is an intervention employed to influence physical inactivity in patients with COPD [5]. The main aim of the intervention is to stimulate patients to increase their daily physical activity levels by incorporating lifestyle activities into daily life. Patients receive counselling in order to modify their behaviour towards enhanced physical activity through the application of a pedometer, which allows patient monitoring and feedback of their daily steps along with frequently adjusted goal setting. Previous research has shown that remote coaching of physical activity (tele coaching) improves daily steps over a three-month period [6]. Studies incorporating physical activity promotion during pulmonary rehabilitation have, however, failed to find consistent improvements in daily physical activity along with improvements in exercise capacity and quality of life [7]. This is principally due to diverse interventions that have lacked an emphasis on individualised goal setting and patient feedback, with only a small number of contact sessions to discuss strategies for consistently improving activity levels and affecting motivation towards behaviour change. No study to date has comprehensively incorporated both a behavioural change intervention (physical activity promotion along with some form of behavioural modification therapy) and pulmonary rehabilitation to facilitate progression of improved physical functioning to enhanced daily physical activity levels. Primarily adherence to the behavioural physical promotion intervention alongside pulmonary rehabilitation has been inconsistent [8]. Consequently, more evidence is required to understand the true benefits of the intervention. The current study aims to provide regular feedback of daily steps (twice weekly), with a pre-intervention interview enabling the research team to understand patient concerns and preferences around daily physical activity. This will provide the healthcare team with information, which can be incorporated into individualised goals, allowing patients to receive physical activity support tailored to their own specific needs, capabilities and daytime habits.

Alongside the physical barriers influencing daily physical activity, the distressing nature of COPD has a significant impact on patients' psychological wellbeing. Major focusing points for COPD patients are the sense of feeling unwell, the inability to perform everyday activities and the emotional consequences of the condition (British Lung Foundation, 2006). These symptoms can promote anxiety and depression, which are prevalent in patients with COPD and are associated with poorer treatment outcomes and reduced survival [9]. Cognitive Behavioural modification (CBM) strategies is a psychological intervention that focuses on understanding how experiences are interpreted. It provides an interaction between thoughts, mood, behaviour and physical sensations, which are intrinsically linked. [10] conducted a small case study involving 10 COPD patients. They used CBM strategies in COPD patients who were anxious or depressed, assessed using the hospital anxiety and depression scale. Techniques used for anxiety included; education on anxiety and COPD, distraction techniques, breathing control and relaxation. These techniques help to break the vicious cycle of anxiety and can reduce patients' distress. Similar techniques for patients suffering mainly from depression include; education about depression and inactivity and planning and recording activities each day, while rating these for achievement or pleasure. These techniques help to break patient inactivity, which can lead to low mood and poor physical condition. A key treatment for depression can involve encouragement to increase activities within the patients' physical capabilities. The study found clinical and statistically significant improvements in anxiety and depression scores and a statistically significant reduction in hospital admissions following CBM strategies [10]. CBM is therefore an important approach to incorporate into COPD management to improve engagement with pulmonary rehabilitation and the effectiveness of a physical activity promotion strategy. [10].

The addition of CBM strategies to structured pulmonary rehabilitation is currently under investigation (TANDEM COPD trial). The feasibility of assessing patient adherence to a pulmonary rehabilitation programme that concomitantly promotes daily physical activity and behavioural changes is still unknown. Accordingly, it is proposed that it is necessary to incorporate standard pulmonary rehabilitation and physical activity promotion along with behavioural modification strategies to induce both functional and behavioural changes including anxiety, depression and physical inactivity.

**Research question:**

The project will investigate whether patients adhere well to an intervention combining standard pulmonary rehabilitation sessions (including exercise training and education), instructions on promoting daily physical activity and behavioural modification strategies to combat anxiety, depression and physical inactivity.

**Aims:**

The primary objective is to investigate patient adherence to the regular use of activity trackers to monitor and adjust daily physical activity levels during the course of a standard pulmonary rehabilitation programme (16 sessions) that includes behavioural modification consultancy sessions.

The secondary aims are to assess:

- Change in physical activity using a validated triaxial accelerometer.
- Mean change in Hospital Anxiety and Depression Score assessed by the HADS questionnaire.
- Mean change in quality of life assessed by St' Georges Respiratory Questionnaire (StGRQ).
- Exercise capacity assessed by the 6-min walking test (6MWT).

**Project plan:**

This is a single centre feasibility, single blind, parallel, randomised controlled trial. We will investigate patient adherence, acceptability of additional physical activity promotion along with Cognitive behavioural Modification by the patients and the multidisciplinary respiratory team.

**Study population:**

We will recruit 40 stable COPD patients.

**Key inclusion criteria:**

- 1) COPD confirmed by obstructive spirometry.
- 2) Clinically stable male or female COPD patients aged 40 years or older.
- 3) Optimised medical therapy
- 4) Able to provide informed consent.
- 5) HADS score of 8 or above.

**Key exclusion criteria:**

- 1) Orthopaedic, neurological or other concomitant diseases that significantly impair normal biomechanical movement patterns, as judged by the investigator.
- 2) Moderate or severe COPD exacerbation (AECOPD) within 4 weeks.
- 3) Unstable ischaemic heart disease, including myocardial infarction within 6 weeks.
- 4) Moderate or severe aortic stenosis or hypertrophic obstructive cardiomyopathy.
- 5) Uncontrolled hypertension.
- 6) Another condition likely to limit life expectancy to less than one year (principally metastatic malignancy).

**Planned interventions:**

Following confirmation of eligibility, informed consent (Appendix 1) and baseline assessment (Table 1), 40 patients will be randomised to: 1) an 8-week pulmonary rehabilitation programme according to British Thoracic Society (BTS) standards [11] or 2) 8 weeks of standard pulmonary rehabilitation alongside [10] physical activity promotion [6], (Fig. 1). Randomisation will be performed independently, with 1:1 allocation using stratification, variables: HADS (8 or above) and 6MWT (above or below 350m) [6] & [12], (Fig. 2).

*Standard Care Pulmonary rehabilitation;*

*Exercise Sessions:*

All patients will attend a group programme running twice weekly for 8 weeks (16 sessions) for approximately 50 minutes of exercise and 20 minutes of education or relaxation. The exercises include an individualised programme of aerobic (cycling and walking) and strengthening exercises were each patient would be progressed at each session as able.

*Cognitive behavioural modification (CBM):*

CBM strategies are part of standard care pulmonary rehabilitation at the Royal Victoria Infirmary. Made up of four elements: behaviour, cognition/thoughts, feelings/emotions, and physical sensations [13]. A number of techniques will be used to aid symptoms of anxiety and depression including; education on anxiety and depression and COPD, distraction techniques, breathing control and relaxation and rating achievement/pleasure of physical activities [10] (Figure 1). CBM will be administered once at study entry (week 1 for 45 min session), and three times during weeks 2, 3 and 4 for 30 min each time.

*Physical activity Promotion:*

The physical activity (PA) promotion intervention, will include: 1) a step-counter with a digital display, 2) a semi-structured interview discussing motivation issues, favourite activities, and strategies to become more active; 3) a tailored physical activity coaching plan including an individualized daily activity goal (steps/day) revised weekly. Patients' targets during the course of PR will be revised every 7 days, based on performance in the preceding week. The aim is to increase physical activity by 10% each week. The goal can be altered if required. Patients will be asked to wear the step counter during waking hours for a minimum of 8 hours after waking up on a daily basis. Patients will log their daily steps on a diary provided by the PR team. On a weekly basis, staff at the pulmonary rehabilitation programme will download manually the data from the activity monitor to keep a record. The patient's goal will be adjusted to the patient's performance of the previous week and to their willingness to increase their goal [6], (Figure 1).

**Trial Outcomes:**

The primary outcome is to investigate patient adherence to the regular use of activity trackers to monitor and adjust daily physical activity levels during the course of a standard pulmonary rehabilitation programme (16 sessions) that includes behavioral modification consultancy sessions to adopt an active lifestyle.

Secondary outcomes include:

- Change In physical activity at 9 weeks;
- Change in hospital anxiety and depression score at 9 weeks;
- Change in 6MWT at 9 weeks
- Change in QOL at 9 weeks

## **Assessment Procedures (Pre & Post):**

### *Pulmonary function:*

Pulmonary function assessment will be performed before and after completion of the PR program. The assessment will include comprehensive evaluation for the determination of Forced Expiratory Volume at the 1st second (FEV1) and Forced Vital Capacity (FVC) (Table 1).

### *Functional capacity:*

The six-minute walk test (6 MWT) will be performed according to the instructions of the American Thoracic Society [14], in order to assess the functional capacity of the patients. Intensity of dyspnoea and leg discomfort will be assessed by the modified Borg scale, whereas cardiac frequency (fc), and oxygen saturation will be recorded every min and at the end of 6 MWT. The 6 MWT will be performed within 1 week before and one week after the end of the rehabilitation program (Table 1).

### *Daily physical activity:*

Assessment of Daily Physical Activity will be performed one week before starting the PR program and one week after the completion of the PR program (9<sup>th</sup> week) using a triaxial accelometer (Actigraph GT3X; Actigraph LLC, Pensacola, FL, USA). Patients will be asked to wear the activity monitor during wakefulness for 7 consecutive days. Daily step count will be performed over 7 days, with at least 3 acceptable days' data, excluding days with less than 8 hours of wear time (Table 1).

### *Health-related Quality of Life:*

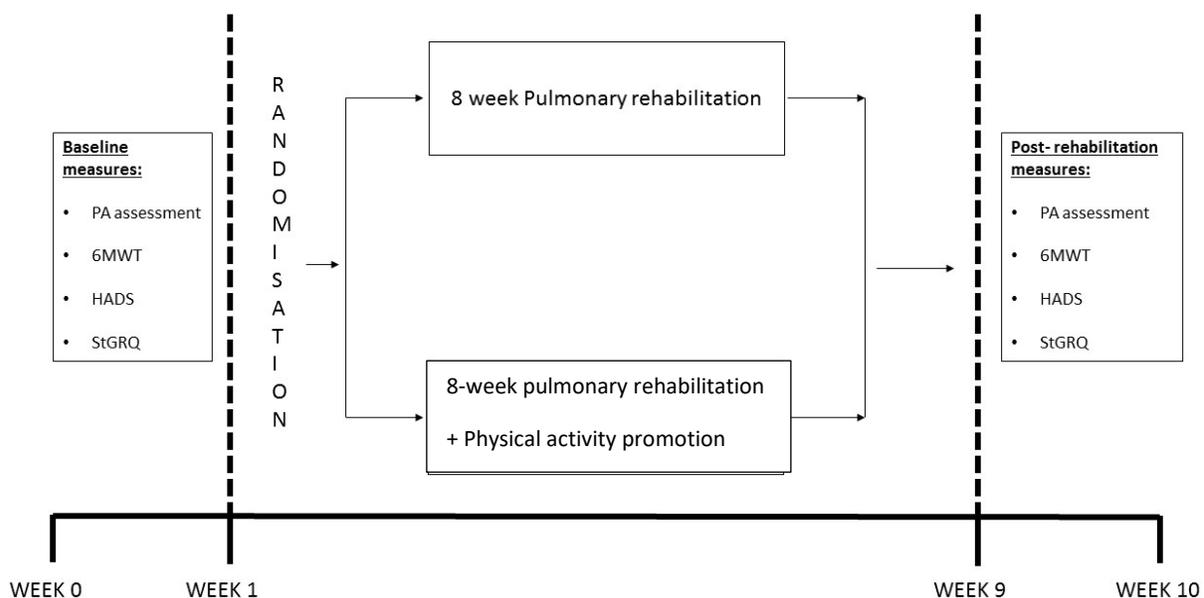
Quality of Life (QoL) will be assessed at the onset and following completion of the PR program. Patients will be asked to complete different questionnaires in order to evaluate their emotional condition and symptoms. The assessment of QoL will include 2 different questionnaires namely: Hospital Anxiety and Depression Score (HADS), and the St George's Respiratory Questionnaire (StGRQ)). The questionnaires will be administered within 1 week before and within 1 week after the end of the rehabilitation programme.

## **Statistical plan**

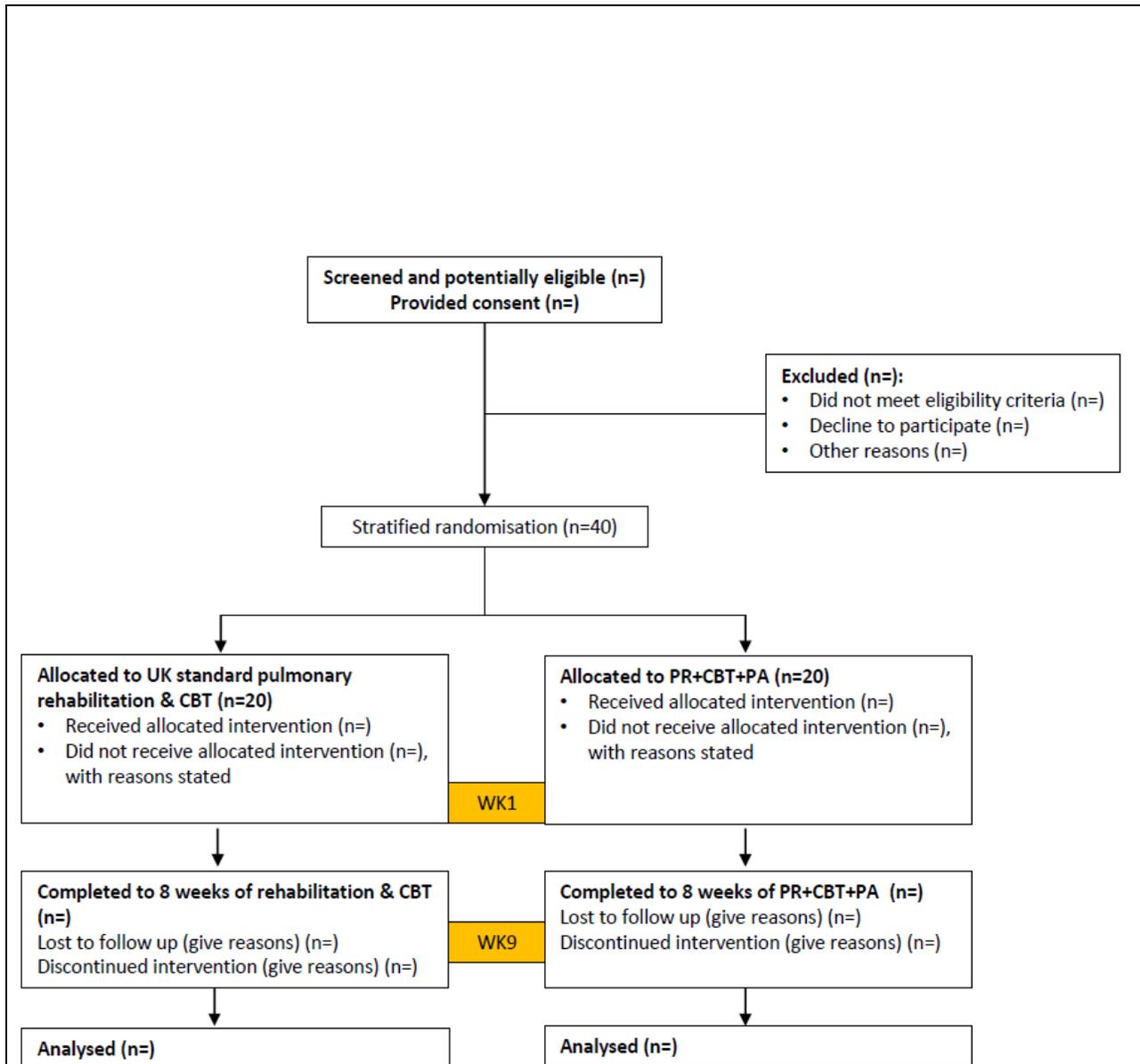
Statistical analyses will be supported by standard statistical software (e.g. SPSS, SAS) as required. This is a feasibility study and key outcomes of interest relate to adherence, attendance and drop out rather than clinical outcomes. However, clinical outcome data (steps/day) will be collected and reported to help inform a future randomized controlled trial. Feasibility data will be summarized using standard descriptive statistics, depending on the level of the data (e.g. mean, median, standard deviation, range). Baseline characteristics between groups will be assessed by t-tests for independent samples. Differences between groups across different time points will be assessed by a two-way ANOVA with repeated measures followed by appropriate post-hoc analysis. The Level of significance is set at  $p < 0.05$ .

**Table 1: Assessment of variables prior to and following the rehabilitation programme**

Visit number (Assessments)	1	2	3	4
	Week 0	Week 1	Week 9	Week 10
Inclusion/Exclusion criteria	x			
Information & Informed consent	x			
Physical examination	x			
mMRC evaluation	x			
Current medication review	x			
Pulmonary Function Assessment		x		
Heart Function Assessment (resting ECG)		x		
BMI (body composition)		x		x
Oximetry & Blood Pressure		x		
6 Minute Walk Test		x		x
Daily Physical Activity Assessment	x		x	x
Quality of Life Assessment		x		x



**Figure 1: Study design** . PA: physical activity; CBM: cognitive behavioural modification, 6MWT: 6-min walk test, HADS: Hospital anxiety and depressions score, StGRQ: St’Georges Respiratory questionnaire.



**Figure 2: Consort Diagram.** PR: pulmonary rehabilitation, CBM: cognitive behavioural modification, PA: Physical activity promotion.

## **Participant Information Sheet**

Title of Project: **A feasibility study assessing the inclusion of Physical Activity Promotion to standard care pulmonary rehabilitation and cognitive behavioural therapy in patients with COPD who are anxious and depressed.**

Name of researcher:.....

We would like to invite you to take part in our research study. Joining the study is entirely up to you before you decide we would like you to understand why the research is being undertaken and what it would involve for you. One member of our team will go through this information sheet with you, to help you decide whether you would like to take part and answer any questions, you may have. This should take about 30 minutes. Please feel free to talk to others about the study if you wish.

The first part of the Participant Information Sheet tells you the purpose of the study and what will happen to you if you take part.

Then we give you more detailed information about the conduct of the study.

Do ask if anything is unclear.

### **What is the purpose of the study?**

In patients who suffer COPD, daily physical activity is reduced compared to healthy individuals. Reduced levels of physical activity are associated with increased rates of hospital admission and mortality.

Interventions such as physical activity promotion have been found to improve engagement in physical activity and alongside pulmonary rehabilitation have been found to promote a healthy physically active lifestyle. To date no study has incorporated physical activity promotion alongside an intervention to adapt behaviour. Therefore, we aim to incorporate physical activity promotion to the standard care pulmonary rehabilitation (including cognitive behavioural therapy) at the Royal Victoria Infirmary.

### **Why have you been chosen?**

You have been chosen because you are a patient with COPD referred from the chest clinic to a programme of pulmonary rehabilitation at the Royal Victoria Infirmary. After reporting a score of >8 on the HADS questionnaire you have also been referred to Dr Karen Heslop for sessions of Cognitive Behavioural Therapy. Both Pulmonary rehabilitation and Cognitive behavioural therapy are part of your standard care and will not be affected by your decision in regards to this study.

### **What the study involves?**

The physical activity promotion intervention, will include: 1) a step-counter with a digital display , 2) a semi-structured interview discussing motivation issues, favourite activities, and strategies to become more active; 3) a tailored physical activity coaching plan including an individualized daily activity goal (steps) revised weekly. The physical activity promotion intervention will take place during your routine pulmonary rehabilitation visits and will only require a 5-10-minute 1-1 conversation with a member of the research team. During this time a conversation will be held to discuss the previous weeks daily step count (reported from step-counters), leading to a new weekly step goal being set.

### **Who would usually be admitted?**

In this study, the participants will be COPD patients who experience breathlessness and locomotor muscle discomfort during activities of daily living and have reported a HADS score of >8 for both anxiety and depression. Those patients will have shown interest in receiving both pulmonary rehabilitation and cognitive behavioural therapy to improve their functional capacity and quality of life.

### **Where the study will be conducted?**

The study will take place in the department for rehabilitation at the Royal Victoria Infirmary; part of the Newcastle upon Tyne Health Care Trust.

### **How long will the study last; when will it start and end?**

As per standard practice the study will involve two visits prior to the initiation of the pulmonary rehabilitation programme and one visit after completion of the pulmonary rehabilitation program for assessing the effects of pulmonary rehabilitation on your functional capacity and symptoms. The program itself will last a total of 8 weeks, with 2 sessions per week lasting a total of 1 hour. During each rehabilitation session, you will exercise using a stationary bicycle, treadmill and free weights. So you are expected to make in total 19 visits to the hospital. The physical activity

promotion intervention will take place during routine visits to undertake pulmonary rehabilitation sessions, with no extra visits to hospital required.

### **Do I have to take part?**

No, it is your free choice to take part. If you decide to take part, you will be asked to sign a consent form. You are free at any time to withdraw from the study, and do not have to give a reason. If you decide to withdraw from the study, we will use the information we have gathered up to that point, but we will not include your personal information unless you give us permission to do so.

If you decide not to take part, you will continue to receive the same usual care treatment.

### **What is physical activity promotion and Cognitive behavioural modification?**

The physical activity (PA) promotion intervention, will include: 1) a step-counter with a digital display, 2) a semi-structure interview discussing motivation issues, favourite activities, and strategies to become more active; 3) a tailored physical activity coaching plan including an individualized daily activity goal (steps) revised weekly.

Cognitive behavioural modification is made up of four elements; behaviour, cognition/thoughts, feelings/emotions, physical sensations. A number of techniques will be used to aid symptoms of anxiety and depression including; education on anxiety and depression and COPD, distraction techniques, breathing control and relaxation and rating achievement/pleasure of physical activities.

### **Risk assessment**

A respiratory nurse will supervise all measurements. In case the physician notices anything unusual in terms of the measurements (e.g. drop of blood pressure, alterations at ECG), he/she will stop the measurement and provide all the necessary care to you. Furthermore, all the necessary medical equipment and medication that a physician is going to need in case of an emergency will be available in the same room in which the exercise tests will be performed.

### **What are the possible disadvantages and risks to taking part?**

It is likely to feel breathless or experience muscle discomfort during the PR programme, nevertheless it is expected to recover very quickly after each session. Exercise is good for you.

### **What are the advantages to taking part?**

You will have the chance to experience the positive effects of pulmonary rehabilitation and your results will contribute to inform clinical service in the future so that an optimal form of exercise training is prescribed to patients in the future.

### **Will my personal information be kept confidential?**

During the study, we will collect information from you about your health and well-being. Your personal information such as your name and date of birth will be kept confidential and only available to the research team. The information given will only be used in a way that cannot be traced back to you, and any personal information will be stored securely. With your permission,

we will write to your GP to let him/her know that you are taking part in the study. No one outside the research team will know if you decide not to take part.

### **What if there is a problem or I need more information?**

If you wish to complain, or have any concerns about the study, please ask to speak to the physicians who oversee the study and will do his/her best to answer your questions. If you are still unhappy, you can complain formally using the normal NHS complaints channels.

### **What will happen with the results of the study?**

The results will be discussed at scientific medical meetings, and will be published in medical journals so that others can learn from our findings. You can receive a copy of the results by contacting Dr. Karen Heslop-Marshall.

*Newcastle upon Tyne Healthcare trust is the sponsor for this study based in England. We will be using information from you and/or your medical records in order to undertake this study and will act as the data controller for this study. This means that we are responsible for looking after your information and using it properly. Newcastle upon Tyne Healthcare trust will keep identifiable information about you for three years after the study has finished.*

*Your rights to access change or move your information are limited, as we need to manage your information in specific ways in order for the research to be reliable and accurate. If you withdraw from the study, we will keep the information about you that we already have obtained. To safeguard your rights, we will use the minimum personally identifiable information possible.*

*You can find out more about how we use your information by contacting the Respiratory Nurse Consultant in charge of this study, who's contact details can be found below; **Dr. Karen***

**Heslop-Marshall, Chest Clinic, RVI Hospital.**

**Telephone: 0191 282 29095**

**Email: karen.heslop@nuth.nhs.uk**

## CONSENT FORM

Title of Project: **A feasibility study assessing the inclusion of Physical Activity Promotion to standard care pulmonary rehabilitation and cognitive behavioural therapy in patients with COPD who are anxious and depressed.**

Name of Researcher: **Matthew Armstrong**

Please read the following statements, placing an initial in each box to confirm that you have read and agreed the terms required. Once complete please provide your name, date of completion and a signature on the lines provided.

On completion of this consent form, the original copy will be kept alongside the study documents and a copy will be made for your personal use.

Please initial  
box

1. I confirm that I have read the information sheet dated..... (version.....) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my medical care or legal rights being affected.
3. I understand that the information collected about me will be used to support other research in the future, and may be shared anonymously with other researchers.

4. I agree to my General Practitioner being informed of my participation in the study. / I agree to my General Practitioner being involved in the study, including any necessary exchange of information about me between my GP and the research team.

5. I understand that the information held and maintained by \_\_\_\_\_ [*(enter name of organisation(s) that will be providing you with data, including any NHS/HSC organisations)*] may be used to help contact me or provide information about my health status.

6. I agree to take part in the above study.

\_\_\_\_\_  
Name of Participant                      Date    Signature

\_\_\_\_\_  
Name of research                      Date    Signature

## References:

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