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[Intervention Protocol]

Interventions to promote referral, uptake and adherence to pulmonary rehabilitation for people with chronic obstructive pulmonary disease (COPD)

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ABSTRACT

This is a protocol for a Cochrane Review (Intervention). The objectives are as follows:

To determine the effectiveness of interventions to increase patient referral, uptake, and adherence to pulmonary rehabilitation programmes, for patients with COPD.

BACKGROUND

Description of the condition

Chronic obstructive pulmonary disease (COPD) is defined as ‘a common, preventable, and treatable disease that is characterised by persistent respiratory symptoms and airflow limitation that are due to airway or alveolar abnormalities (or both), usually caused by significant exposure to noxious particles or gases’ (Vogelmeier 2017).

Burden of disease

COPD is a common and increasingly prevalent respiratory disease that presents major public health challenges worldwide

(Lopez-Campos 2016). It accounts for 2.9 million deaths worldwide annually, and is currently the third leading cause of global death (Lozano 2012). It is estimated that 328 million people have been diagnosed with COPD worldwide (Lopez-Campos 2016), but it is accepted that this may represent less than half of the true disease burden, as there are many undiagnosed people living with COPD (Bernd 2015).

COPD accounts for high healthcare utilisation and subsequent cost worldwide (Lopez-Campos 2016). Emergency hospital admissions for COPD exacerbations are rising annually (Steiner 2015), although timely community management can reduce many COPD emergency hospital admissions (Blunt 2013).

Risk factors for COPD

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Tobacco smoke is the largest risk factor for COPD, although other factors, including outdoor air pollution, the burning of biomass fuels, exposure to passive smoking and other noxious gases and fumes, combined with genetic disposition, maternal tobacco exposure, and childhood respiratory infections, are important contributors to disease development. Increased exposure to risk factors for COPD (with the rising tobacco epidemic in low- and middle-income countries) and increasing population longevity contribute to the heavy forecasted societal and economic burden worldwide (Lopez-Campos 2016).

Pathology, symptoms, and progress

The pathophysiological effects of COPD are chronic inflammation of the airways and irreversible lung tissue damage, resulting in reduced airflow to the lungs (Szilasi 2006). COPD is diagnosed when spirometry demonstrates airflow obstruction that is not fully reversible (Qaseem 2011). COPD is a debilitating disease that worsens over time, with frequently reported symptoms of decreased exercise capacity, dyspnoea, and leg fatigue (Butcher 2012; Houchen 2009). Patients may experience exacerbations, when the symptoms of their disease worsen in response to stimuli, such as respiratory infections and air pollution (Anzueto 2007; White 2003). The frequency of exacerbations is variable, but tends to increase as the disease progresses (Hoogendoorn 2010). Exacerbations are one of the main causes of worsening prognosis, often leading to hospital admission, particularly for those with severe disease (Anzueto 2007). Hospital admission in those with COPD is associated with poor prognosis, lower quality of life, high post-admission mortality, and high 90-day re-admission rates (Alamagro 2010; Anzueto 2007; Steiner 2016).

Comorbidities

COPD co-morbidities are common, and include cardiovascular disease, diabetes, asthma, anxiety, and depression (Eisner 2010; Mannino 2015; Schneider 2010). These increase the overall burden to the individual, as well as to families, caregivers, and health and social care services, a burden that is increasing worldwide (GBD 2015).

COPD Management

Other than the treatment and prevention of exacerbations, therapy during stable COPD is aimed at reducing progression and managing symptoms. All patients should be offered smoking cessation advice at regular intervals, as this is the main disease-modifying treatment available at present (Vogelmeier 2017). Pharmacotherapy consists of short-acting and long-acting bronchodilator inhalers, with steroid inhalers added to manage symptoms and prevent exacerbations. Patients with more severe breathlessness (usually Medical Research Council (MRC) Grade 3 or worse, dyspnoea) are eligible for pulmonary rehabilitation (PR). All patients

should receive influenza and pneumococcal vaccines, and advice about self-management (Bolton 2013; Vogelmeier 2017). In practice, evidence from the literature suggests that patients are often not appropriately managed, with over and under prescription of inhalers, and under-utilisation of other effective services (Perez 2011; Price 2014).

Details of pulmonary rehabilitation

Pulmonary rehabilitation (PR) is a structured multidisciplinary programme defined as 'an interdisciplinary programme of care for patients with chronic respiratory impairment that is individually tailored and designed to optimise each patient's physical and social performance and autonomy. Programmes comprise individualised exercise programmes and education' (Bolton 2013). One of the main aims of PR is to increase physical activity for those with COPD (Spruit 2013). Increasing physical activity requires behaviour change. PR emphasizes behaviour change through patient and interdisciplinary collaboration, and it is this collaborative approach that is key in achieving increasing physical activity in patients with COPD, over exercise-only interventions (Spruit 2015). PR programmes are commonly delivered to groups of patients in community or hospital settings, although other models of delivery, including home-based programmes, are also available. Evidence that supports home-based PR as an alternative, yet effective PR approach for COPD patients, is an emerging field (Grosbois 2015; Mohammadi 2013).

Recommendations state that for optimal effectiveness, programmes should run twice weekly for a minimum of six weeks (Bolton 2013; Vogelmeier 2017), although programmes that run twice weekly for a minimum for eight weeks are recommended by other guidelines (Rochester 2015).

Randomised controlled trials (RCTs) show that PR is effective in improving exercise capacity, breathlessness, functional independence, and psychological well-being (McCarthy 2015; Zoeckler 2014). PR also reduces healthcare utilisation, including hospital admissions and length of stay (California PRC Group 2004; Hui 2003). The effect on hospital admission appears to be related to the comprehensiveness of individual programmes, which is often variable (Moore 2016; Puhan 2016). Economic analyses suggest it is also cost-effective, at GBP 2000 to GBP 8000 per Quality-Adjusted Life Year (QALY), thus overall, it is an essential component in the management of COPD (Williams 2011).

Referral to PR

The American College of Physicians, American College of Chest Physicians, American Thoracic Society, and European Respiratory Society COPD clinical guidelines recommend PR for all symptomatic COPD patients with a Forced Expiratory Volume in one second (FEV₁) less than 50% predicted (Qaseem 2011). Recommendations are that PR is undertaken at a time of disease stability

(Bolton 2013; Rochester 2015; Vogelmeier 2017), yet undertaking PR soon after an acute exacerbation of COPD is clinically valuable (Rochester 2015), particularly when hospitalisation for an exacerbation was required (Bolton 2013; Puhan 2016).

In European countries, most referrals to PR are undertaken by healthcare practitioners from primary, community, secondary, and tertiary care settings, whilst in North America, self-referral is relatively common (Spruit 2014). Referral to PR remains persistently poor worldwide, regardless of the availability of PR (Camp 2015; McNaughton 2016; Steiner 2015; Wadell 2013). In their New Zealand audit, McNaughton 2016 reported that only 2% of the expected COPD population was referred to PR, whilst in England and Wales, 68,000 (15.2%) of 446,000 eligible patients were referred (Steiner 2015). Reasons given for low patient referral by healthcare practitioners included a lack of knowledge about programme content, challenging or uncertain referral process (or both), time pressures for the prospective referrer, uncertainty of whose role it was to refer, and anticipated access difficulties for patients (Foster 2016; Harris 2008a; Johnston 2013). Conclusions from these studies were that these difficulties disempowered the healthcare practitioner (HCP), and that increasing knowledge of PR and its benefits would improve referral rates.

Attendance at pulmonary rehabilitation

Following referral, patients are required to attend a PR pre-assessment. This is commonly completed by the PR staff and includes a full patient history, physical examination, assessment of contraindications and risk factors, such as unstable cardiovascular disease (unstable angina, unstable arrhythmias, aortic aneurysm, hypertension), or other inhibiting conditions, such as severe arthritis or neurological conditions (Bolton 2013; Spruit 2013). It is also a time during which a detailed description of the programme is provided, and discussions about individual patient goals, motivations, expectations, including barriers and capabilities, should be discussed (Vogelmeier 2017).

In the England and Wales audit, it was reported that of the 68,000 COPD patients referred, 47,020 (69%) attended pre-assessment, following which, 10% to 14.8% of patients did not enrol in PR (Steiner 2015; Steiner 2016). Keating 2011 reported that uptake of PR has traditionally been poor, with up to half of the patients offered a course, not enrolling. Reasons for patients' lack of uptake or attendance at PR included limited understanding of COPD and a high COPD symptom burden, leading to fear and a sense of loss of control (Harris 2008b; Lewis 2014). Consequently, PR is often perceived as too difficult to complete, of limited benefit, or both (Cooke 2012; Hayton 2013; Keating 2011). Additional influencing factors include the referrer (Arnold 2006; Hogg 2012), and transport difficulties, including access to transport and cost of travel (Almadana 2014; Keating 2011).

Patients decline to attend pulmonary rehabilitation at the initial assessment stage, the first PR session, or both (Cassidy 2014;

Keating 2011). Following assessment, some COPD patients are deemed ineligible for PR, and in other cases, the patient themselves chooses to decline. However, the assessment of contraindications, including unstable angina, can often be subjective (Gunes 2009). Standardising this assessment would reduce current variation and ambiguity between guidelines (Bolton 2013; Spruit 2013).

PR adherence

Studies report variable and un-sustained attendance following enrolment in a PR course, with non-completers ranging from 42% in Keating 2011 to 58% in Steiner 2016. A Swedish audit reported PR completion rates ranging between 20% and 99% (Wadell 2013).

PR adherence reporting measures vary across studies. For example, Hayton 2013 reported that 71% of patients attended at least 63% of the planned eight sessions, and an audit in New Zealand showed that 46% to 75% of attendees attended all 16 planned PR sessions (McNaughton 2016).

Factors associated with lower attendance include advancing age, being female, being from a minority ethnic group, being a current smoker, having greater breathlessness, living alone, experiencing financial hardship, long term oxygen use, having anxiety and depression, and having a reduced baseline health-related quality of life (Boutou 2014; Cassidy 2014; Fischer 2007; Hayton 2013; Hogg 2012; Keating 2011; McNaughton 2016; Sabit 2008).

Description of the intervention

The purpose of this review is to focus on interventions to improve referral, uptake, and adherence to pulmonary rehabilitation by COPD patients, which is already recommended as an effective service.

Interventions identified in scoping reviews have identified that increasing HCP knowledge, and support to COPD patients to manage co-morbidities, such as anxiety and depression, improved patient uptake to PR (Hardy 2014). A quasi-randomised trial sought to increase patient empowerment by using tablet devices with a personal training diary. Investigators observed improvements in PR adherence in this intervention group compared with usual care (Ringbaek 2016).

Interventions may use a variety of delivery platforms, including digital technologies, avatar-based technologies and videos, or more traditional, written information, paying attention to the verbal and written language used (Johnston 2013; Williams 2011). The use of 'lay' advocates, such as 'expert patients' may also play a key role.

How the intervention might work

The intervention may use a variety of direct or indirect behaviour change approaches, either separately or in combination, targeted at each step or audience. The intervention may target the patient, their HCP, partner, family members, caregivers, friends, or a combination.

Within the behaviour change approaches, it is likely the interventions will seek to address capability, opportunity, or motivation issues within each of the specified participant groups (Michie 2013). This may, for example, include increasing the opportunities to discuss or access PR programmes; it may also include strategic interventions, which enhance referral processes or increase awareness of PR programmes and their benefits.

Why it is important to do this review

COPD is an increasing global public health issue, with a high burden of morbidity and mortality (Lozano 2012; Murray 2015). PR is a clinically effective and cost effective intervention that can reduce mortality and improve prognosis.

However, referral to pulmonary rehabilitation programmes, and uptake and adherence rates are universally low. Interventions to tackle each of these outcomes will benefit patients' physical and psychological well-being, and reduce the use of unplanned and emergency healthcare services.

There is only one similar systematic review that has been published, which investigated interventions that sought to improve the uptake and completion of pulmonary rehabilitation in COPD (Jones 2017). This systematic review included only randomised controlled trials, of which there was only one (Ringbaek 2016). They concluded that they could not make any recommendations for practice. Three UK trials are currently underway, and there are non-randomised studies available, which will inform the evidence base and warrant inclusion.

There is also a systematic review that investigated interventions that increased uptake and adherence to cardiac rehabilitation for patients with coronary heart disease, including heart failure. This review reported limited evidence supporting intervention effectiveness within this field (Karmali 2014). Similar to Jones 2017, this systematic review only included RCTs.

Given the ongoing studies within in the pulmonary rehabilitation field, and the lack of evidence reported by previous systematic reviews that only included RCTs, this proposed systematic review, which will be regularly updated to include new evidence and will have clinical benefit for those with COPD and their caregivers.

OBJECTIVES

To determine the effectiveness of interventions to increase patient referral, uptake, and adherence to pulmonary rehabilitation programmes, for patients with COPD.

METHODS

Criteria for considering studies for this review

Types of studies

We anticipate that there will be limited trials available, therefore, we will include a broad range of study designs including: randomised controlled trials (RCT; individual or cluster-level) and observational studies, such as non-randomised controlled trials (including controlled before-and-after studies and non-controlled, before-and-after studies). We will include studies reported in full text, those published as an abstract only, and unpublished data. We will not apply any restrictions.

Types of participants

Inclusion criteria

Interventions to improve referral, uptake, and adherence rates may be applied to healthcare professionals or patients, partners, caregivers, family, or friends of the COPD patient. Therefore, we will include studies in which the population is either:

1. Healthcare practitioners (of any age) who care for patients with either stable or acute COPD, in all healthcare settings.

Or:

2. Adult participants (at least 18 years of age) who have a primary diagnosis of COPD, defined with or without spirometric confirmation. We will include studies in which the participants have any stage of COPD, with either stable disease or post-acute exacerbations, and who may have singular or multiple co-morbidities. There will be no upper age limit.

Or:

3. Partners, caregivers, family, or friends (of any age), of the COPD patient, who may influence referral, uptake, or adherence to pulmonary rehabilitation.

Exclusion criteria

We will exclude studies in which the focus of the study is on participants receiving PR with the following primary diagnoses: asthma, bronchiectasis, lung cancer, interstitial lung disease (ILD), and congestive cardiac failure.

We will exclude interventions that are designed to target other programmes, such as maintenance pulmonary rehabilitation programmes.

Types of interventions

Interventions will be eligible if they aim to increase referral to, uptake of, or adherence to any type of PR programme.

Potential comparators could be usual care, or any concurrent control group that was not receiving an intervention that aimed to improve referral, uptake, or adherence to PR, or alternative intervention to improve referral/uptake/adherence.

Types of outcome measures

Primary outcomes

1. Referral to pulmonary rehabilitations programmes (as measured by referral sent or received)
2. Attendance at pulmonary rehabilitation programme assessment
3. Attendance at start of pulmonary rehabilitation programme
4. Adherence to pulmonary rehabilitation programme (as specified by study reports, but usually percent % of sessions attended)

We will present outcomes as proportions.

Rationale. In order to access and enrol in PR, patients are initially referred by a HCP, or in some circumstances, the patient may self-refer. Attending a PR assessment is the next step, which if successful, is followed by an opportunity to start a PR programme. Adequate attendance at PR programmes is essential in order to gain clinical and psychosocial benefits, however, the literature informs us that these steps are areas of weakness in PR recruitment and retention. Interventions designed to increase uptake and sustainability at each stage are emerging. Identifying those that are effective is a key aim of the systematic review.

Secondary outcomes

There are no secondary outcome measures for this review.

Search methods for identification of studies

Electronic searches

We will search for randomised controlled trials in the Cochrane Airways Trials Register, which is maintained by the Information Specialist for the Group. The Cochrane Airways Trials Register contains studies identified from several sources (see [Appendix 1](#) for details). We will conduct additional searches of the following databases, using appropriate search terms to identify both randomised and non-randomised trials:

1. Cochrane Central Register of Controlled Trials through the Cochrane [Register of Studies Online](#) (CENTRAL; search date);
2. MEDLINE Ovid (1946 to search date);

3. Embase Ovid (1974 to search date);
4. CINAHL EBSCO (Cumulative Index to Nursing and Allied Health Literature; all years to search date);
5. PEDro (Physiotherapy Evidence Database; search date)

We have described the proposed CENTRAL and MEDLINE search strategies in [Appendix 2](#). We will adapt them for the other databases. We will search all databases from their inception to the present, and there will be no restriction on language of publication. We will search handsearched conference abstracts and grey literature through the CENTRAL database and the Cochrane Airways Trials Register.

We will search the following trials registries:

1. UK Clinical Trials Gateway (ukctg.nihr.ac.uk)
2. US National Institutes of Health Ongoing Trials Register ClinicalTrials.gov (www.clinicaltrials.gov/)
3. World Health Organization International Clinical Trials Registry Platform (ICTRP; apps.who.int/trialsearch/)

Searching other resources

We will check the reference lists of all primary studies and review articles for additional references. We will search relevant manufacturers' websites for study information.

We will search for errata or retractions from included studies published in full text on [PubMed](#) and report the date this was done in the review.

Data collection and analysis

Selection of studies

Two review authors (JY and RJ) will independently screen the titles and abstracts of the search results and code them as 'retrieve' (eligible or potentially eligible or unclear) or 'do not retrieve'. We will retrieve the full-text study reports of all potentially eligible studies, and two review authors (JY and RA) will independently screen them for inclusion, recording the reasons for exclusion of ineligible studies. We will resolve any disagreement through discussion, or if required, we will consult a third review author (PA). We will identify and exclude duplicates and collate multiple reports of the same study, so that each study, rather than each report, is the unit of interest in the review. We will record the selection process in sufficient detail to complete a PRISMA flow diagram and 'Characteristics of excluded studies' table ([Moher 2009](#)).

Data extraction and management

We will use a pre-designed data collection form for these study characteristics and outcome data, which will be piloted on at least one study in the review.

1. Methods: study design, aim of study, total duration of study, details of any 'run-in' period, number of study centres and location, study setting, withdrawals, and date of study. Study inclusion and exclusion criteria

2. COPD patients: N, mean age, age range, gender, severity of condition, diagnostic criteria, baseline lung function, smoking history, medication, prior history of PR

3. Healthcare practitioner: N, mean age, gender, job role, length of time in job role, contracted hours in job role, prior academic experience, knowledge of and experience with PR

4. Interventions: type of behaviour change intervention, duration of intervention and comparator, description of target PR service

5. Outcomes: primary and secondary outcomes specified and collected, and time points reported

6. Notes: funding for studies, and notable conflicts of interest of trial authors.

Two review authors (JY and RJ) will independently extract outcome data from included studies. We will note in the 'Characteristics of included studies' table if outcome data were not reported in a usable way. We will resolve disagreements by consensus, or by involving a third review author (PA). One review author (JY) will transfer data into the Review Manager 5 file (RevMan 2014). We will double-check that data are entered correctly by comparing the data presented in the systematic review with the study reports. A second review author (AE) will spot-check study characteristics for accuracy against the study report.

Assessment of risk of bias in included studies

Two review authors (JY and RJ) will independently assess risk of bias for each study using the criteria outlined in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011). We will resolve any disagreements by discussion or by involving another author (PA). We will assess the risk of bias according to the following domains:

1. random sequence generation;
2. allocation concealment;
3. blinding of participants and personnel;
4. blinding of outcome assessment;
5. incomplete outcome data;
6. selective outcome reporting;
7. other bias.

We will judge each potential source of bias as high, low, or unclear, and provide a quote from the study report and a justification for our judgement in the 'Risk of bias' table. We will summarise the risk of bias judgements across different studies for each of the domains listed. We will consider blinding separately for different key outcomes where necessary (e.g. for unblinded outcome assessment, risk of bias for objectively recorded PR attendance may be different than for patient-reported attendance). Where information on risk of bias relates to unpublished data or correspondence

with a trialist, we will note this in the 'Risk of bias' table.

When considering treatment effects, we will take into account the risk of bias for the studies that contribute to that outcome.

Methodological quality or risk of bias for non-randomised studies will be assessed using the ROBINS-I tool (Sterne 2016).

When including non-randomised studies, we will assess whether the authors have accounted for potential confounding factors including characteristics of the patients (e.g. age, sex, ethnicity, smoking status, severity of disease, co-morbidities, prior attendance at PR, caring responsibilities, distance from programme) and characteristics of the healthcare professionals (type, experience, age, academic history).

Assessment of bias in conducting the systematic review

We will conduct the review according to this published protocol, and justify any deviations from it in the 'Differences between protocol and review' section of the systematic review.

Measures of treatment effect

We will analyse dichotomous data as odds ratios (OR), and continuous data as the mean difference (MD) or standardised mean difference (SMD).

We will undertake meta-analyses of RCTs and CCTs only when this is meaningful; that is, if the treatments, participants, outcomes, and the underlying clinical question are similar enough for pooling to make sense.

We will use RevMan 5 software to calculate pooled effect sizes, to test for heterogeneity, and to perform subgroup analysis (RevMan 2014).

We will only combine RCTs and CCTs if there is minimal clinical and methodological diversity between the controlled studies.

If there is large heterogeneity, we will explore reasons for it, including undertaking subgroup analyses of the RCTs and CCTs separately.

We will use a narrative format to describe skewed data (for example, as medians and interquartile ranges for each group).

For non-controlled before and after studies we intend to describe the presence of the study and describe the results together with caveats about the lack of control group.

It is likely that only end point studies will be available.

Unit of analysis issues

The unit of analysis will be the patient, and/or the healthcare practitioner. We will only meta-analyse data from cluster-RCTs if the available data have been adjusted (or can be adjusted), to account for the clustering. For cluster-randomised trials, we will make adjustments to the sample sizes for each intervention, based on the method described in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011).

Dealing with missing data

We will contact investigators or study sponsors to verify key study characteristics and obtain missing numerical outcome data where needed (e.g. when a study is identified as an abstract only). When this is not possible, and the missing data are thought to introduce serious bias, we will take this into consideration in the GRADE rating for affected outcomes.

When we identify relevant studies of mixed populations with no subgroup data, we will contact the study authors to request them. If we are still unable to acquire these data, and if less than 80% of the participants are from the population of interest, we will describe these studies in a narrative format, but exclude them from meta-analyses.

Assessment of heterogeneity

If appropriate we will use the I^2 statistic to measure heterogeneity among the studies in each analysis. We will consider an I^2 value greater than 50% to indicate substantial statistical heterogeneity, we will report it and explore the possible causes by pre-specified subgroup analysis (see below).

Assessment of reporting biases

If we are able to pool more than 10 studies, we will create and examine a funnel plot to explore possible small study and publication biases.

Data synthesis

We will use a random-effects model and perform a sensitivity analysis with a fixed-effect model (if appropriate).

'Summary of findings' table

We will create a 'Summary of findings' table with the following outcomes: referral to pulmonary rehabilitations programmes, attendance at PR programme assessment, attendance at start of PR programme, and attendance for the duration of PR programme. We will use the five GRADE considerations (risk of bias, indirectness, consistency of effect, imprecision, and publication bias) to assess the quality of a body of evidence as it relates to the studies that contribute data for the pre-specified outcomes. We will use the methods and recommendations described in Section 8.5 and Chapter 12 of the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011), and GRADEpro software (GRADEpro GDT). We will justify all decisions to downgrade the quality of studies in footnotes, and we will make comments to aid the reader's understanding of the review where necessary.

Subgroup analysis and investigation of heterogeneity

We plan to carry out the following subgroup analyses where possible:

1. Type of referring healthcare practitioner (nurse, doctor, other)
Rationale: the type of healthcare practitioner could influence whether patients are referred, and the likelihood of uptake and adherence after referral.

2. Origin of referral (self, community, hospital)
Rationale. Motivation for adherence and completion may vary according to who made the referral.

3. Pulmonary rehabilitation programme setting (home versus centre-based)

Rationale. Perceived convenience of attending has been highlighted as a barrier to attendance in qualitative studies. Therefore, the setting could influence uptake, adherence, or completion.

4. Patient age (up to 65 years, over 65 years)

Rationale. Patient age and working status are reported to be an influencing characteristic, particularly in adherence. The age cut-off is based on approximate age for retirement.

5. COPD severity (as determined by stable disease or post-exacerbation)

Rationale. Motivation to attend and complete may differ according to whether the patient has had a recent exacerbation.

We will use the following outcomes in subgroup analyses:

1. Referral to PR programmes (as measured by study reports);
2. Attendance at PR programme assessment (as measured by study reports);
3. Attendance at start of PR programmes (as measured by study reports);
4. Adherence to PR programmes (as measured by study reports).

We will use the formal test for subgroup interactions in Review Manager 5 (RevMan 2014).

Sensitivity analysis

We will undertake sensitivity analyses, where possible to

- compare the results from a fixed-effect model with the random-effects models;
- restrict the analyses to those with an active comparator only;
- if only non-randomised controlled clinical trials are available, remove studies that are at 'serious' or 'critical' risk of bias, according to the ROBINS-I tool

We will exclude RCT studies with high risk of bias (two or more domains judged to be at high risk of bias).

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REFERENCES

Additional references

Alamagro 2010

Almagro P, Salvadó M, Garcia-Vidal C, Rodriguez-Carballeira M, Delgado M, Barreiro B, et al. Recent improvement in long-term survival after a COPD hospitalisation. *Thorax* 2010;**65**:298–302.

Almadana 2014

Almadana V, Romero C, Valido A, Gomez-Bastero AP, Sanchez J, Montemayor T. Profile of patients who drop out of a pulmonary rehabilitation program. *Chest* 2014;**145** (suppl 3):370A.

Anzueto 2007

Anzueto A, Sethl S, Matrinez F. Exacerbations of COPD. *Proceedings of the American Thoracic Society* 2007;**4**:554–64.

Arnold 2006

Arnold E, Bruton A, Ellis-Hill C. Adherence to pulmonary rehabilitation: a qualitative study. *Respiratory Medicine* 2006;**100**(10):1716–23.

Bernd 2015

Bernd L, Joan BS, Michael S, Bernhard K, Lowie EV, Louisa G, et al. Determinants of under diagnosis of COPD in national and international surveys. *Chest* 2015;**148**(4): 971–85.

Blunt 2013

Blunt I. Focus on preventable admissions trends in emergency admissions for ambulatory care sensitive conditions, 2001 to 2013. www.health.org.uk/sites/health/files/QualityWatch_FocusOnPreventableAdmissions.pdf (accessed prior to 23 March 2017).

Bolton 2013

Bolton CE, Bevan-Smith EF, Blakey JD, Crowe P, Elkin SL, Garrod R, et al. British Thoracic Society guideline on pulmonary rehabilitation in adults: accredited by NICE. *Thorax* 2013;**68**:S2.

Boutou 2014

Boutou A, Tanner R, Lord V, Hogg L, Nolan J, Jefford, et al. An evaluation of factors associated with completion and benefit from pulmonary rehabilitation in COPD. *BMJ Open Respiratory Research* 2014;**1**:1–8.

Butcher 2012

Butcher S, Pikaluk B, Chura R, Walkner M, Farthing J, Marciniuk D. Associations between isokinetic muscle strength, high-level functional performance, and physiological parameters in patients with chronic obstructive pulmonary disease. *International Journal of Chronic Obstructive Pulmonary Disease* 2012;**7**:537–42.

California PRC Group 2004

California Pulmonary Rehabilitation Collaborative Group. Effects of pulmonary rehabilitation on dyspnea, quality of life, and healthcare costs in California. *Journal of Cardiopulmonary Rehabilitation* 2004;**24**(1):52–62.

Camp 2015

Camp PG, Hernandez P, Bourbeau J, Kirkham A, Debigare R, Stickland MK, et al. Pulmonary rehabilitation in Canada: A report from the Canadian Thoracic Society COPD Clinical Assembly. *Canadian Respiratory Journal* 2015;**22**(3):147–52.

Cassidy 2014

Cassidy S, Turnbull S, Gardani M, Kirkwood K. Attendance at pulmonary rehabilitation classes: An exploration of demographic, physiological and psychological factors that predict completion of treatment. *Chronic Respiratory Disease* 2014;**11**(2):95–102.

Cooke 2012

Cooke M, Thackery S. Differences between community professional and patient perceptions of chronic obstructive pulmonary disease treatment outcomes: a qualitative study. *Journal of Clinical Nursing* 2012;**21**:1524–33.

Eisner 2010

Eisner M, Blanc P, Yelin E, Katz P, Sanchaz G. Influence of anxiety on health outcomes in COPD. *Thorax* 2010;**65**: 229–34.

Fischer 2007

Fischer M, Scharloo M, Abbink JJ, Thijs-Van Nies A, Rudolphus A, Snoei L. Participation and drop-out in pulmonary rehabilitation: a qualitative analysis of the patient's perspective. *Clinical Rehabilitation* 2007;**21**: 212–21.

Foster 2016

Foster F, Piggot R, Riley L, Beech R. Working with primary care clinicians and patients to introduce strategies for

- increasing referrals for pulmonary rehabilitation. *Primary Health Care Research and Development* 2016;**17**(3):226–37.
- GBD 2015**
Global Burden of Disease Study 2013 Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 301 acute and chronic diseases and injuries in 188 countries, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet* 2015;**386**:743–800.
- GRADEpro GDT [Computer program]**
GRADE Working Group, McMaster University. GRADEpro GDT. Version accessed prior to 23 March 2017. Hamilton (ON): GRADE Working Group, McMaster University, 2014.
- Grosbois 2015**
Grosbois JM, Gicquello A, Langlois C, Le Rouzic O, Bart F, Wallaer B, et al. Long-term evaluation of home-based pulmonary rehabilitation in patients with COPD. *International Journal of COPD* 2015;**10**:2037–44.
- Gunes 2009**
Gunes Y, Tuncer M, Guntekin U, Gumrukcuoglu H, Akdag S, Oxbay B. Reliability of symptoms suggestive of angina in patients with chronic obstructive pulmonary disease. *Arquivos Brasileiros De Cardiologia* 2009;**92**(5):334–8.
- Hardy 2014**
Hardy S, Smart D, Scalalon M, Rogers S. Integrating psychological screening into reviews of patients with COPD. *British Journal of Nursing* 2014;**23**(15):832–7.
- Harris 2008a**
Harris D, Hayter M, Allender S. Factors affecting the offer of pulmonary rehabilitation to patients with chronic obstructive pulmonary disease by primary care professionals: a qualitative study. *Primary Health Care Research and Development* 2008a;**9**(4):280–90.
- Harris 2008b**
Harris D, Hayter M, Allender S. Improving the uptake of pulmonary rehabilitation in patients with COPD: qualitative study of experiences and attitudes. *British Journal of General Practice* 2008b;**58**(555):703–10.
- Hayton 2013**
Hayton C, Clark A, Olive S, Browne P, Galey P, Knights E. Barriers to pulmonary rehabilitation: characteristics that predict patient attendance and adherence. *Respiratory Medicine* 2013;**107**:401–7.
- Higgins 2011**
Higgins JPT, Green S, (editors). *Cochrane Handbook for Systematic Reviews of Interventions* Version 5.1.0 (updated March 2011). The Cochrane Collaboration, 2011. Available from www.handbook.cochrane.org.
- Hogg 2012**
Hogg L, Garrod R, Thornton R. Effectiveness, attendance, and completion of an integrated, system-wide pulmonary rehabilitation service for COPD: prospective observational study. *COPD* 2012;**9**(5):546–54.
- Hoogendoorn 2010**
Hoogendoorn M, Feenstra T, Hoogenveen R, Al M, Rutten-vanMölkken M. Association between lung function and exacerbation frequency in patients with COPD. *International Journal of COPD* 2010;**5**:435–44.
- Houchen 2009**
Houchen L, Steiner M, Singh S. How sustainable is strength training in chronic obstructive pulmonary disease?. *Physiotherapy* 2009;**95**(1):1–7.
- Hui 2003**
Hui K, Hewitt A. A simple pulmonary rehabilitation program improves health outcomes and reduces hospital utilization in patients with COPD. *Chest* 2003;**24**(1):94–7.
- Johnston 2013**
Johnston K, Young M, Grimmer M, Antic R, Firth P. Barriers to, and facilitators for, referral to pulmonary rehabilitation in COPD patients from the perspective of Australian general practitioners: a qualitative study. *Primary Care Respiratory Journal* 2013;**22**(3):319–24.
- Jones 2017**
Jones A, Taylor A, Gowler H, O’Kelly N, Ghosh S, Bridle C. Systematic review of interventions to improve patient uptake and completion of pulmonary rehabilitation in COPD. *ERJ Open Research* 2017;**3**:1–10.
- Karmali 2014**
Karmali KN, Davies P, Taylor F, Beswick A, Martin N, Ebrahim S. Promoting patient uptake and adherence in cardiac rehabilitation. *Cochrane Database of Systematic Reviews* 2014, Issue 6. [DOI: 10.1002/14651858.CD007131.pub3]
- Keating 2011**
Keating A, Lee A, Holland A. What prevents people with chronic obstructive pulmonary disease from attending pulmonary rehabilitation? A systematic review. *Chronic Respiratory Disease* 2011;**8**(2):89–99.
- Lewis 2014**
Lewis A, Bruton A, Donovan-Hall M. Uncertainty prior to pulmonary rehabilitation in primary care: a phenomenological qualitative study in patients with chronic obstructive pulmonary disease. *Chronic Respiratory Disease* 2014;**11**(3):173–80.
- Lopez-Campos 2016**
Lopez-Campos J, Tan W, Soranio J. Global burden of COPD. *Respirology* 2016;**14**:14–23.
- Lozano 2012**
Lozano R, Naghavi M, Foreman K, Lim S, Shibuya K, Aboyans V. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet* 2012;**380**:2095–128.
- Mannino 2015**
Mannino D, Higuchi K, Yu T, Zhou H, Li Y, Tian H, et al. Economic Burden of COPD in the Presence of Comorbidities. *Chest* 2015;**148**:138–50.

McCarthy 2015

McCarthy B, Casey D, Devane D, Murphy K, Murphy E, Lacasse Y. Pulmonary rehabilitation for chronic obstructive pulmonary disease. *Cochrane Database of Systematic Reviews* 2015, Issue 2. [DOI: 10.1002/14651858.CD003793.pub3]

McNaughton 2016

McNaughton A, Weatherall M, Williams G, Delacey D, George C, Beasley R. An audit of pulmonary rehabilitation program. *Clinical Audit* 2016;**8**:7–12.

Michie 2013

Michie S, Richardson M, Johnston M, Abraham C, Francis J. The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions. *Annals of Behavioural Medicine* 2013;**46**: 81–95.

Mohammadi 2013

Mohammadi F, Jowkar Z, Khankeh HR, Tafti SF. Effect of home-based nursing pulmonary rehabilitation on patients with chronic obstructive pulmonary disease: a randomised clinical trial. *British Journal of Community Nursing* 2013;**18** (8):398–04.

Moher 2009

Moher D, Liberati A, Tetzlaff J, Altman D. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Medicine* 2009;**6**(7): e1000097. [DOI: 10.1371/journal.pmed.1000097]

Moore 2016

Moore E, Palmer T, Newson R, Majeed A, Quint J, Soljak MA. Pulmonary rehabilitation as a mechanism to reduce hospitalizations for acute exacerbations of COPD: a systematic review and meta-analysis. *Chest* 2016;**150**(4): 837–59.

Murray 2015

Murray C, Barber R, Foreman K, O'xgoren A, Abd-Allah F, Abera S, et al. Global, regional, and national disability-adjusted life years (DALYs) for 306 diseases and injuries and healthy life expectancy (HALE) for 188 countries, 1990–2013: quantifying the epidemiological transition. *Lancet* 2015;**386**(10009):2145–91.

Perez 2011

Perez X, Wisnivesky J, Lursurchachai L, Kleinman L, Kronish I. Barriers to adherence to COPD guidelines among primary care providers. *Respiratory Medicine* 2011;**106**:374–81.

Price 2014

Price D, West D, Brussell G, Gruffydd-Jones K, Jones R, Miravittles M, et al. Management of COPD in the UK primary-care setting: an analysis of real-life prescribing patterns. *International Journal of COPD* 2014;**9**:889–905.

Puhan 2016

Puhan M, Gimeno-Santos E, Cates C, Troosters T. Pulmonary rehabilitation following exacerbations of chronic obstructive pulmonary disease. *Cochrane Database*

of Systematic Reviews 2016, Issue 12. [DOI: 10.1002/14651858.CD005305.pub4]

Qaseem 2011

Qaseem A, Wilt T, Weinberger S, Hanania N, Criner G. Diagnosis and management of stable chronic obstructive pulmonary disease: a clinical practice guideline update from the American College of Physicians, American College of Chest Physicians, American Thoracic Society, and European Respiratory Society. *Annals of Internal Medicine* 2011;**155**: 179–91.

RevMan 2014 [Computer program]

The Nordic Cochrane Centre, The Cochrane Collaboration. Review Manager 5 (RevMan 5). Version 5.3. Copenhagen: The Nordic Cochrane Centre, The Cochrane Collaboration, 2014.

Ringbaek 2016

Ringbaek T, Lavesen M, Lange P. Tablet computers to support outpatient pulmonary rehabilitation in patients with COPD. *European Clinical Respiratory Journal* 2016;**3**: 310–6.

Rochester 2015

Rochester C, Vogiatzis I, Holland A, Lareau S, Marciniuk D, Puhan M, et al. An official American Thoracic Society/European Respiratory Society policy statement: enhancing implementation, use, and delivery of pulmonary rehabilitation. *American Journal of Respiratory and Critical Care Medicine* 2015;**192**(11):1373–86.

Sabit 2008

Sabit R, Griffiths T, Watkins A, Evans W, Bolton C, Shale D, et al. Predictors of poor attendance at an outpatient pulmonary rehabilitation programme. *Respiratory Medicine* 2008;**102**(6):819–24.

Schneider 2010

Schneider C, Jick S, Bothner U, Meier C. COPD and the risk of depression. *Chest* 2010;**137**:341–7.

Spruit 2013

Spruit M, Singh S, Garvey C, ZuWallack R, Nici L, Rochester C, et al. An official American Thoracic Society/European Society statement: key concepts and advances in pulmonary rehabilitation. *American Journal of Respiratory and Critical Care Medicine* 2013;**188**(8):e13–64.

Spruit 2014

Spruit M, Pitta F, Garvey C, ZuWallack R, Roberts C, Collins E. Differences in content and organisational aspects of pulmonary rehabilitation programmes. *European Respiratory Journal* 2014;**43**:1326–37.

Spruit 2015

Spruit M, Pitta F, McAuley E, ZuWallack R, Nici L. Pulmonary rehabilitation and physical activity in patients with chronic obstructive pulmonary disease. *American Journal of Respiratory and Critical Care Medicine* 2015;**192** (8):924–33.

Steiner 2015

Steiner MC, Roberts CM, Lowe D, Welham S, Searle L, Skipper E, et al. on behalf of the national COPD

pulmonary rehabilitation audit 2015 workstream group. National COPD Audit programme: time to breathe better. November 2015. www.rcplondon.ac.uk/projects/outputs/pulmonary-rehabilitation-time-breathe-better (accessed prior to 23 March 2017).

Steiner 2016

Steiner M, Holzhauser-Barrie J, Lowe D, Searle L, Skipper E, Welham S, et al. Pulmonary rehabilitation: steps to breathe better. National chronic obstructive pulmonary disease (COPD) audit programme: Clinical audit of pulmonary rehabilitation services in England and Wales 2015. National clinical audit report. February 2016. rcplondon.ac.uk/projects/outputs/pulmonary-rehabilitation-steps-breathe-better (accessed prior to 23 March 2017).

Sterne 2016

Sterne J, Hernan M, Reeves B, Savovic J, Berkman N, Viswanathan M, et al. ROBINS-I: a tool for assessing risk of bias in non-randomised studies of interventions. *BMJ* 2016;**355**:1–7.

Szilasi 2006

Szilasi M, Dolinay T, Nemes Z, Strausz J. Pathology of chronic obstructive pulmonary disease. *Pathology Oncology Research* 2006;**12**(1):52–60.

Vogelmeier 2017

Vogelmeier CF, Criner GJ, Martinez FJ, Anzueto A, Barnes PJ, Bourbeau J, et al. Global strategy for the diagnosis,

management, and prevention of chronic obstructive lung disease 2017 report. GOLD executive summary. *American Journal of Respiratory and Critical Care Medicine* 2017;**195**(5):557–82.

Wadell 2013

Wadell K, Janaudis Ferreira T, Arne M, Lisspers K, Ställberg B, Emtner M. Hospital-based pulmonary rehabilitation in patients with COPD in Sweden - A national survey. *Respiratory Medicine* 2013;**107**(8):1195–200.

White 2003

White A, Gompertz S, Stockley R. Chronic obstructive pulmonary disease 6: The aetiology of exacerbations of chronic obstructive pulmonary disease. *Thorax* 2003;**58**:73–80.

Williams 2011

Williams S, Baxter N, Buxton M, Harrison A, Holmes S, Hughes E, et al. IMPRESS guide to pulmonary rehabilitation. Improving and integrating respiratory services. respiratoryfutures.org.uk/knowledge-portal/impress-documents/impress-guide-to-pulmonary-rehabilitation/ 2011; Vol. 3, issue 2:1–20.

Zoeckler 2014

Zoeckler N, Kenn K, Kuehl K. Illness perceptions predict exercise capacity and psychological well-being after pulmonary rehabilitation in COPD patients. *Journal of Psychosomatic Research* 2014;**76**:146–51.

* Indicates the major publication for the study

APPENDICES

Appendix I. Sources searched for the Cochrane Airways Trials Register

Electronic searches: core databases

Database	Frequency of search
CENTRAL (crso.cochrane.org/)	Monthly
MEDLINE Ovid	Weekly
Embase Ovid	Weekly
PsycINFO Ovid	Monthly

(Continued)

CINAHL EBSCO	Monthly
AMED EBSCO	Monthly

Handsearches: core respiratory conference abstracts

Conference	Years searched
American Academy of Allergy, Asthma and Immunology (AAAAI)	2001 onwards
American Thoracic Society (ATS)	2001 onwards
Asia Pacific Society of Respiriology (APSR)	2004 onwards
British Thoracic Society Winter Meeting (BTS)	2000 onwards
Chest Meeting	2003 onwards
European Respiratory Society (ERS)	1992, 1994, 2000 onwards
International Primary Care Respiratory Group Congress (IPCRG)	2002 onwards
Thoracic Society of Australia and New Zealand (TSANZ)	1999 onwards

Appendix 2. Database search strategies

CENTRAL (Cochrane Register of Studies Online)

#1 MESH DESCRIPTOR Pulmonary Disease, Chronic Obstructive EXPLODE ALL TREES

#2 MESH DESCRIPTOR Bronchitis, Chronic

#3 (obstruct*) near3 (pulmonary or lung* or airway* or airflow* or bronch* or respirat*)

#4 (COPD OR COAD OR COBD OR AECOPD):TI,AB,KW

#5 #1 OR #2 OR #3 OR #4

#6 MESH DESCRIPTOR Rehabilitation EXPLODE ALL TREES

#7 MESH DESCRIPTOR Respiratory Therapy EXPLODE ALL TREES

#8 MESH DESCRIPTOR Physical Therapy Modalities EXPLODE ALL TREES

#9 (rehabilitat* or fitness* or exercis* or train* or physiotherap* or (physical* NEXT therap*)):TI,AB,KY

#10 #6 OR #7 OR #8 OR #9

#11 MESH DESCRIPTOR Patient Compliance EXPLODE ALL TREES

#12 MESH DESCRIPTOR Patient Acceptance of Health Care EXPLODE ALL TREES

#13 MESH DESCRIPTOR Patient Dropouts

#14 (adhere* or nonadhere* or non-adhere*):TI,AB,KY

#15 (complet* or complian* or noncomplan* or non-complian*):TI,AB,KY

Interventions to promote referral, uptake and adherence to pulmonary rehabilitation for people with chronic obstructive pulmonary disease (COPD) (Protocol)

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#16 (refusal or refuse*):TI,AB,KY
 #17 concord*:TI,AB,KY
 #18 conform*:TI,AB,KY
 #19 accept*:TI,AB,KY
 #20 comply*:TI,AB,KY
 #21 MESH DESCRIPTOR Referral and Consultation EXPLODE ALL TREES
 #22 MESH DESCRIPTOR Health Promotion EXPLODE ALL TREES
 #23 MESH DESCRIPTOR Health Knowledge, Attitudes, Practice
 #24 referral
 #25 referred:TI,AB,KY
 #26 promot*:TI,AB,KY
 #27 (uptake or up-take):TI,AB,KY
 #28 (increase* NEAR participat*):TI,AB,KY
 #29 attend*:TI,AB,KY
 #30 engage*:TI,AB,KY
 #31 #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25
 OR #26 OR #27 OR #28 OR #29 OR #30
 #32 #5 AND #10 AND #31

MEDLINE Ovid

1. exp Pulmonary Disease, Chronic Obstructive/
2. Bronchitis, Chronic/
3. (obstruct\$ adj3 (pulmonary or lung\$ or airway\$ or airflow\$ or bronch\$ or respirat\$)).tw.
4. (COPD or COAD or COBD or AECOPD).tw.
5. or/1-4
6. exp Rehabilitation/
7. exp Respiratory Therapy/
8. exp Physical Therapy Modalities/
9. (rehabilitat\$ or fitness\$ or exercis\$ or train\$ or physiotherap\$ or physical\$ NEXT therap\$).tw.
10. or/6-9
11. exp Patient Compliance/
12. exp Patient Acceptance of Health Care/
13. Patient Dropouts/
14. (adhere\$ or nonadhere\$ or non-adhere\$).tw.
15. (complet\$ orcomplan\$ or noncomplan\$ or non-complan\$).tw.
16. (refusal or refuse\$).tw.
17. concord\$.tw.
18. conform\$.tw.
19. accept\$.tw.
20. comply\$.tw.
21. exp Health Promotion/
22. exp "Referral and Consultation"/
23. Health Knowledge, Attitudes, Practice/
24. referral.tw.
25. referred.tw.
26. promot\$.tw.
27. (uptake or up-take).tw.
28. (increase\$ adj3 participat\$).tw.
29. attend\$.tw.
30. engage\$.tw.
31. or/11-30
32. 5 and 10 and 31

33. (controlled clinical trial or randomized controlled trial).pt.
34. (randomized or randomised).ab,ti.
35. placebo.ab,ti.
36. dt.fs.
37. randomly.ab,ti.
38. trial.ab,ti.
39. groups.ab,ti.
40. or/33-39
41. cohort studies/ or longitudinal studies/ or follow-up studies/ or prospective studies/ or retrospective studies/ or cohort.ti,ab. or longitudinal.ti,ab. or prospective.ti,ab. or retrospective.ti,ab.
42. Case-Control Studies/ or Control Groups/ or Matched-Pair Analysis/ or ((case* adj5 control*) or (case adj3 comparison*) or control group*).ti,ab,kw.
43. comparative study.pt.
44. (pre test or pretest or post test or posttest or preintervention or postintervention).tw.
45. (case\$ adj3 series).tw.
46. or/41-45
47. 40 or 56
48. 32 and 47
49. Animals/
50. Humans/
51. 49 not (49 and 50)
52. 48 not 51

CONTRIBUTIONS OF AUTHORS

JY will co-ordinate the review; design search strategies in collaboration with Cochrane Airways Group's Information Specialist; will undertake study selection, data extraction, and entry into RevMan 5; will contribute to data analysis and interpretation of data.

RJ will undertake study selection, data extraction, and entry into RevMan 5; will contribute to data analysis and interpretation of data.

AE will spot-check study characteristics for accuracy against the study report and will contribute to the interpretation of data.

PA will be the third reviewer of included studies in the case of uncertainty. PA will also provide a clinical perspective and general advice on the review.

KJ will provide a methodological perspective, a clinical perspective, and general advice on the review; KJ will be the third reviewer of 'risk of bias' issues in the case of uncertainty.

All authors contributed to the reading, writing, and approval of this protocol.

The review will be updated by all authors.

DECLARATIONS OF INTEREST

JY: none known

RJ: none known

PA: none known

AE: none known

KJ: none known

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