National Institute for Health and Care Excellence

Final

Chronic obstructive pulmonary disease in over 16s: diagnosis and management

[C] Self-management interventions, education and telehealth monitoring

NICE guideline NG115

Evidence review

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Final

This evidence review was developed by the NICE Guideline Updates Team

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Review question

What is the clinical and cost effectiveness of self-management interventions, education, and telehealth monitoring for improving outcomes and adherence to treatment in people with stable COPD?

Introduction

For the purposes of this review question, the following definitions of education, self-management and telehealth monitoring were used.

Education

Education was defined as the provision of information (e.g. about the disease and medication), which may be delivered as booklets/leaflets, or booklets/leaflets plus face to face sessions with a clinician, or using on-line educational materials. Interventions involving training or a self-management plan were excluded from this category.

Self-management

Self-management programmes aim to help the person with COPD manage their symptoms and disease better on a day to day basis and/or when acute exacerbations occur. These programmes are often multi-component or may have a particular focus (e.g. exercise or managing exacerbations). Common components include:

- education sessions (e.g. providing information about COPD, lung function and oximetry and the importance of stopping smoking, vaccination and pulmonary rehabilitation)
- smoking cessation advice, support, goal setting and treatment for tobacco dependence
- inhaler training
- exercise plans and physical activity advice
- action plans (how to recognise and what to do during an exacerbation)
- breathlessness control and management
- nutritional advice and goals

By reducing exposure to risk factors and changing behaviour self-management may reduce the chance of COPD exacerbations occurring and enable earlier treatment of them.

The programmes may be delivered using self-management manuals that people are guided through individually or in group sessions and then continue to use at home, or may be delivered using electronic means (e.g. tablet based manuals and phone calls). Sessions are usually interactive with the aim of setting personalised goals that can be adapted in an iterative process. Motivational interviewing may be used to try to achieve behaviour change, by increasing the person with COPD's self-belief in the ability to change.

Telehealth monitoring

People with COPD have a reduced quality of life because of breathlessness and other symptoms, and are at risk of exacerbations, which may necessitate hospital admission with worsening breathlessness/and or respiratory failure. Telehealthcare is intended to reduce the impact of exacerbations by enabling earlier detection and intervention, thus improving quality of life for the person with COPD and reducing resource use for the health system. In this review we aim to determine whether telehealth monitoring is effective in achieving these goals. For an intervention to be classified as telehealth monitoring in this review it must include: a system of collecting data from the patient on health (and/or exercise) outcomes; transmission of the data using technology; interpretation of this data by a healthcare professional and the provision for feedback to the person with COPD (e.g. to alter medication, provide advice, invite the person to attend a consultation with their health care provider).

This review identified studies that fulfilled the conditions specified in Table 1. For full details of the review protocol, see appendix A.

Table 1 PICO table - self-management, education and telehealth monitoring

Population	People diagnosed with COPD
Interventions	• Self-management interventions (structured interventions for individuals aimed at improvement in self-health behaviours and self-management skills) including: ○ Self-management plans (e.g. self-determined goals and pre-defined plans). Often multicomponent and may include an education intervention, exercise training and action plan in case of exacerbations. ○ Training to help with self-management including: - to facilitate optimal inhaler use - psychological therapy (e.g. cognitive behavioural therapy, CBT) specifically targeting variables related to COPD (e.g. breathlessness-related panic). ○ Phone/tablet applications ○ Peer support • Education (information provided to support broader knowledge of condition) including: ○ Information leaflets (e.g. on inhaler use, lung function) ○ Structured information sessions ○ Websites/ education apps • Telehealth monitoring (data and feedback from health professional, including data on completion of exercise as well as health status)

Comparator	• Each other • No intervention (placebo, routine medical care, no treatment) • Combinations of interventions
Outcomes	• Mortality • Hospital admissions, re-admissions and bed days • Exacerbations • Symptoms including breathlessness (e.g. Borg dyspnoea (breathlessness) score, Modified MRC scale for dyspnoea (breathlessness)) and orthopnoea • Anxiety (e.g. General anxiety disorder 7, GAD7; Hospital Anxiety and Depression Scale, HADS) • Depression (e.g. patient health questionnaire 9, PHQ9; Hospital Anxiety and Depression Scale, HADS) • Adherence to treatment plans • Exercise capacity/ exercise tolerance (e.g. 6 minute walking distance, 6MWD, or the shuttle walk test) • Change in FEV1, rate of change in FEV1 • Adverse events: all, severe, treatment discontinuation • Knowledge about COPD (Bristol COPD knowledge questionnaire) • Illness-specific self-efficacy (COPD Self-efficacy scale, CSES) • Quality of life (e.g. St. George's respiratory questionnaire, SGRQ, overall score) • Resource use and costs

Methods and process

This evidence review was developed using the methods and process described in Developing NICE guidelines: the manual. Methods specific to this review question are described in the review protocol in appendix A, and the methods section in appendix B.

Additional methodological points:

- the minimally important differences (MIDs) used in this review are summarised in Table 7 in appendix B. These were selected based on the literature with input from the committee.
- where data were presented for multiple time points the latest time point was used in our analyses.
- in cases where the primary studies were included in a Cochrane review that was judged to be high quality and directly applicable, evidence tables were not compiled and the reader is referred to the Cochrane review for study information.
- subgroup analyses were not carried out for this review because the majority of included studies did not report data for the categories of interest in an accessible format. The planned subgroup analyses had included smoking status, multimorbidities and severity of disease.

The search strategies used in this review are detailed in appendix C.

Declarations of interest were recorded according to NICE's 2014 conflicts of interest policy.

Clinical evidence

Included studies

This review was conducted as part of a larger update of the 2010 NICE COPD guideline (CG101). A systematic literature search for randomised controlled trials (RCTs) and systematic reviews was conducted from the date of the searches in the previous version of the guideline (May 2003), and this identified 3,832 references. Additional references were added from the old guideline (16), the surveillance report (42) and from an included systematic review/within RCTs (5) to give 3,895 references.

Although priority screening was used for this review, all of the abstracts were screened on title and abstract with 233 papers ordered as potentially relevant systematic reviews or RCTs based on the criteria in the review protocol. In particular, RCTs were excluded if they did not meet the criteria specified in the review protocol (appendix A). Interventions that use telehealth to provide education or monitor health status in the absence of a feedback component were excluded. Educational interventions focusing on inhaler technique were excluded if only adherence was reported and there was no measure of the effect of the training on quality of life or health outcomes such as the number of exacerbations and hospital admissions.

Sixty eight papers were included after full text screening: 4 systematic reviews (SRs) and 64 RCTs. For self-management there were 43 RCTs and 4 SRs. The SRs were all judged to be of high quality and partially applicable. As a result these reviews were used directly as a source of information for inclusion in our analysis (in particular, study evidence tables), but data was only extracted from reviews when it was not accessible/available in the primary study (e.g. Bosch 2007 is in German). There were 2 RCTs on education interventions and 19 RCTs of telehealth monitoring. These were divided into telehealth monitoring, telehealth monitoring with consultations, telehealth with self-management information and telehealth monitoring with a focus on exercise.

A second set of searches was conducted at the end of the guideline development process for all updated review questions using the original search strategies, to capture papers published whilst the guideline was being developed. These searches, which included articles up to February 2018, returned 3,100 references in total for all the questions included in the update, and these were screened on title and abstract. 6 papers were identified as being potentially relevant for this review question and were screened on full text, with 2 new studies, Bove 2016 and Cordova 2016, included in the review in the self-management and breathing plans, and telehealth monitoring sections respectively.

The process of study identification is summarised in the diagram in appendix D.

For analysis purpose, self-management was divided in to the following groups:

- Action plans (with brief education) – self-management plans that focus on managing exacerbations and have education component lasting less than 2 hours, but do not include other self-management components.
- Self-management exercise plans – focus on increasing physical exercise, but in the context of a self-management plan (exercise interventions that were solely based on promoting exercise were beyond the scope of this review).
- Self-management breathing plans - focus on managing breathlessness, but in the context of a broader self-management plan.
- Other self-management interventions - divided by delivery method (face to face, web based or via the telephone)

The full references for included studies are listed in appendix M.

Excluded studies

Excluded studies are listed in appendix J, with reasons for their exclusion, and in appendix K as full references.

Summary of clinical studies included in the evidence review

The included studies are summarised in the following tables: Table 2 (self-management systematic reviews); Table 3 (self-management RCTs); Table 4 (telehealth monitoring RCTs) and Table 5 (education RCTs). For detailed evidence tables refer to appendix E and the included Cochrane reviews.

Table 2 Summary of included self-management systematic reviews. The list of outcomes here is confined to those listed in our review protocol. The evidence tables list additional outcomes measured in the studies.

Short Title	Population	Interventions	Relevant outcomes
Howcroft (2016)	• 7 RCTs and quasi- RCTs • The databases were searched from their inception to November 2015 • Participants were patients with a clinical diagnosis of COPD based on spirometric criteria such as those of GOLD (GOLD 2016) for persistent airflow limitation (i.e. post-bronchodilator FEV1/FVC < 70%) with a history of smoking.	• Action plans for exacerbations with brief patient education versus usual care for people with COPD.	• Health-related quality of life (HRQoL) scores • COPD self-management knowledge and intended actions • Number of hospital admissions • Number of exacerbations requiring emergency department visits • Anxiety and depression • Lung function • Mortality • Cost-effectiveness
Lenferink (2017)	• 22 RCTs • The databases were searched from 1995 to May 2016. • *Participants diagnosed with COPD according to the Global Initiative for Chronic Obstructive Lung Disease (GOLD) classification criteria (GOLD2017); with a post-bronchodilator forced expiratory volume in one second (FEV) - to-forced vital capacity (FVC) ratio < 0.70.*	• Multicomponent self-management interventions involving action plans and feedback from the healthcare provider versus usual care.	• Health-related quality of life (HRQoL) scores • Number of COPD exacerbations • Number of hospital admissions • Number of exacerbations requiring emergency department visits • Self-efficacy • Mortality

	• Participants with a primary diagnoses of asthma were excluded.		
McCabe (2017)	• 3 RCTs and cluster-randomised trials • The databases were searched from database inception to November 2016. • Participants were over 18 years old with a diagnosis of COPD according to the Global Initiative for Chronic Obstructive Lung Disease (GOLD) classification criteria (GOLD2016); post-bronchodilator forced expiratory volume in one second (FEV) - to-forced vital capacity (FVC) ratio < 0.70 and chronic respiratory symptoms such as coughing, breathlessness, and sputum.	• Computer and mobile technology interventions for self-management	• Health-related quality of life (HRQoL) scores • Number of COPD exacerbations. • Number of hospital admissions • Anxiety and depression • Self-efficacy • Lung function • Exercise capacity • Cost-effectiveness
Zwerink (2014)	• 23 RCTs and non-randomised trials • The databases were searched from 1995 to August 2011. • Patients with a clinical diagnosis of COPD with symptoms and meeting agreed spirometry criteria (i.e. forced expiratory volume in one second (FEV1)/forced vital capacity (FVC) < 70%) were included (GOLD 2010). •Patients with asthma as a primary diagnosis were excluded.	• Multicomponent self-management versus usual care or another control intervention.	• Health-related quality of life (HRQoL) scores • Number of hospital admissions • Length of stay in hospital • Number of exacerbations requiring emergency department visits • Anxiety and depression • Self-efficacy • Lung function • Exercise capacity

Table 3 Summary of included self-management RCTs.

The list of outcomes here is confined to those listed in our review protocol. The evidence tables list additional outcomes measured in the studies. (Data for Bösch (2007) is taken directly from Zwerink et al (2014) Cochrane review as the paper is not available in English.)

Short Title	Population	Interventions	Relevant outcomes

Bischoff (2012)	• Sample size: 110 • % female: 41% • Mean age (SD): 64.5 (10.9) • Smoking status and history Current smoker: intervention 29%; control 27%	• Self-management • Usual care	• Health-related quality of life (HRQoL) • Exacerbation frequency • Self-efficacy
Bösch (2007)	• Sample size: 50 • % female: 36.2% (of people completing the trial) • Mean age (SD): Intervention group: 63.8 years (8.4); Control group 64.6 years (6.8)	• Self-management • Usual care	• Breathlessness • Pulmonary function status • Number of hospitalisations • 6 minute walk distance (6MWD)
Bourbeau (2003) and associated papers Gadoury (2005) and Sedeno (2009)	• Sample size: 191 • % female: 44.5% • Mean age (SD): 69.5 years (6.9) • Smoking status and history Smoking pack-yrs, mean (SD) Intervention: 57.8 (40.6) Control: 56.1 (31.3)	• Self-management • Usual care	• Disease specific health-related quality of life • Number of exacerbations • Pulmonary function status • Number of hospitalisations •6 minute walk distance (6MWD)
Bucknall (2012)	• Sample size: 464 • % female: 63.5% • Mean age (SD): 69.2 years (9.3) • Smoking status and history Current smoker: 39%	• Self-management • Usual care	• Mortality • Hospital Anxiety and Depression Scores (HADS) • Disease specific health-related quality of life • Self-efficacy
Bove (2016)	• Sample size: *66* • % female: *66.67%* • Mean age (SD): *70.20 (8.50)* • Current smoker: *28.79%*	• Self-management psychoeducative breathing plan • Usual care	• Hospital Anxiety and Depression Scores (HADS)
Effing (2009) and Zwerink (2016)	• Sample size: 159 • % female: 40.9 • Mean age (SD): 63.4 years (8.0) • Smoking status (current smoker) Intervention: 32.9% Control: 33.3%	• Self-management • Usual care	• Disease specific health-related quality of life • Hospital Anxiety and Depression Scores (HADS) • Pulmonary function status • Number of hospitalisations
Fan (2012)	• Sample size: 426 • % female: 3.1	• Self-management • Usual care	• Mortality • Number of exacerbations

	• Mean age (SD): 66.0 years (8.3) • Smoking status (current smoker) Intervention: 28.2% Control: 27.2%		• Health-related quality of life • Adherence (compliance) with a medication regimen • Self-efficacy •COPD specific knowledge
Gallefoss (1999a, 1999b, 2000, 2004)	• Sample size: *62* • % female: *50.0* • Mean age (SD): *57.5 years (9.5)* • Smoking status and history *Current smokers Intervention: 39% Control: 39%* *Pack years (median) Intervention: 17 Control: 17*	• Self-management • Usual care	• Adherence (compliance) with a medication regimen • Disease specific health-related quality of life • Health-related quality of life measures • Costs of intervention
Howard (2014)	• Sample size: *222* • % female: *51.8%* • Mean age (SD): *72.2 years (10.9)* • Smoking status and history *Ever/never smoked (number of pack years as mean, SD)* *Intervention: 94%/6% (38.2, 18.2) Control: 94%/6% (37.1, 18.3)* *Current smoker at baseline (no. per day as mean, SD)* *Intervention: 27% (3.6, 6.9) Control: 30% (3.5, 6.9)*	• Self-management breathing programme • Another control intervention (information booklet)	• Number of hospitalisations • Disease specific health-related quality of life • Hospital Anxiety and Depression Scores (HADS)
Jarab (2012)	• Sample size: *133* • % female: *59.4* • Mean age (SD): *62.5 years (14.5)* • Smoking status and history *Intervention: 54.5% Control: 56.7%*	• Self-management • Usual care	• COPD specific knowledge • Number of hospitalisations • Adherence (compliance) with a medication regimen • Disease specific health-related quality of life
Johnson-Warrington (2016)	• Sample size: *78* • % female: *64.1* • Mean age (SD):*68.0 years (8.1)* • Smoking status and history *Intervention current: 14 ex-smoker: 24 never smoker: 1 Control*	• Self-management with an exercise focus • Usual care	• COPD specific knowledge • Number of hospitalisations due to COPD • Disease specific health-related quality of life

	current smoker: 18 ex-smoker: 21 never smoker: 0 Smoking pack years Intervention: 52.39 (SD 34.32) Control: 48.33 (SD 29.02)		• Hospital Anxiety and Depression Scores (HADS) • Incremental Shuttle Walk Test (ISWT) • Endurance Shuttle Walking Test (ESWT)
Jonsdottir (2015)	• Sample size: *119* • % female: *45.4* • Mean age (SD): *59.0 years (4.5)* • Smoking status and history *Intervention, n (%) Current smoker: 24 (50.0) Ex-smoker: 24 (50.0) Control Current smoker: 36 (69.2) Ex-smoker: 16 (30.8)*	• Self-management • Usual care	• Number of exacerbations • Disease specific health-related quality of life • Hospital Anxiety and Depression Scores (HADS) • Health-related quality of life measures • Physical activity
Khdour (2009)	• Sample size: 173 • % female: 56.1 • Mean age (SD): 66.5 years (9.6) • Smoking status and history, n (%) Ex-smokers: Intervention 53 (60.9); Control 60 (69.7) Current smokers: Intervention 19 (21.8); Control 18 (20.9) Never smoked: Intervention 15 (17.2); Control 8 (9.3)	• Self-management • Usual care	• Disease specific health-related quality of life • Pulmonary function status • Number of hospitalisations •COPD specific knowledge • Adherence (compliance) with a medication regimen
Kheirabadi (2008)	• Sample size: 42 • % female: 31.0 • Mean age (SD): 56.4 years (4.9)	• Self-management • Usual care	• Disease specific health-related quality of life
Koff (2009)	• Sample size: 40 • % female: 52.5 • Mean age (SD): 65.8 years (8.7) • Smoking status Current smoker: Intervention 15%, Control 20%	• Self-management • Usual care	• Disease specific health-related quality of life • Number of hospitalisations • Costs of resource use
Kuo (2013)	• Sample size: *64* • % female: *6.25* • Age: *41- 50 years: 1 51-60 years: 13 61-70 years: 18 >70 years: 32*	• Face- to- face self-management	• Breathlessness • Self-efficacy • Pulmonary function status

	• Smoking status and history *Smoking history,% (both groups combined): Never: 23.44 Ex-smoker: 42.19 Sometimes: 4.69 Daily: 29.69*	• Self-management guidebook	
Leiva-Fernandez (2014)	• Sample size: *146* • % female: *8.2* • Mean age (SD): *69.1 years (8.8)*	• Self-management • Usual care	• COPD specific knowledge • Adherence (compliance) with a medication regimen • Disease specific health-related quality of life • Generic health-related quality of life
Liu (2013)	• Sample size: *60* • % female: *22.8% of the people who completed the trial* • Mean age (SD): *69.1 years (2.4)* • Smoking status and history *Intervention: Never smokers (n): 5 Smokers (n): 10 Former smokers (n): 14 Control: Never smokers (n): 8 Smokers (n): 8 Former smokers (n): 12 Pack-years: Intervention: 44.4 (1.7) Control: 46.9 (2.3)*	• Self-management breathing plan • Control is a handout of breathing exercises.	• Pulmonary function tests • Disease specific health-related quality of life • 6 minute walk distance (6MWD)
McGeoch (2006)	• Sample size: *159 people (17 practices)* • % female: *40.9* • Mean age (SD): *70.9 years (10.9)* • Smoking status and history *Intervention: Current smoker: 27 (31%) Ex-smoker: 59 (69%) Control: Current smoker: 17 (23%) Ex-smoker: 56 (77%)*	• Action plan. • Usual care	• Number of hospitalisations • Disease specific health-related quality of life • Hospital Anxiety and Depression Scores (HADS)
Mitchell (2014)	• Sample size: *184* • % female: *45.1* • Mean age (SD): *69.0 years (9.1)* • Smoking status and history *Intervention: Current smokers: 18 Ex- smokers: 67 Never-*	• Self-management • Usual care	• COPD specific knowledge • Disease specific health-related quality of life • Hospital Anxiety and Depression Scores (HADS)

	smokers: 4 Exposure pack-years: 43 (SD 31.7) Control: Current smokers: 21 Ex- smokers: 68 Never-smokers: 6 Exposure pack-years: 36 (SD 22.4)		• Incremental Shuttle Walk Test (ISWT) • Endurance Shuttle Walking Test (ESWT)
Monninkhof (2003)	• Sample size: 248 • % female: 15.5 • Mean age (SD): 65 years (7) • Smoking status and history Ex-smokers: Intervention 72%, Control 74% Current smokers: Intervention 28%, Control 26%	• Self-management • Usual care	• Disease specific health-related quality of life • 6 minute walk distance (6MWD) • Number of exacerbations • Costs of resource use
Moy (2015 and 2016)	• Sample size: 238 • % female: 6.3 • Mean age (SD): 66.8 years (8.8)	• Self-management with a focus on exercise • Usual care	• Disease specific health-related quality of life • Number of exacerbations • Number of hospitalisations
Nguyen (2013)	• Sample size: *125* • % female: *45.6* • Mean age (SD): *68.7 years (9.7)* • Smoking status and history *Currently smoking n/total (%): Intervention 1 (eDSMP): 2/43 (5) Intervention 2 (fDSMP): 2/41 (5) Intervention 3 (education): 3/41 (7))*	• Self-management breathing plans (face-to- face and electronic versions) • Another control intervention (general health education)	• Breathlessness • Disease specific health-related quality of life • Generic health-related quality of life •6 minute walk distance (6MWD) • A symptom-limited incremental treadmill test (ITT) • Self-efficacy
Ninot (2011)	• Sample size: *45* • % female: *15.8* • Median age (IQR): *Intervention: 65 (59-74) Control: 61 (56-65)* • Smoking status and history *Intervention: ever smoked: 95% current smoker: 25% Control: ever smoked: 94% current smoker: 28%*	• Self-management • Usual care	• Number of hospitalisations • Breathlessness • Disease specific health-related quality of life • Health-related quality of life measures • Maximal exercise test • 6 minute walk distance (6MWD) • Daily physical activity • Costs of intervention

Rice (2010)	• Sample size: 743 • % female: 2.0 • Mean age (SD): 69.9 years (9.5) • Smoking status and history Current smoker, n (%): Intervention 80 (21.6); Control 85 (23.0)	• Action plan with phone support • Usual care	• Number of hospitalisations • Disease specific health-related quality of life • Mortality
Rootmensen (2008)	• Sample size: 191 (111 with COPD) • % female: 45 • Mean age (SD): 60.5 years (15.0) • Smoking status, n (%) Non-smoking: Intervention 77 (79), Control 75 (80) Current smoker: Intervention 12 (12), Control 11 (12) Unknown: Intervention 8 (8), Control 8 (9)	• Action plan • Usual care	• Number of exacerbations • Generic health-related quality of life • Disease specific health-related quality of life
Sanchez-Nieto (2016)	• Sample size: *96* • % female: *9.4* • Mean age (SD): *67.7 years (7.0)* • Smoking status and history *Active smokers Intervention: 37.3% Control: 35.6% Pack years index Intervention: 56.9 (SD 44.3) Control: 52.5 (SD 26.2)*	• Action plan with inhaler training • Usual care	• Mortality. • Number of hospitalisations
Tabak (2014)	• Sample size: 29 • % female: 50.0 • Mean age (SD): 63.5 years (8.2) • Smoking status Smokers: Intervention 36.4%, Control 33.3% Non-smokers: Intervention 63.6%, Control 66.7%	• Self-management • Usual care	• Number of exacerbations • Number of hospitalisations • Breathlessness • Adherence (compliance) with a medication regimen • 6 minute walk distance (6MWD) • Generic health-related quality of life
Taylor (2012)	• Sample size: *116* • % female: *52.6%* • Mean age (SD): *69.5 years (9.9)* • Smoking status and history *Current smoker, n (%) Intervention: 24 (31) Control: 8 (21) Ever smoker, n (%) Intervention: 68 (87) Control: 33 (87) Mean pack-years (SD) Intervention: 47.6 (30.6) Control: 50.2 (35.8)*	• Self-management • Usual care	• Number of hospitalisations • Disease specific health-related quality of life • Hospital Anxiety and Depression Scores (HADS) • Generic health-related quality of life • Daily physical activity

			• Costs of intervention • Self-efficacy
Trappenburg (2011)	• Sample size: 233 • % female: 42.5 • Mean age (SD): 65.6 years (10.6) • Smoking status, n (%) Current smoking: Intervention 31 (28), Control 37 (30)	• Action plan with phone support • Usual care	• Number of exacerbations • Number of hospitalisations • Disease specific health-related quality of life • Hospital Anxiety and Depression Scores (HADS) • Self-efficacy
Voncken-Brewster (2015)	• Sample size: 1,325 • % female: 52.7 • Mean age (SD): 57.6 years (7.2) • Smoking status and history Currently smoking: 447 (34.2) Currently not smoking: 860 (65.8) Number of cigarettes smoked/day among smokers, n=447 (mean [SD]) 19.3 (12.1)	• Self-management • Usual care	• Disease specific health-related quality of life • Breathlessness
Wakabayashi (2011)	• Sample size: *102* • % female: *13.7* • Mean age (SD): *Whole population: 71.7 years (7.6) Intervention: 72.9 (6.4) Control: 70.4 (8.6)* • Smoking status and history *packs/year Whole population: 68.7 (SD 39.3) Intervention: 70.1 (42.3) Control: 67.3 (36.4)*	• Self-management • Usual care	• Lung Information Needs Questionnaire (LINQ) • MRC dyspnoea score • Pulmonary function tests • Disease specific health-related quality of life • 6 minute walk distance (6MWD)
Walters (2013) and Schuz (2015)	• Sample size: *31 practices* • % female: *47.3* • Mean age (SD): *67.7 years (7.7)* • Smoking status and history *Smoking history pack-years mean (SD) Intervention: 53.9 (26.3) Control: 43.4 (21.4) Current smoker Intervention: 43 (48)*	• Self-management • Usual care	• COPD specific knowledge • Number of hospitalisations • MRC dyspnoea score • Disease specific health-related quality of life • Hospital Anxiety and Depression Scores

	Control: 33 (36)		(HADS) • Alternative anxiety and depression measures • Generic health-related quality of life • Daily physical activity • Self-efficacy
Watson (1997)	• Sample size: • % female: 35.6 • Mean age (SD): 67.5 (9.0) • Smoking status and Current smoker: Intervention 24%, Control 33%	• Action plan • Usual care	• Disease specific health-related quality of life • Pulmonary function status • Mortality
Wood-Baker (2006)	• Sample size: 139 • % female: 41.7 • Mean age (SD): 70.0 years (8.1) • Smoking history (pack-years, mean (SD) Intervention: 55 (26), Control: 59 (33.7)	• Action plan • Usual care	• Disease specific health-related quality of life • Number of exacerbations • Number of hospitalisations • Pulmonary function status

Table 4 Summary of included telehealth monitoring RCTs.

The list of outcomes here is confined to those listed in our review protocol. The evidence tables list additional outcomes measured in the studies.

Short Title	Population	Intervention	Relevant outcomes
Antoniades (2012)	• Sample size: *44* • % female: *54.5* • Mean age (SD): *69 years (9.5)* • Smoking status and history *Intervention: Non-smoker: 4 Current smoker: 0 Control: Non-smoker: 2 Current smoker: 6*	• Telehealth monitoring • Usual care	• Number of hospitalisations • Disease specific health-related quality of life • Generic health-related quality of life • 6 minute walk distance (6MWD)
Bentley (2014)	• Sample size: *63* • % female: *64.2* • Mean age (SD): *66.6 years (10.5)*	• Telehealth monitoring	• Number of hospitalisations • Disease specific health-related quality of life • Costs of intervention

		• Usual care	
Cordova (2016)	Sample size: *79* • % female: *61.2%* • Mean age (SD) *Intervention: 64 (6); control 63 (8) years.* • Smoking, pack-years, mean (SD) *Intervention: 43(22); control 54 (25)*	• Telehealth monitoring • Control (no feedback, but fill in electronic diary)	• Mortality
Demeyer (2017)	• Sample size: 343 • % female: 36.2 • Mean age (SD): 66.5 years (8.0)	• Telehealth monitoring with an exercise focus • Usual care	• 6 minute walk distance (6MWD)
De San (2013)	• Sample size: *80* • % female: *24.0% of the participants that completed the trial* • Mean age (SD): *72.5 years (SD no data provided) for the participants that completed the trial*	• Telehealth monitoring • Usual care	• Number of hospitalisations • Disease specific health-related quality of life • Costs of intervention
Farmer (2017)	• Sample size: *166* • % female: *34.6* • Mean age (SD): *69.8 years (9.6)* • Smoking status and history: *Smoking history n (%) Intervention: Current: 23 (20.9) Ex-smoker (<2 years):17 (15.5) Ex-smoker (≥2 years): 70 (63.6) Control: Current: 13 (23.2) Ex-smoker (<2 years): 8 (14.3) Ex-smoker (≥2 years): 35 (62.5)*	• Telehealth monitoring with self-management information • Usual care	• Mortality • Number of hospitalisations • Number of exacerbations • Adherence (compliance) with a medication regimen • Disease specific health-related quality of life • Anxiety and depression measures • Generic health-related quality of life
Ho (2016)	• Sample size: *106* • % female: *23.6* • Mean age (SD): *80.2 years (8.7)*	• Telehealth monitoring with	• Number of all-cause hospitalisations

	• Smoking status and history *Smoking, pack-years Intervention: 58 (SD 43) Control: 47 (SD 31)*	phone counselling • Usual care	
Jodar-Sanchez (2013)	• Sample size: *45* • % female: *4.4* • Mean age (SD): *72.6 years (8.9)*	• Telehealth monitoring • Usual care	• Number of hospitalisations • Number of exacerbations • Disease specific health-related quality of life • Generic health-related quality of life
Kenealy (2015)	• Sample size: *48* • % female: *37.5* • Median age (IQR): *Intervention: 67 (64-74) Control: 67.5 (63-72.5)*	• Telehealth monitoring • Usual care	• Number of hospitalisations • Disease specific health-related quality of life • Hospital Anxiety and Depression Scores (HADS) • Generic health-related quality of life • Costs of intervention • Self-efficacy
McDowell (2015)	• Sample size: *110* • % female: *56.4* • Mean age (SD): *70.0 years (7.3)* • Smoking status and history *Current smokers (%) Intervention: 38.2 Control: 32.7 Smoking history (pack years, mean, SD) Intervention: 49.4 (25.4) Control: 43.0 (19.9)*	• Telehealth monitoring. • Usual care.	• Number of exacerbations • Disease specific health-related quality of life • Hospital Anxiety and Depression Scores (HADS) • Generic health-related quality of life • Costs of intervention
Nguyen (2009)	• Sample size: *17* • % female: *64.7* • Mean age (SD): *68.2 years (10.4)*	• Telehealth monitoring of exercise • Control- exercise without monitoring	• Disease specific health-related quality of life • Generic health-related quality of life • 6 minute walk distance (6MWD) • Incremental cycle ergometer test • Free-Living Ambulatory Physical Activity • Self-efficacy

Pare (2013)	• Sample size: *120* • % female: *68.3* • Mean age (SD): *68.2 years (6.6)*	• Telehealth monitoring with self-management information • Usual care	• Number of hospitalisations • Costs of intervention
Pinnock (2013)	• Sample size: *256* • % female: *52.6* • Mean age (SD) *68.9 years (8.6)* • Smoking status and history *No of participants (%) Intervention: Never smoked: 2 (2) Ex-smoker: 89 (70) Current smoker: 37 (29) Control: Never smoked: 0 (0) Ex-smoker: 98 (77) Current smoker: 30 (23)*	• Telehealth monitoring • Usual care.	• Lung Information Needs Questionnaire (LINQ) • Mortality • Number of exacerbations • Adherence (compliance) with a medication regimen • Disease specific health-related quality of life • Hospital Anxiety and Depression Scores (HADS)
Ringbaek (2015)	• Sample size: *281.* • % female: *53.0* • Mean age (SD): *69.6 years (9.5)* • Smoking status and history *Current smokers, N (%) Intervention: 35 (24.8%) Control: 47 (33.6%)* *Pack years, mean (range) (data missing for some participants)* *Intervention: 42.9 (0–210) Control: 41.0 (0–110)*	• Telehealth monitoring with video consultation • Usual care	• Mortality • Number of hospitalisations • Number of exacerbations
Segrelles (2014)	• Sample size: *60* • % female: *26.7* • Mean age (SD): *73.9 (9.5)*	• Telehealth monitoring • Usual care.	• Number of hospitalisations
Shany (2017)	• Sample size: *42.* • % female: *54.7* • Mean age (SD): *73.2 years (8.3)*	• Telehealth monitoring • Usual care.	• Number of hospitalisations • Disease specific health-related quality of life • Hospital Anxiety and Depression

			Scores (HADS) • Costs of intervention
Vianello (2016)	• Sample size: *334.* • % female: *28.1* • Mean age (SD): *76.1 years (6.4)* • Smoking status and history *Smoking habit (No of participants, %) Intervention: Current Smoker: 10 (4.35) Former Smoker: 153 (66.52) Non-Smoker: 65 (28.26) Packs/year [mean (SD)]: 42.35 (63.03) Control: Current Smoker: 3 (2.88) Former Smoker: 64 (61.54) Non-Smoker: 36 (34.62) Packs/year [mean (SD)]: 50.54 (90.50)*	• Telehealth monitoring • Usual care	• Mortality • Number hospitalisations • Hospital Anxiety and Depression Scores (HADS) • Generic health-related quality of life
Vitacca (2009 and 2016)	• Sample size: *240 people who had respiratory failure (100 with COPD)* • % female: *32.3% of the people completing the trial* • Mean age (SD) *61.2 years (17.5) of the people completing the trial* • Smoking status and history *(Of the people completing the trial, n (%)) Intervention: Ex-smokers: 55 (47) Current smokers: 7 (6) Control: Ex-smokers: 43 (42) Current smokers: 9 (9)*	• Telehealth monitoring with patient initiated consultations • Usual care	• Mortality • Number of hospitalisations • Number of exacerbations • Costs of intervention
Vorrink (2016)	• Sample size: 1*83* • % female: *43.2* • Mean age (SD) : *62.4 years (8.6)*	• Telehealth monitoring of exercise • Usual care	• Disease specific health-related quality of life • Self-administered standardised chronic respiratory questionnaire • 6 minute walk distance (6MWD) Modified 6-min walk test (6MWT) • Daily physical activity

Table 5 Summary of included education RCTs.

The list of outcomes here is confined to those listed in our review protocol. The evidence tables list additional outcomes measured in the studies.

Short Title	Population	Interventions	Relevant outcomes
Hill (2010)	• Sample size: *100* • Mean age (SD): *64.5 years (9.7)* • Smoking status and history *Current smokers: 46.2% Current non-smokers 53.8%*	• Education • Usual care	• COPD specific knowledge
Siddique (2012)	• Sample size: *4425* • % female: *2.46%* • Mean age (SD): *70 years (10)*	• Education • Usual care	• COPD specific knowledge • Mortality • Number of hospitalisations

Quality assessment of clinical studies included in the evidence review

The RCTs and systematic reviews were assessed for risk of bias and applicability and this information is presented in the evidence tables in appendix E. Where studies have been included from the Cochrane reviews the evidence tables within those reviews contain this information.

See appendix G for full GRADE tables. Where issues around potential publication bias were identified (either due to data not being reported in an extractable format within papers or papers not being reported in English), this is used as a reason to downgrade for risk of bias.

Economic evidence

Included studies

A single search was conducted to cover all review question topics in this guideline update. This search returned 16,299 records, of which 16,214 were excluded on title and abstract for this review question. The remaining 85 papers were screened using a review of the full text and 7 were found to be relevant to the question. A number of relevant UK-based analyses were identified by the review, so only studies using an NHS perspective were included.

Excluded studies

Details of the studies excluded at full-text review are given in Appendix J.

Summary of studies included in the economic evidence review

Self-management

Dritsaki (2016a) conducted a cost-utility analysis alongside an RCT (reported in Mitchell 2014) of a self-management intervention from the perspective of the NHS with a 6-month time horizon. Patients were required to have a FEV1/FVC ratio of < 0.7, to be grade 2-5 on the MRC dyspnoea (breathlessness) scale and to have been clinically stable for 4 weeks. The intervention consisted of a ‘self-management programme of activity, coping and education’ (SPACE), centred around the ‘SPACE for COPD’ manual, which contains educational material on a variety of topics and a home exercise programme. Participants were introduced to the programme by a physiotherapist during an initial 30-45 minute consultation, with follow-up calls from the physiotherapist at 2 and 4 weeks.

Participants’ HRQoL was recorded at baseline, 6 weeks and 6 months using the EQ-5D, from which QALYs were calculated using ordinary least squares regression with baseline utility as a covariate to adjust for between-arm differences. Healthcare resource usage data were collected over the 6-month trial period using hospital records, GP records, and directly from patients’ own recollection at follow-up

appointments. Healthcare unit costs were taken from standard NHS sources (PSSRU unit costs of health and social care, NHS reference costs).

Base case results of the evaluation showed that the self-management intervention was associated with incremental costs of £27.18 and incremental QALYs of 0.097, giving an ICER of £280.39/QALY compared with usual care. Probabilistic sensitivity analysis (PSA) was conducted using 1,000 bootstrapped samples of trial data, and showed that self-management is associated with a 97% probability of being cost effective at a threshold of £20,000/QALY.

This study was classified as being directly applicable, as it assesses an intervention of interest from the perspective of the NHS. However, the evaluation was categorised as having very serious limitations. This is primarily because health benefits appear to have been calculated incorrectly; reported QALYs for usual care and self-management were 0.61 and 0.71, which is not possible given the 6-month time horizon (an individual in perfect health would accrue 0.5 QALYs over this period). It also appears that baseline differences in HRQoL between arms have not been adequately accounted for in QALY calculations. Correcting for these errors it is likely that the QALY gain associated with self-management would be quite considerably lower, and the uncertainty surrounding its cost effectiveness would be correspondingly higher.

Jordan (2015) is a health technology assessment which included a cost-utility analysis of self-management support delivered within 6 weeks of hospital discharge compared with usual care in patients with COPD who had been admitted for an exacerbation. The evaluation was conducted from the perspective of the NHS, and used a time horizon of 30 years. Data on the self-management intervention were taken from a meta-analysis of RCTs, which included interventions comprising one or more of: adherence to medication, breathing techniques, bronchial hygiene techniques, early recognition of symptoms/action plans, education, exercise, inhaler technique, nutritional programmes, patient empowerment, relaxation, respiratory muscle training, stress management, support groups, or telecare (although only if provided in combination with other elements).

The evaluation used a Markov model to simulate long-term disease progression through moderate, severe and very severe COPD stages according to the GOLD criteria (FEV1 50%-80% predicted, 30%-50% predicted and < 30% predicted, respectively). The model also considered short-term increases in the risk of death and readmission in the period after hospital admission. Baseline transition probabilities for hospital admissions, admission-related mortality, and disease progression were taken from a variety of COPD studies – predominantly the European COPD Audit, TORCH and ECLIPSE studies. To model the self-management arm, a hazard ratio for the effectiveness of intervention in reducing hospital admissions was applied to baseline hospitalisation probabilities.

HRQoL values for each GOLD stage were collected from the BLISS study – derived using the EQ-5D-5L instrument. Resource use associated with each GOLD stage was estimated with reference to NICE guidelines and expert opinion. Unit costs were derived from standard NHS sources.

Base case results showed that self-management has an ICER of £8,218/QALY compared with usual care. PSA showed that self-management is associated with a 68% probability of being cost effective at a threshold of £20,000/QALY. The authors noted that the key driver of this uncertainty was the lack of significance in the estimate of the effectiveness of self-management in reducing hospital admissions. Deterministic sensitivity analyses were conducted in which the time horizon of the model, effectiveness of self-management and duration of intervention effect were varied. Of these, scenarios in which a 6 month time horizon was used and in which the effectiveness of self-management was set to the lower 95% confidence interval caused the ICER of self-management to exceed £20,000/QALY. Subgroup analyses showed that for patients stratified by GOLD stage, age, gender and smoking status the base case ICER remained below £20,000/QALY, although the uncertainty surrounding the cost effectiveness of self-management remained relatively high.

This evaluation was categorised as being directly applicable as it assesses the intervention of interest, in the population of interest, from the perspective of the NHS. Although the evaluation used the EQ-5D-5L instrument to measure HRQoL, as opposed to the preferred EQ-5D-3L, this is unlikely to materially affect model conclusions, and the evaluation was classified as having only minor limitations overall.

Khdour (2011) conducted a cost-utility analysis alongside a RCT (reported in Khdour 2009) of a self-management intervention compared with usual care from the perspective of the NHS over a time horizon of 1 year. Patients were required to have a confirmed diagnosis of COPD for at least one year, and an FEV1 of between 30% and 80% predicted. The intervention consisted of a 60 minute consultation with a hospital pharmacist, in which patients were educated on COPD, their prescribed medication, adherence, inhaler technique, and management of symptoms including exercise and breathing techniques. Patients also received a 20 minute follow-up call at 3 and 9 months, and an outpatient visit at 6 and 12 months.

Patients' HRQoL was recorded at baseline, 6 and 12 months using the EQ-5D, and QALYs were calculated using the area under the curve method, adjusting for differences in baseline utility between arms. Resource usage was recorded prospectively during the study via patient-completed questionnaires (GP visits) and patients' medical records (emergency department and secondary care resource usage).

Results showed that self-management is associated with a cost saving of £671.59 and generates an additional 0.065 QALYs compared with usual care, and is therefore the dominant strategy. PSA was conducted via 1,000 bootstrapped samples of trial data, and showed that self-management has a 95% probability of being cost effective at a threshold of £20,000/QALY.

This study was classified as being directly applicable, as it assesses the intervention of interest, in the population of interest, from the perspective of the NHS. Despite a relatively short time horizon of 1 year, the study was categorised as having only minor limitations, as self-management was shown to be highly cost effective at this endpoint, and is likely to generate further cost savings and QALY gains in the future.

Taylor (2012) conducted a cost-utility analysis alongside a RCT of a self-management intervention compared with usual care from the perspective of the NHS over a time horizon of 6 months. Patients were required to have an FEV1/FVC ratio of < 0.7, and either an exacerbation in the last year or post-bronchodilator FEV1 < 80% predicted. The intervention – Better Living with Long Term Airways disease (BELLA) – focussed on five areas of self-management skills: defining the problem, decision making, finding and using resources, forming partnerships with healthcare providers, and developing an action plan. The programme consisted of seven three-hour group sessions, delivered weekly by two trained lay tutors. Participants also received a copy of the generic Expert Patients Programme manual.

Patients' HRQoL was recorded using the EQ-5D at baseline, 2 months and 6 months, from which QALYs for each arm were calculated using the area under the curve method. COPD-related healthcare resource usage data were taken from patients' primary care records. Unit costs of healthcare were sourced from the PSSRU Unit Costs of Health and Social Care and NHS Reference Costs. The cost of the self-management intervention was estimated to be £30,000 to provide the course for the 78 patients in the intervention group.

Base case results showed that self-management has an ICER of £11,710/QALY compared with usual care. PSA was conducted via 1,000 bootstrapped samples of trial data, and showed that self-management is associated with a 75% probability of being cost effective at a threshold of £20,000/QALY.

This study was classified as being directly applicable, as it evaluates an intervention of interest from the perspective of the NHS. It was categorised as having only minor limitations as, although the analysis uses a time horizon of only 6 months, the intervention is cost effective at this endpoint, and is likely to produce further QALY gains in the future.

Telehealth monitoring

Bentley (2014) conducted a cost-utility analysis alongside a pilot RCT of a telehealth intervention as part of a discharge service for patients with early-stage COPD, compared with the discharge service without the telehealth component. The evaluation was conducted from the perspective of the NHS, and used a 6 month time horizon. Patients were required to have SpO2 > 90% on air or pO2 > 7 kPa/pH 7.35–7.45, and between 1 and 3 COPD-related hospital admissions in the last year. The intervention involved daily monitoring of patients' vital signs via telehealth monitoring equipment over the 8 week period following discharge, with clinicians alerted if readings fell outside anticipated parameters for the individual so that action could be taken.

Patients' HRQoL was measured using the Saint George's Respiratory Questionnaire (SGRQ) at baseline, 8 weeks and 6 months. These values were mapped to EQ-5D scores, from which QALYs were calculated using the area under the curve method. Healthcare resource use data were captured from secondary user services records, and patient-completed diaries of GP visits. Unit costs of healthcare were taken from

standard NHS sources (NHS reference costs), with costs of telehealth equipment installation and de-installation recorded directly.

Results showed that the discharge service with telehealth was associated with incremental costs of £1,170 and incremental QALYs of 0.017 compared with the standard discharge service, and was therefore associated with an ICER of £68,811/QALY.

This study was classified as being directly applicable as it assesses an intervention of interest from the perspective of the NHS. It was categorised as having potentially serious limitations due to the short time horizon, lack of sensitivity analysis, and lack of clarity on whether adjustment for baseline HRQoL was used.

McDowell (2015) conducted a cost-utility analysis alongside a RCT of a telehealth monitoring intervention compared with usual care in patients with moderate to severe COPD. The evaluation was conducted from the perspective of the NHS and used a 6 month time horizon. Patients were required to have moderate or severe COPD according to GOLD criteria, and at least 2 of the following: emergency department admissions; hospital admission or emergency GP contacts in the 12 months before the study. The intervention involved patients providing clinical data via a finger probe and blood pressure cuff and answering a series of questions regarding their condition on a daily basis, which was transmitted via a telephone line and reviewed by a dedicated nurse. Following an abnormal data reading, patients were first requested to re-submit their data after relaxing for 30 minutes, and if the readings were still abnormal patients received a community respiratory team visit.

QALYs were calculated from EQ-5D scores supplemented by a visual analogue scale, recorded at baseline and at 6 months. Costs of the telehealth monitoring intervention were sourced from the service providers (Home Telehealth Ltd) and community respiratory team costs were sourced from hospital finance records.

Results showed that telehealth monitoring is associated with incremental costs of £2,039 and 0.01 QALYs compared with usual care, producing an ICER of £203,900/QALY.

This evaluation was classified as being directly applicable, as it assesses the intervention of interest from the perspective of the NHS. It was categorised as having very serious limitations, as it does not appear to have included costs other than those directly associated with the telehealth monitoring intervention, does not include any sensitivity analyses, uses a short time horizon of 6 months, and is unclear as to whether baseline correction was used in calculating QALYs.

Stoddart (2015) conducted a cost-utility analysis along an RCT of a telehealth monitoring intervention compared with usual care in patients with COPD who had been admitted to hospital with an exacerbation in the previous year (reported in Pinnock 2013). The evaluation was conducted from the perspective of the NHS and used a 1 year time horizon. Patients were required to have a diagnosis of COPD confirmed by spirometry and a FEV1/FVC ratio of < 0.7. Participants in the intervention had telehealth monitoring equipment and a secure broadband line installed in their homes. Patients submitted a daily questionnaire on their symptoms

and medication, as well as data on oxygen saturation and pulse rate. If readings exceeded predefined thresholds or were not submitted a monitoring clinician was alerted, who then decided on the appropriate course of action.

Patients' HRQoL was measured at baseline and at 1 year with the EQ-5D, from which QALYs were calculated using the area under the curve approach, with correction for differences in baseline scores. Healthcare resource usage was obtained via patient questionnaires (primary care visits), hospital records (secondary care resource usage), and records kept by research nurses (medication usage). Unit costs were taken from standard NHS sources (Scottish National Tariff and BNF). The cost of the telehealth monitoring intervention comprised equipment costs (estimated by the annuity method, assuming a four-year equipment lifespan), installation and maintenance costs based on costs for contracted services, initial patient training costs based on anecdotal descriptions from staff of the time taken, and monitoring/alert handling costs calculated from records kept by the community respiratory team and anticipatory care nurses monitoring and responding to telehealth monitoring data.

Base case results showed that telehealth monitoring is associated with incremental costs of £2,293 and incremental QALYs of 0.0167 compared with usual care, producing an ICER of £137,277. PSA was conducted using 1,000 non-parametric bootstrapped samples, and showed that telehealth monitoring is associated with a 10.1% probability of being cost effective at a threshold of £20,000/QALY.

This evaluation was classified as being directly applicable, as it assesses the intervention of interest from the perspective of the NHS. It was categorised as having only minor limitations as, despite a relatively short time horizon, the high ICER and lack of certainty that telehealth monitoring produces a QALY benefit indicate that the intervention is unlikely to become cost effective over a lifetime time horizon.

Evidence statements

Clinical evidence statements

The format of the evidence statements is explained in the methods in appendix B.

Education

Moderate to high quality evidence from 1 RCT reporting data from up to 3,425 people with COPD found improvements in knowledge about COPD with educational interventions versus usual care, but could not differentiate mortality.

Self-management

Action plans

Moderate to high quality evidence from up to 3 RCTs reporting data from up to 1,055 people with COPD found improvements in depression and reductions in length of hospital stay in people offered self-management interventions involving action plans and brief education versus usual care.

Very low quality evidence from up to 6 RCTs reporting data from up to 1,338 people with COPD found improvements in quality of life in people offered self-management interventions involving action plans and brief education versus usual care, but the point estimate was less than the minimal clinically important difference.

Low to moderate quality evidence from up to 6 RCTs reporting data from up to 1,561 people with COPD could not differentiate anxiety, FEV1, mortality, the number of exacerbations or the number of hospital admissions between people offered self-management interventions involving action plans and brief education or usual care.

Sensitivity analysis - action plans

Sensitivity analyses were carried out to remove studies at high risk of bias from the prioritised outcomes. These analyses did not lead to any changes in the interpretation of the evidence apart from those listed below:

High quality evidence from 3 RCTs reporting data from up to 427 people with COPD found no meaningful difference in quality of life between people offered self-management interventions involving action plans and brief education or usual care.

Subgroup analysis for recruitment based on exacerbation history

Very low quality evidence from 2 RCTs reporting data from 897 people with COPD who had experienced an exacerbation within the last 12 months found improvements in quality of life in people offered self-management interventions involving action plans and brief education versus usual care.

Low quality evidence from 4 RCTs reporting data from 441 people with COPD who were not recruited based on exacerbation history found no meaningful difference in quality of life between people offered self-management interventions involving action plans and brief education or usual care.

Exercise plans

Moderate quality evidence from 1 RCT reporting data from 71 people with COPD found an improvement in breathlessness in people offered exercise self-management interventions versus usual care.

Very low to moderate quality evidence from up to 2 RCTs reporting data from up to 317 people with COPD could not differentiate quality of life, depression, anxiety, knowledge, exercise capacity or mortality between people offered exercise self-management interventions or usual care.

Breathing plans

Low to high quality evidence from up to 2 RCTs reporting data from up to 182 people with COPD found improvements in depression, anxiety, FEV1 and exercise capacity, and reductions in length of hospital stay in people offered breathing self-management interventions versus usual care.

Very low quality evidence from up to 3 RCTs reporting data from up to 407 people with COPD could not differentiate quality of life, breathlessness or mortality between people offered breathing self-management interventions or usual care.

Sensitivity analysis- breathing plans

Sensitivity analyses were carried out to remove studies at high risk of bias from the prioritised outcomes. These analyses did not lead to any changes in the interpretation of the evidence apart from those listed below:

Moderate quality evidence from 1 RCT reporting data from 57 people with COPD could not differentiate depression between people offered breathing self-management interventions versus usual care.

Subgroup analysis by plan type- breathing plans

High quality evidence from 1 RCT reporting data from 57 people with COPD found improvements in quality of life and exercise capacity in people offered an online breathing self-management intervention versus usual care.

Low quality evidence from 1 RCT reporting data from 62 people with COPD could not differentiate quality of life or exercise capacity between people offered a face to face breathing self-management intervention versus usual care.

Low to moderate quality evidence from 1 RCT reporting data from 63 people with COPD found no meaningful difference in quality of life and could not differentiate exercise capacity between people offered an electronic self-management intervention versus usual care.

General self-management interventions

Moderate to high quality evidence from up to 4 RCTs reporting data from up to 614 people with COPD found improvements in quality of life, knowledge and medication adherence, and reductions in hospital admissions in people offered self-management interventions versus usual care.

Low quality evidence from 18 RCTs reporting data from up to 2,106 people with COPD found improvements in respiratory specific quality of life in people offered self-management interventions versus usual care, but the point estimate was less than the minimal clinically important difference.

Very low to moderate-quality evidence from up to 9 RCTs reporting data from up to 1,801 people with COPD could not differentiate breathlessness, depression, anxiety, self-efficacy, FEV1, exercise capacity, mortality, length of stay in hospital or the number of exacerbations between people offered self-management interventions versus usual care.

Sensitivity analysis- general self-management interventions

Sensitivity analyses were carried out to remove studies at high risk of bias from the prioritised outcomes. These analyses did not lead to meaningful changes in the interpretation of the evidence apart from those listed below:

Very low to moderate-quality evidence from up to 7 RCTs reporting data from up to 1,313 people with COPD could not differentiate hospital admissions between people offered self-management interventions versus usual care.

Moderate-quality evidence from 12 RCTs reporting data from up to 1,587 people with COPD found no meaningful difference in respiratory specific quality of life between people offered self-management interventions versus usual care.

Subgroup analysis by mode of delivery- general self-management interventions

Very low quality evidence from 15 RCTs reporting data from 1705 people with COPD found improvements in quality of life in people offered a face to face self-management intervention versus usual care, but the point estimate was less than the minimal clinically important difference.

Low quality evidence from 1 RCT reporting data from 154 people with COPD could not differentiate quality of life between people offered a telephone self-management intervention versus usual care.

Very low quality evidence from 2 RCTs reporting data from 247 people with COPD found improvements in quality of life in people offered a web-based self-management intervention versus usual care.

Publication bias- general self-management interventions

There was no evidence identified that publication bias influenced the results of any of the comparisons.

Face to face self-management versus guidebook

Low quality evidence from 1 RCT reporting data from 64 people with COPD found improvements in breathlessness in people offered face to face self-management versus a self-management guidebook, but the point estimate was less than the minimal clinically important difference.

Moderate quality evidence from 1 RCT reporting data from 64 people with COPD could not differentiate self-efficacy between people offered face to face self-management versus a self-management guidebook.

Telehealth monitoring

Exercise focused

Low quality evidence from 1 RCT reporting data from up 121 people with COPD could not differentiate quality of life between people offered exercise focused telehealth monitoring interventions versus usual care.

Very low quality evidence from 3 RCTs reporting data from 481 people with COPD found no meaningful difference in exercise capacity or breathlessness between people offered exercise focused telehealth monitoring interventions versus usual care.

Sensitivity analysis- exercise focused telehealth monitoring

Sensitivity analyses were carried out to remove studies at high risk of bias from the prioritised outcomes. These analyses did not lead to any changes in the interpretation of the evidence.

Health focused

Moderate quality evidence from 1 RCT reporting data from 76 people with COPD found reductions in numbers of exacerbations in people offered health focused telehealth monitoring interventions versus usual care.

Low to moderate quality evidence from up to 10 RCTs reporting data from up to 1,280 people with COPD could not differentiate (generic) quality of life, depression, anxiety, exercise capacity, mortality, hospital admissions and readmissions, length of hospital stay or adherence to treatment plans between people offered exercise focused telehealth monitoring interventions versus usual care.

High quality evidence from 6 RCTs reporting data from 566 people with COPD found no meaningful difference in respiratory specific quality of life between people offered health focused telehealth monitoring interventions versus usual care.

Subgroup analysis based on the presence or absence of access to self-management information - health focused telehealth monitoring

Moderate quality evidence from 3 RCTs reporting data from 577 people with COPD found no meaningful difference in depression between people offered telehealth monitoring without self-management information versus usual care.

Moderate quality evidence from 1 RCT reporting data from 141 people with COPD found improvements in depression in people offered telehealth monitoring with self-management information versus usual care.

Publication bias- health focused telehealth monitoring

There was no evidence identified that publication bias influenced the results of any of the comparisons.

Economic evidence statements

Self-management

A directly applicable study with very serious limitations (Dritsaki 2016a) found that a self-management intervention (comprising one initial consultation with a physiotherapist with two follow-up calls) was highly cost effective compared with usual care, with an ICER of £280/QALY and a 97% probability of being cost effective at a £20,000/QALY threshold. However, the authors appear to have made an error in calculating incremental QALYs, which means that the ICER is likely to be substantially higher than this.

A directly applicable study with minor limitations (Jordan 2015) found that self-management is cost effective compared with usual care in the base-case analysis, with an ICER of £8,218. However, these is substantial uncertainty surrounding this result; self-management is associated with a 68% probability of being cost effective at a threshold of £20,000/QALY.

A directly applicable study with minor limitations (Khdour 2011) found that a self-management intervention (comprising one initial consultation with a pharmacist with two follow-up calls and two outpatient visits) dominated usual care; it is both cheaper (cost saving of £671.59) and more effective (0.065 incremental QALYs). Probabilistic sensitivity analysis showed that self-management is associated with a 95% probability of being cost effective at a threshold of £20,000/QALY.

A directly applicable study with minor limitations (Taylor 2012) found that a self-management intervention (comprising seven three-hour group sessions) produces a cost effective ICER of £11,710/QALY compared with usual care, and is associated with a 75% probability of being cost effective at a threshold of £20,000/QALY.

Telehealth monitoring

A directly applicable study with potentially serious limitations (Bentley 2014) found that a telehealth monitoring intervention as part of a discharge service was not cost effective compared with the discharge service alone at a threshold of £20,000/QALY, with an ICER of £68,811/QALY.

A directly applicable study with potentially serious limitations (McDowell 2015) found that a telehealth monitoring intervention was not cost effective compared with usual care at a threshold of £20,000, with an ICER of £203,900.

A directly applicable study with minor limitations (Stoddart 2015) found that a telehealth monitoring was unlikely to be cost effective compared with usual care, with an ICER of £137,277/QALY and a 10.1% probability of being cost effective at a threshold of £20,000/QALY.

The committee's discussion of the evidence

Interpreting the evidence

The outcomes that matter most

The committee agreed that the outcomes that were most important to assess education and self-management interventions were knowledge (to ensure the interventions were successful in their primary goal of improving patients knowledge around COPD and how to manage it), and overall measures of impact, such as quality of life, which would hopefully capture the potential effects of the interventions across different domains. The most commonly reported quality of life measure in the studies was the St George's Respiratory Questionnaire, which the committee agreed was a commonly used instrument to measure quality of life in people with COPD. Other outcomes such as the number of hospitalisations and exacerbations were also important, but should be reflected in quality of life.

The committee agreed that the same outcomes were important for telehealth monitoring, but that number of hospitalisations (primarily those caused by exacerbations) were more important than knowledge about COPD in this case as the telehealth monitoring interventions were not aimed at improving knowledge.

The quality of the evidence

Self-management and education

The committee agreed there was a sufficient volume and quality of evidence for self-management interventions of various types to be able to make strong recommendations in this area, and that much of the evidence was of moderate or high quality. Some studies were at risk of bias, for reasons including lack of details on randomisation and lack of assessor blinding, but the absence of obvious differences in outcomes between studies at different risks of bias meant the committee were confident there was not substantial systematic bias in the results. The committee noted that there was considerable heterogeneity in the different interventions labelled as being self-management, and it was not possible to identify exactly which components of self-management interventions were most effective, and therefore agreed it was appropriate to focus recommendations on elements that were present across a wide range of the different self-management interventions tested.

The committee noted that for exacerbation action plans, it was not possible to identify the components of these interventions that were effective, and in particular what proportion of the effectiveness came from self-treatment of exacerbations (with either antibiotics or steroids). They were aware of evidence comparing action plans with self-treatment of exacerbations versus action plans without self-treatment of exacerbations showing benefits in exacerbation severity and duration, and reductions in healthcare costs, in people using self-treatment (Zwerink 2016), but these studies again included both steroids and antibiotics, and it was not possible to separate the effects of the two treatments. They therefore agreed that any recommendations

made would need to include all the components present in the interventions in the studies.

Telehealth monitoring

The committee agreed that the included studies matched the definition of telehealth monitoring used in the introduction. They were concerned that some studies (Antoniades et al 2012, Bentley et al 2014, and Farmer et al 2017) excluded people with significant comorbidities, who might be expected to particularly benefit from the intervention. However, the majority of telehealth monitoring studies included these people and did not show improved effects on the key outcomes. The committee agreed that it was appropriate for exercise focused telehealth monitoring trials to exclude people with comorbidities that prevented them from completing the exercises.

The committee noted that there was a large body of evidence of very low to moderate quality that failed to show a positive effect for telehealth monitoring on the majority of outcomes. One study (Vitacca et al. 2016) found a reduction in the number of exacerbations, but this was taken from a subgroup analysis of people on long-term oxygen therapy (LTOT), derived from a larger trial of people with chronic respiratory failure, where only 46% of the participants had a diagnosis of COPD (Vitacca et al 2009). There were problems with the reporting of the original study in that it only presented data for people with COPD for selected outcomes, and not all of these were presented in an accessible fashion for inclusion in this review. The LTOT subgroup analysis population was also relatively small (76 people). In contrast, there were few studies to date that focused on telehealth monitoring interventions specifically to promote physical activity.

The committee observed that certain study populations were not fully representative of the UK COPD population. Ho et al (2016) was based in Taiwan where the prevalence of smoking is higher than in the UK; the number of pack-years smoked was also considerably higher (mean 48 in the control arm, 57 in the intervention arm) and the mean age was 80 years old. In addition, the committee commented that it was useful generally to know what percentage of the study participants were current smokers, but that this information was not provided for every trial.

Benefits and harms

Education

The committee agreed there was clear evidence of benefits from education interventions on patient's knowledge around COPD, and of self-management interventions including substantial patient education components on both patient knowledge and quality of life. They therefore agreed it was appropriate to provide patients with information on COPD throughout the pathway, and created a list of key elements that should be considered from those commonly mentioned throughout the trials. This included a list of other long-term conditions that are common in people with COPD so that patients can be aware of other symtoms and seek advice on those if necessary. The list of the most common COPD co-morbidities were informed by the research of Chetty et al. (2017). The committee noted these elements

matched with their clinical experience of important things to include in discussions with people with COPD.

The committee also discussed the importance of providing suitable information at relevant times to ensure that a person's individual information needs are met. They made a recommendation to reflect this. In addition, the committee noted that there is statutory guidance concerning the obligation to provide accessible information and they included a link to this document. A cross-reference was also added here to the NICE guideline on patient experience, which provides recommendations on how best to provide information to people, including those with sensory impairment.

Self-management

The committee noted there was clear evidence of the effectiveness and cost effectiveness of general self-management plans for people with COPD, and agreed it was appropriate to make a strong recommendation that each person should have an individualised self-management plan developed (again incorporating, as above, the elements commonly identified throughout the trials). These self-management plans were shown to improve quality of life (although this finding was not robust to removing studies at high risk of bias) and reduce hospitalisations for people with COPD. They also noted that these trials included regular review of those self-management plans, and this was also an important point to capture in the recommendation. There was no evidence identified that self-management plans focussing solely on exercise were more effective than general self-management plans, and therefore the committee agreed these more specialised standalone plans should not be mentioned in the recommendations (though exercise can be an important component of a general self-management plan). The committee noted that there was already strong evidence for benefit from exercise within a pulmonary rehabilitation programme, but that this was outside the scope of this guideline update. They agreed with existing guidance that pulmonary rehabilitation should continue to be the recommended mechanism for enabling exercise/activity.

The committee also noted the clear positive benefits of exacerbation action plans for people at risk of exacerbations. These plans were again shown to improve quality of life (although this finding was not robust to removing studies at high risk of bias), and also to reduce depressive symptoms and length of hospital stay. The committee agreed it was therefore appropriate to recommend their use. In particular, the committee noted that most of the exacerbation action plans provided people with (i) instructions on how to respond to symptoms of an exacerbation, and (ii) oral corticosteroids and antibiotics to keep at home that they can use to respond to symptoms if appropriate. As a result, the committee made explicit reference to these key components in the recommendation. However, the committee agreed that these treatments are not without potential side effects and should be offered to people who are likely to receive benefits that outweigh the harms. The committee defined this group as people who have had an exacerbation within the last year, and who remain at risk of exacerbations. This was based, in part, on a subgroup analysis that showed an increased quality of life (using SGRQ) in people offered action plans who had experienced an exacerbation within the last year. In comparison, no clinical improvement in quality of life was detected in trials that did not recruit participants

based on exacerbation history. The committee also noted that the risk of future exacerbations could change, for example optimised prescription of inhaled therapies or quitting smoking may greatly reduce risk, and they included the provison for remaining at risk of exacerbations to the recomendation to reflect this. The committee also included a cross reference to the NICE guideline on managing acute exacerbations of COPD to provide more information on the choice of antibiotics.

The committee discussed the structure of the action plan further and when it should be used. They noted that the clinical trials using action plans frequently contained instructions to use inhaled bronchodilators, antibiotics and oral corticosteroids at pre-specifed doses following a worsening of symptoms, which included increased breathlessness, and changes in sputum colour and volume. The committee made a recommendation to reflect this evidence, including specific requirements to trigger the use of antibiotics or oral corticosteroids, and to ensure that healthcare professional caring for people with COPD are kept informed about the use of this medication.

The committee also discussed the potential for antibiotic overuse and the associated risks of antibiotic resistance for the person with COPD and society as a whole. They were keen to stress that people should be assessed before being provided with medicines to keep at home, and should be both competent and confident in their use before they are provided. They also stressed the importance of continued monitoring to ensure people are using these medicines appropriately and that frequent use of rescue packs of antibiotics should prompt a review of the person's condition. In particular, they noted that repeated use of antibiotics should be avoided and that optimisation of other treatments (including non-pharmacological management and vaccinations; treatment for tobacco dependence and inhaled therapies) could help reduce exacerbations and thus mean that antibiotics are only needed in the small group of people whose symptoms cannot be managed with other treatments.

The committee also discussed the evidence on specific cognitive behavioural self-management strategies for managing breathlessness. Whilst these plans were not shown to improve the symptoms of breathlessness, they did reduce distress (for example, by reducing anxiety), which the committee agreed could be interpreted as people better understanding and being able to cope with their breathlessness. The plans also lead to an improvement in physical activity (people who are less anxious about their breathlessness are less likely to avoid exertion as a result of it). The committee therefore agreed the evidence supported a positive recommendation for the inclusion of a cognitive behavioural component to self-management plans for people with frightening breathlessness, but since this was based on a smaller number of studies than the other recommendation, they decided to make this a weaker recommendation.

Finally, the committee agreed it was appropriate to retain a recommendation from the 2010 guideline about informing people at risk of hospitalisation about what may happen if they are hospitalised. This was noted as being important to prevent anxiety in people who are hospitalised, which may result from interventions such as non-invasive ventilation, if they are not suitably prepared. The committee decided to add an additional statement to this recommendation explaining that this should include a

discussion of future treatment preferences, including ceilings of care and resuscitation. They noted that this information would be discussed with any patient who is hospitalised and not just those who have COPD.

The committee agreed there was no evidence of any harms from self-management interventions, and that none should result as long as people are aware of when, and as a result of what symptoms, they should make contact with a healthcare professional, and had access back into specialist services should this be needed.

Telehealth monitoring

The committee discussed the aim of telehealth monitoring and who could benefit from the intervention. They noted that many of the telehealth monitoring interventions were designed to detect fluctuations in key measurements that could indicate the beginning of an exacerbation sooner than relying on symptoms alone. In turn, this would trigger earlier treatment with the goal of reducing the severity of the exacerbation and preventing hospitalisations. However, this would only be expected to lead to benefits if people with COPD are not self-medicating or seeking help for an exacerbation in a timely manner, and that this could be addressed by telehealth monitoring. If the clinicians are unable to use the measurements taken to predict an exacerbation earlier than a patient could do so based on symptoms alone then telehealth monitoring would not provide any additional benefit to the patient or reduce healthcare utilisation. The committee also noted that some people who could potentially benefit the most by telehealth monitoring may be unable to use the equipment and follow the measurement schedule, and they may already be receiving additional care and support from their health professional team to manage their COPD.

The committee considered the large body of evidence on telehealth monitoring and exercise focused telehealth monitoring. They concluded that there was no convincing evidence for the effectiveness of this intervention in reducing exacerbations, hospitalisations or other outcomes of interest to people with COPD. As a result, they agreed to recommend that telehealth monitoring is not used routinely in people with COPD. However, the committee recognised that telehealth monitoring may have a role in other diseases in the NHS and agreed that this recommendation should not prevent or change the use of telehealth monitoring in people with these conditions who also have COPD. In addition, the committee did not want to prevent the use of telemonitoring in people with COPD if it was indicated for a specific reason, such as short-term monitoring following hospital discharge, and so they confined their do not offer recommendation to routine telehealth monitoring. The committee also discussed the possibility that telehealth monitoring could be beneficial to people with COPD in the future if (i) suitable predictive factors were identified and/or technology improve sufficiently to allow detection of exacerbations earlier than by symptoms and (ii) if earlier intervention prompted by these measures led to improved outcomes.

The committee discussed the possibility that telehealth monitoring could increase anxiety in people with COPD by enabling them to see daily fluctuations in their measurements that they would not normally be aware of, and that are not linked to worsening symptoms. Alternatively, it could reassure people if their readings remain

the same. The committee noted that having people with COPD self-monitor could help empower them to manage their condition, but sending the information to a remote centre for monitoring could disempower them and make them less likely to seek help unless prompted by medical personnel.

Cost effectiveness and resource use

The committee considered the economic evidence for self-management of COPD, and concluded that self-management interventions are likely to be cost effective at a threshold of £20,000 per QALY, and therefore felt justified in recommending their use. The committee also discussed the cost effectiveness of exacerbation action plans and breathing plans (to address breathlessness-related anxiety) alongside self-management interventions. It was concluded that such components are very likely to be cost effective, as they are associated with very small (if any) marginal costs and produce clear clinical benefits.

The committee noted that all included studies on telehealth monitoring in patients with COPD indicate that such interventions are not cost effective at a threshold of £20,000 per QALY. The committee also noted that the QALY gains associated with telehealth monitoring were small in absolute terms, which is consistent with the lack of significance in health-related quality of life outcomes from the clinical evidence. The committee therefore felt justified in recommending against the routine use of telehealth monitoring in stable COPD on both clinical and economic grounds.

The committee concluded that the recommendations regarding self-management are unlikely to have a significant impact on resource usage, as such interventions are currently widely used in the management of COPD. The recommendation on telehealth monitoring is likely to reduce the number of patients with stable COPD who are offered telehealth monitoring and is therefore anticipated to be resource-saving.

Other factors the committee took into account

The committee agreed it was important to give specific consideration to people who are not as able to self-manage their own care. They noted that for some individuals, carers may need to be involved in the delivery of a self-management plan, but that the same elements would be appropriate for a self-management plan partially or primarily delivered by carers as one fully self-managed by the individual themselves.

The committee stressed that telehealth monitoring is not the same as telephone monitoring of vulnerable people with COPD or people who have reported symptoms. In telephone monitoring, health professionals use phone calls to check on the people with COPD and measurements are not sent routinely for assessment. As a result, this recommendation should not change current practice of using telephone monitoring of vulnerable people with COPD.

The committee noted that there may be specific subgroups of people where telehealth monitoring might be more appropriate; those in remote areas who might find it hard to seek medical advice, or vulnerable groups of people with COPD who were less likely to seek help for changes in their symptoms, due to issues such as

communication difficulties and cognitive problems. However, in the absence of any evidence of benefits the committee agreed it would not be appropriate to make different recommendations for these populations.

Appendices

Appendix A – Review protocols

Review protocol for self-management interventions, education and telehealth

Field (based on PRISMA-P)	Content
Review question	What is the clinical and cost effectiveness of self-management interventions, education, and telehealth monitoring for improving outcomes and adherence to treatment in people with stable COPD?
Type of review question	Intervention
Objective of the review	To determine the effectiveness of self-management interventions, education and telehealth monitoring for people with COPD.
Eligibility criteria – population	People diagnosed with COPD

Eligibility criteria – interventions	• Self-management interventions (structured interventions for individuals aimed at improvement in self-health behaviours and self-management skills) including:
	  ○ Self-management plans (e.g. self-determined goals and pre-defined plans). Often multicomponent and may include an education intervention, exercise training and action plan in case of exacerbations.
	  ○ Training to help with self-management including:
	  ▪ to facilitate optimal inhaler use

	▪ psychological therapy (e.g. cognitive behavioural therapy, CBT) specifically targeting variables related to COPD (e.g. breathlessness-related panic). o Phone/tablet applications o Peer support • Education (information provided to support broader knowledge of condition) including: o Information leaflets (e.g. on inhaler use, lung function) o Structured information sessions o Websites/ education apps • Telehealth monitoring (data on health is collected and relayed to a monitoring service, with the option of feedback from a health professional if needed). This may also be carried as part of a self-management plan.
Eligibility criteria – comparators	• Each other • No intervention (placebo, routine medical care, no treatment) • Combinations of interventions
Outcomes	• Mortality • Hospital admissions, re-admissions and bed days • Exacerbations • Symptoms including breathlessness (e.g. Borg dyspnoea score, Modified MRC scale for dyspnoea) and orthopnoea

	• Anxiety (e.g. General anxiety disorder 7, GAD7; Hospital Anxiety and Depression Scale, HADS) • Depression (e.g. patient health questionnaire 9, PHQ9; Hospital Anxiety and Depression Scale, HADS) • Adherence to treatment plans • Exercise capacity/ exercise tolerance (e.g. 6 minute walking distance, 6MWD, or the shuttle walk test) • Change in FEV1, rate of change in FEV1 • Adverse events: all, severe, treatment discontinuation • Knowledge about COPD (Bristol COPD knowledge questionnaire) • Illness-specific self-efficacy (COPD Self-efficacy scale, CSES) • Quality of life (e.g. St. George's respiratory questionnaire, SGRQ, overall score) • Resource use and costs
Eligibility criteria – study design	• RCTs • Systematic reviews of RCTs
Other exclusion criteria	• Trials of less than 12 weeks duration (to ensure trials looking at acute effects are excluded and confine search to trials looking at longer term effects of interventions). • Pulmonary rehabilitation interventions (including tele-rehabilitation and home-based rehabilitation programmes) • Supervised exercise programmes, and exercise interventions that are not associated with telehealth monitoring.

	Trials of self-management plans where the intervention is the addition of an exercise programme to a self-management plan versus the self-management plan alone are also excluded. • Smoking cessation interventions • Telehealth interventions other than telehealth monitoring (e.g. tele-consultations, coaching and counselling, unless part of a self-management plan or carried out in association with telehealth monitoring) • Cognitive behavioural therapy for non – COPD specific issues (e.g. anxiety or depression) • Trials looking at the management of exacerbations at home versus hospitalisation during an exacerbation. • Non-English language publications
Proposed sensitivity/sub-group analysis, or meta-regression	Subgroups: • Trials that recruited patients with at least one COPD exacerbation in the 12 months before study entry • Severity of COPD (as defined by Global Strategy for the Diagnosis, Management and Prevention of COPD, GOLD, 2017 and NICE clinical guideline 101 (2010) based on predicted airflow limitation (FEV1 %) in patients with FEV1/FVC <0.70) • Multimorbidities (including COPD with asthma, bronchopulmonary dysplasia, bronchiectasis, anxiety or depression) • Smoking status (smokers versus non-smokers or, data permitting, never

	smoked, ex-smokers and current smokers). Subgroup analyses will only be conducted if the majority of trials report data for the listed categories in an accessible format.
Selection process – duplicate screening/selection/analysis	10% of the abstracts were reviewed by two reviewers, with any disagreements resolved by discussion or, if necessary, a third independent reviewer. If meaningful disagreements were found between the different reviewers, a further 10% of the abstracts were reviewed by two reviewers, with this process continued until agreement is achieved between the two reviewers. From this point, the remaining abstracts will be screened by a single reviewer. This review made use of the priority screening functionality with the EPPI-reviewer systematic reviewing software. See Appendix B for more details.
Data management (software)	See Appendix B
Information sources – databases and dates	See Appendix C Main Searches: • Cochrane Database of Systematic Reviews – CDSR (Wiley) • Cochrane Central Register of Controlled Trials – CENTRAL (Wiley) • Database of Abstracts of Reviews of Effects – DARE (Wiley) • Health Technology Assessment Database – HTA (Wiley) • EMBASE (Ovid)

	• MEDLINE (Ovid) • MEDLINE In-Process (Ovid) The search will be date limited from 1st May 2003 to 18th July 2017. No new searches were undertaken in the 2010 guideline update for this question. Economics: • NHS Economic Evaluation Database – NHS EED (Wiley) • Health Economic Evaluations Database – HEED (Wiley) • EconLit (Ovid) • Embase (Ovid) • MEDLINE (Ovid) • MEDLINE In-Process (Ovid) The economics search will cover all questions and will be date limited from the previous search January 2009-May 2017.
Identify if an update	Update of 2004 COPD guideline question: Do self-management plans & patient education affect concordance with treatment and improve outcomes in patients with stable COPD? In patients with stable COPD and their relatives / carer, what effect does education have on morbidity, quality of life, advanced directives or mortality measures? This is the first time that the effectiveness of telehealth monitoring has been examined.
Author contacts	Guideline update
Highlight if amendment to previous protocol	For details please see section 4.5 of Developing NICE guidelines: the manual

Search strategy – for one database	For details please see appendix C
Data collection process – forms/duplicate	A standardised evidence table format will be used, and published as appendix E (clinical evidence tables) or I (economic evidence tables).
Data items – define all variables to be collected	For details please see evidence tables in appendix E (clinical evidence tables) or I (economic evidence tables).
Methods for assessing bias at outcome/study level	See Appendix B
Criteria for quantitative synthesis	See Appendix B
Methods for quantitative analysis – combining studies and exploring (in)consistency	See Appendix B
Meta-bias assessment – publication bias, selective reporting bias	See Appendix B
Confidence in cumulative evidence	See Appendix B
Rationale/context – what is known	For details please see the introduction to the evidence review in the main file.
Describe contributions of authors and guarantor	A multidisciplinary committee developed the evidence review. The committee was convened by the NICE Guideline Updates Team and chaired by Damien Longson (until September 2017) and Andrew Molyneux (from September 2017) in line with section 3 of Developing NICE guidelines: the manual. Staff from the NICE Guideline Updates Team undertook systematic literature searches, appraised the evidence, conducted meta-

	analysis and cost-effectiveness analysis where appropriate, and drafted the evidence review in collaboration with the committee. For details please see Developing NICE guidelines: the manual.
Sources of funding/support	The NICE Guideline Updates Team is an internal team within NICE.
Name of sponsor	The NICE Guideline Updates Team is an internal team within NICE.
Roles of sponsor	The NICE Guideline Updates Team is an internal team within NICE.

Appendix B – Methods

Priority screening

The reviews undertaken for this guideline all made use of the priority screening functionality with the EPPI-reviewer systematic reviewing software. This uses a machine learning algorithm (specifically, an SGD classifier) to take information on features (1, 2 and 3 word blocks) in the titles and abstract of papers marked as being 'includes' or 'excludes' during the title and abstract screening process, and re-orders the remaining records from most likely to least likely to be an include, based on that algorithm. This re-ordering of the remaining records occurs every time 25 additional records have been screened.

Research is currently ongoing as to what are the appropriate thresholds where reviewing of abstract can be stopped, assuming a defined threshold for the proportion of relevant papers it is acceptable to miss on primary screening. As a conservative approach until that research has been completed, the following rules were adopted during the production of this guideline:

- In every review, at least 50% of the identified abstract (or 1,000 records, if that is a greater number) were always screened.
- After this point, screening was only terminated if a pre-specified threshold was met for a number of abstracts being screened without a single new include being identified. This threshold was set according to the expected proportion of includes in the review (with reviews with a lower proportion of includes needing a higher number of papers without an identified study to justify termination), and was always a minimum of 250.

As an additional check to ensure this approach did not miss relevant studies, the included studies lists of included systematic reviews were searched to identify any papers not identified through the primary search.

Incorporating published systematic reviews

For all review questions where a literature search was undertaken looking for a particular study design, systematic reviews containing studies of that design were also included. All included studies from those systematic reviews were screened to identify any additional relevant primary studies not found as part of the initial search.

Quality assessment

Individual systematic reviews were quality assessed using the ROBIS tool, with each classified into one of the following three groups:

- High quality – It is unlikely that additional relevant and important data would be identified from primary studies compared to that reported in the review, and unlikely that any relevant and important studies have been missed by the review.

- Moderate quality – It is possible that additional relevant and important data would be identified from primary studies compared to that reported in the review, but unlikely that any relevant and important studies have been missed by the review.
- Low quality – It is possible that relevant and important studies have been missed by the review.

Each individual systematic review was also classified into one of three groups for its applicability as a source of data, based on how closely the review matches the specified review protocol in the guideline. Studies were rated as follows:

- Fully applicable – The identified review fully covers the review protocol in the guideline.
- Partially applicable – The identified review fully covers a discrete subsection of the review protocol in the guideline.
- Not applicable – The identified review, despite including studies relevant to the review question, does not fully cover any discrete subsection of the review protocol in the guideline.

Using systematic reviews as a source of data

If systematic reviews were identified as being sufficiently applicable and high quality, and were identified sufficiently early in the review process, they were used as the primary source of data, rather than extracting information from primary studies. The extent to which this was done depended on the quality and applicability of the review, as defined in Table 6. When systematic reviews were used as a source of primary data, any unpublished or additional data included in the review which is not in the primary studies was also included. Data from these systematic reviews was then quality assessed and presented in GRADE/CERQual tables as described below, in the same way as if data had been extracted from primary studies. In questions where data was extracted from both systematic reviews and primary studies, these were cross-referenced to ensure none of the data had been double counted through this process.

Table 6 Criteria for using systematic reviews as a source of data

Quality	Applicability	Use of systematic review
High	Fully applicable	Data from the published systematic review were used instead of undertaking a new literature search or data analysis. Searches were only done to cover the period of time since the search date of the review.
High	Partially applicable	Data from the published systematic review were used instead of undertaking a new literature search and data analysis for the relevant subsection of the protocol. For this section, searches were only done to cover the period of time since the search date of the review. For other sections not covered by the systematic review, searches were undertaken as normal.
Moderate	Fully applicable	Details of included studies were used instead of undertaking a new literature search. Full-text papers of included studies were still retrieved for the purposes of data analysis. Searches were

Quality	Applicability	Use of systematic review
		only done to cover the period of time since the search date of the review.
Moderate	Partially applicable	Details of included studies were used instead of undertaking a new literature search for the relevant subsection of the protocol. For this section, searches were only done to cover the period of time since the search date of the review. For other sections not covered by the systematic review, searches were undertaken as normal.

Evidence synthesis and meta-analyses

Where possible, meta-analyses were conducted to combine the results of studies for each outcome. For mean differences, where change from baseline data were reported in the trials and were accompanied by a measure of spread (for example standard deviation), these were extracted and used in the meta-analysis. Where measures of spread for change from baseline values were not reported, the corresponding values at study end were used and were combined with change from baseline values to produce summary estimates of effect. All studies were assessed to ensure that baseline values were balanced across the treatment groups; if there were significant differences in important confounding variables at baseline these studies were not included in any meta-analysis and were reported separately.

Evidence of effectiveness of interventions

Quality assessment

Individual RCTs and quasi-randomised controlled trials were quality assessed using the Cochrane Risk of Bias Tool. Cohort studies were quality assessed using the CASP cohort study checklist. Each individual study was classified into one of the following three groups:

- Low risk of bias – The true effect size for the study is likely to be close to the estimated effect size.
- Moderate risk of bias – There is a possibility the true effect size for the study is substantially different to the estimated effect size.
- High risk of bias – It is likely the true effect size for the study is substantially different to the estimated effect size.

Each individual study was also classified into one of three groups for directness, based on if there were concerns about the population, intervention, comparator and/or outcomes in the study and how directly these variables could address the specified review question. Studies were rated as follows:

- Direct – No important deviations from the protocol in population, intervention, comparator and/or outcomes.
- Partially indirect – Important deviations from the protocol in one of the population, intervention, comparator and/or outcomes.

- Indirect – Important deviations from the protocol in at least two of the following areas: population, intervention, comparator and/or outcomes.

Methods for combining intervention evidence

Meta-analyses of interventional data were conducted with reference to the Cochrane Handbook for Systematic Reviews of Interventions (Higgins et al. 2011).

Where different studies presented continuous data measuring the same outcome but using different numerical scales (e.g. a 0-10 and a 0-100 visual analogue scale), these outcomes were all converted to the same scale before meta-analysis was conducted on the mean differences. Where outcomes measured the same underlying construct but used different instruments/metrics, data were analysed using standardised mean differences (Hedges' g).

A pooled relative risk was calculated for dichotomous outcomes (using the Mantel–Haenszel method). Both relative and absolute risks were presented, with absolute risks calculated by applying the relative risk to the pooled risk in the comparator arm of the meta-analysis (all pooled trials).

Fixed- and random-effects models (der Simonian and Laird) were fitted for all syntheses, with the presented analysis dependent on the degree of heterogeneity in the assembled evidence. Fixed-effects models were the preferred choice to report, but in situations where the assumption of a shared mean for fixed-effects model were clearly not met, even after appropriate pre-specified subgroup analyses were conducted, random-effects results are presented. Fixed-effects models were deemed to be inappropriate if one or both of the following conditions was met:

- Significant between study heterogeneity in methodology, population, intervention or comparator was identified by the reviewer in advance of data analysis. This decision was made and recorded before any data analysis was undertaken.
- The presence of significant statistical heterogeneity in the meta-analysis, defined as $I^2 \geq 50\%$.

In any meta-analyses where some (but not all) of the data came from studies at high risk of bias, a sensitivity analysis was conducted, excluding those studies from the analysis. Results from both the full and restricted meta-analyses are reported. Similarly, in any meta-analyses where some (but not all) of the data came from indirect studies, a sensitivity analysis was conducted, excluding those studies from the analysis.

In situations where subgroup analyses were conducted, pooled results and results for the individual subgroups are reported when there was evidence of between group heterogeneity, defined as a statistically significant test for subgroup interactions (at the 95% confidence level). Where no such evidence as identified, only pooled results are presented.

Meta-analyses were performed in Cochrane Review Manager v5.3.

Minimal clinically important differences (MIDs)

The Core Outcome Measures in Effectiveness Trials (COMET) database was searched to identify published minimal clinically important difference thresholds relevant to this guideline. Identified MIDs were assessed to ensure they had been developed and validated in a methodologically rigorous way, and were applicable to the populations, interventions and outcomes specified in this guideline. In addition, the Guideline Committee were asked to prospectively specify any outcomes where they felt a consensus MID could be defined from their experience. In particular, any questions looking to evaluate non-inferiority (that one treatment is not meaningfully worse than another) required an MID to be defined to act as a non-inferiority margin.

MIDs found through this process and used to assess imprecision in the guideline are given in Table 7. For other mean differences where no MID is given below the line of no effect is used.

Table 7 Identified MIDs

Outcome	MID	Source
Borg dyspnoea (breathlessness) score	2 units (-2, +2)	Ries AL. Minimally clinically important difference for the UCSD shortness of breath questionnaire, Borg Scale, and Visual Analog Scale. J COPD 2005; 2: 105–110.
6 minute walk distance	26m (-26, +26)	Puhan MA, Chandra D, Mosenifar Z, et al. The minimal important difference of exercise tests in severe COPD. Eur Respir J 2011; 37: 784–790.
Total score in St. George's respiratory questionnaire	4 points (-4,+4)	Schünemann HJ, Griffith L, Jaeschke R, et al. Evaluation of the minimal important difference for the feeling thermometer and the St. George's Respiratory Questionnaire in patients with chronic airflow obstruction. J Clin Epidemiol 2003; 56: 1170–1176.
Change in FEV1	100ml (-100, +100)	Cazzola M, MacNee W, Martinez M et al., Outcomes for COPD pharmacological trials: from lung function to biomarkers. Eur Respir J 2008; 31: 416–468.
CRQ dyspnoea (breathlessness) score	0.5 units (-0.5, +0.5)	Redelmeier DA, Guyatt GH, Goldstein RS. Assessing the minimal important difference in symptoms: A comparison of two techniques. Journal of Clinical Epidemiology, 1996; 49, 1215-1219.

For standardised mean differences where no other MID was available, an MID of 0.2 was used, corresponding to the threshold for a small effect size initially suggested by Cohen et al. (1988). The committee specified that any difference in mortality would be clinically meaningful, and therefore the line of no effect was used as an MID. For other relative risks, where no MID was specified, the GRADE default MID interval for dichotomous outcomes of 0.8 to 1.25 was used.

When decisions were made in situations where MIDs were not available, the 'Evidence to Recommendations' section of that review should make explicit the committee's view of the expected clinical importance and relevance of the findings.

GRADE for pairwise meta-analyses of interventional evidence

GRADE was used to assess the quality of evidence for the selected outcomes as specified in 'Developing NICE guidelines: the manual (2014)'. Data from RCTs was initially rated as high quality and the quality of the evidence for each outcome was downgraded or not from this initial point. If non-RCT evidence was included for intervention-type systematic reviews then these were initially rated as either moderate quality (quasi-randomised studies) or low quality (cohort studies) and the quality of the evidence for each outcome was further downgraded or not from this point, based on the criteria given in Table 8.

Table 8 Rationale for downgrading quality of evidence for intervention studies

GRADE criteria	Reasons for downgrading quality
Risk of bias	Not serious: If less than 33.3% of the weight in a meta-analysis came from studies at moderate or high risk of bias, the overall outcome was not downgraded. Serious: If greater than 33.3% of the weight in a meta-analysis came from studies at moderate or high risk of bias, the outcome was downgraded one level. Very serious: If greater than 33.3% of the weight in a meta-analysis came from studies at high risk of bias, the outcome was downgraded two levels. Outcomes meeting the criteria for downgrading above were not downgraded if there was evidence the effect size was not meaningfully different between studies at high and low risk of bias.
Indirectness	Not serious: If less than 33.3% of the weight in a meta-analysis came from partially indirect or indirect studies, the overall outcome was not downgraded. Serious: If greater than 33.3% of the weight in a meta-analysis came from partially indirect or indirect studies, the outcome was downgraded one level. Very serious: If greater than 33.3% of the weight in a meta-analysis came from indirect studies, the outcome was downgraded two levels. Outcomes meeting the criteria for downgrading above were not downgraded if there was evidence the effect size was not meaningfully different between direct and indirect studies.
Inconsistency	Concerns about inconsistency of effects across studies, occurring when there is unexplained variability in the treatment effect demonstrated across studies (heterogeneity), after appropriate pre-specified subgroup analyses have been conducted. This was assessed using the I^2 statistic. N/A: Inconsistency was marked as not applicable if data on the outcome was only available from one study. Not serious: If the I^2 was less than 33.3%, the outcome was not downgraded. Serious: If the I^2 was between 33.3% and 66.7%, the outcome was downgraded one level. Very serious: If the I^2 was greater than 66.7%, the outcome was downgraded two levels. Outcomes meeting the criteria for downgrading above were not downgraded if there was evidence the effect size was not meaningfully different between studies with the smallest and largest effect sizes.

GRADE criteria	Reasons for downgrading quality
Imprecision	If MIDs (one corresponding to meaningful benefit; one corresponding to meaningful harm) were defined for the outcome, the outcome was downgraded once if the 95% confidence interval for the effect size crossed one MID, and twice if it crossed both the upper and lower MIDs. If the line of no effect was defined as an MID for the outcome, it was downgraded once if the 95% confidence interval for the effect size crossed the line of no effect (i.e. the outcome was not statistically significant), and twice if the sample size of the study was sufficiently small that it is not plausible any realistic effect size could have been detected. Outcomes meeting the criteria for downgrading above were not downgraded if the confidence interval was sufficiently narrow that the upper and lower bounds would correspond to clinically equivalent scenarios.

The quality of evidence for each outcome was upgraded if any of the following five conditions were met:

- Data from non-randomised studies showing an effect size sufficiently large that it cannot be explained by confounding alone.
- Data showing a dose-response gradient.
- Data where all plausible residual confounding is likely to increase our confidence in the effect estimate.

Publication bias

Publication bias was assessed in two ways. First, if evidence of conducted but unpublished studies was identified during the review (e.g. conference abstracts, trial protocols or trial records without accompanying published data), available information on these unpublished studies was reported as part of the review. Secondly, where 10 or more studies were included as part of a single meta-analysis, a funnel plot was produced to graphically assess the potential for publication bias.

Evidence statements

For outcomes with a defined MID, evidence statements were divided into 4 groups as follows:

- Situations where the data are only consistent, at a 95% confidence level, with an effect in one direction (i.e. one that is 'statistically significant'), and the magnitude of that effect is most likely to meet or exceed the MID (i.e. the point estimate is not in the zone of equivalence). In such cases, we state that the evidence showed that there is an effect.
- Situations where the data are only consistent, at a 95% confidence level, with an effect in one direction (i.e. one that is 'statistically significant'), but the magnitude of that effect is most likely to be less than the MID (i.e. the point estimate is in the zone of equivalence). In such cases, we state that the evidence showed there is an effect, but it is less than the defined MID.

- Situations where the confidence limits are smaller than the MIDs in both directions. In such cases, we state that the evidence demonstrates that there is no meaningful difference.
- In all other cases, we state that the evidence could not differentiate between the comparators.

For outcomes without a defined MID or where the MID is set as the line of no effect (for example, in the case of mortality), evidence statements are divided into 2 groups as follows:

- We state that the evidence showed that there is an effect if the 95% CI does not cross the line of no effect.
- The evidence could not differentiate between comparators if the 95% CI crosses the line of no effect.

The number of trials and participants per outcome are detailed in the evidence statements, but in cases where there are several outcomes being summarised in a single evidence statement and the numbers of participants and trials differ between outcomes, then the number of trials and participants stated are taken from the outcome with the largest number of trials. This is denoted using the terminology 'up to' in front of the numbers of trials and participants.

The evidence statements also cover the quality of the outcome based on the GRADE table entry. These can be included as single ratings of quality or go from one quality level to another if multiple outcomes with different quality ratings are summarised by a single evidence statement.

Health economics

Literature reviews seeking to identify published cost–utility analyses of relevance to the issues under consideration were conducted for all questions. In each case, the search undertaken for the clinical review was modified, retaining population and intervention descriptors, but removing any study-design filter and adding a filter designed to identify relevant health economic analyses. In assessing studies for inclusion, population, intervention and comparator, criteria were always identical to those used in the parallel clinical search; only cost–utility analyses were included. Economic evidence profiles, including critical appraisal according to the Guidelines manual, were completed for included studies.

Economic studies identified through a systematic search of the literature are appraised using a methodology checklist designed for economic evaluations (NICE guidelines manual; 2014). This checklist is not intended to judge the quality of a study per se, but to determine whether an existing economic evaluation is useful to inform the decision-making of the committee for a specific topic within the guideline.

There are 2 parts of the appraisal process. The first step is to assess applicability (that is, the relevance of the study to the specific guideline topic and the NICE reference case); evaluations are categorised according to the criteria in Table 9.

Table 9 Applicability criteria

Level	Explanation
Directly applicable	The study meets all applicability criteria, or fails to meet one or more applicability criteria but this is unlikely to change the conclusions about cost effectiveness
Partially applicable	The study fails to meet one or more applicability criteria, and this could change the conclusions about cost effectiveness
Not applicable	The study fails to meet one or more applicability criteria, and this is likely to change the conclusions about cost effectiveness. These studies are excluded from further consideration

In the second step, only those studies deemed directly or partially applicable are further assessed for limitations (that is, methodological quality); see categorisation criteria in Table 10.

Table 10 Methodological criteria

Level	Explanation
Minor limitations	Meets all quality criteria, or fails to meet one or more quality criteria but this is unlikely to change the conclusions about cost effectiveness
Potentially serious limitations	Fails to meet one or more quality criteria and this could change the conclusions about cost effectiveness
Very serious limitations	Fails to meet one or more quality criteria and this is highly likely to change the conclusions about cost effectiveness. Such studies should usually be excluded from further consideration

Studies were prioritised for inclusion based on their relative applicability to the development of this guideline and the study limitations. For example, if a high quality, directly applicable UK analysis was available, then other less relevant studies may not have been included. Where selective exclusions were made on this basis, this is noted in the relevant section.

Where relevant, a summary of the main findings from the systematic search, review and appraisal of economic evidence is presented in an economic evidence profile alongside the clinical evidence.

Appendix C – Literature search strategies

Main searches

Sources searched for this review question:

- Cochrane Database of Systematic Reviews – CDSR (Wiley)
- Cochrane Central Register of Controlled Trials – CENTRAL (Wiley)
- Database of Abstracts of Reviews of Effects – DARE (Wiley)
- Health Technology Assessment Database – HTA (Wiley)
- EMBASE (Ovid)
- MEDLINE (Ovid)
- MEDLINE In-Process (Ovid)

Identification of evidence

The population terms have been updated from the original guideline to include potential co-morbidities such as asthma, bronchopulmonary dysplasia and bronchiectasis. These were excluded in the original strategy.

In this update, several lines of the strategy have been focused with the use of the term 'chronic' to reduce retrieval of articles focusing on acute signs or symptoms.

Additional acronyms for COPD have been included and on recommendation from the guideline committee, terms around 'breathlessness' have been added.

Searches were re-run in February 2018 and also included searching Medline epub ahead of print.

Review question search strategy

- What is the clinical and cost effectiveness of self-management interventions, education, and telehealth monitoring for improving outcomes and adherence to treatment in people with stable COPD?

The MEDLINE search strategy is presented below. This was translated for use in all of the other databases.

Search strategy

Medline Strategy, searched 18th July 2017	
Database: Ovid MEDLINE(R) 1946 to July Week 1 2017	
Search Strategy:	
1	lung diseases, obstructive/
2	exp pulmonary disease, chronic obstructive/
3	(copd or coad or cobd or aecb).tw.
4	emphysema*.tw.
5	(chronic* adj4 bronch*).tw.

Medline Strategy, searched 18th July 2017 **Database: Ovid MEDLINE(R) 1946 to July Week 1 2017** **Search Strategy:**
6 (chronic* adj3 (airflow* or airway* or bronch* or lung* or respirat* or pulmonary) adj3 obstruct*).tw.
7 (pulmonum adj4 (volumen or pneumatosis)).tw.
8 pneumonectasia.tw.
9 *Dyspnea/
10 (chronic* adj3 (breath* or respirat*) adj3 (difficult* or labor* or labour* or problem* or short*)).tw.
11 (chronic* adj3 (dyspnea* or dyspnoea* or dyspneic or breathless*)).tw.
12 or/1-11
13 exp Self Care/ or self efficacy/ or social support/ or self-help groups/
14 (selfhelp or selfguid* or self-guid* or selfmanage* or selfpace* or selftreat*).tw.
15 ((self or selves or personal* or themsel*) adj2 (assess* or care or caring or control* or efficacy or help* or intervention* or manag* or pace* or treat*)).tw.
16 ((network* or support or therap*) adj2 (club* or group* or social* or peer* or friend* or companion* or buddy)).tw.
17 Patient Care Planning/ or case management/ or managed care programs/ or patient care management/
18 ((action or care or manag* or individual* or patient* or self or personal*) adj2 (plan* or program*)).tw.
19 (goal* adj2 (care* or set*)).tw.
20 (case adj2 manag*).tw.
21 Health education/ or consumer health information/ or patient education as topic/
22 patient education handout/ or pamphlets/
23 exp Health Promotion/
24 (health adj4 (consumer* or educat* or promot*)).ti.
25 Information centers/ or information services/ or information dissemination/ or libraries/ or library services/
26 ((patient* or carer* or caregiver* or care-giver* or consumer*) adj2 (advis* or advice* or counsel* or booklet* or brochure* or communicat* or dvd* or educat* or forum* or handout* or hand-out* or informat* or leaflet* or learn* or lesson* or material* or pamphlet* or promot* or resource* or support* or teach* or tool* or train* or video* or website*)).tw.
27 Telemedicine/
28 Computers/ or exp computers, handheld/
29 exp Internet/
30 Mobile Applications/
31 Social Networking/
32 electronic mail/ or text messaging/ or telephone/ or exp cell phones/ or hotlines/
33 exp Teaching Materials/
34 Computer-Assisted Instruction/
35 Videoconferencing/
36 (digihealth* or digi-health* or digital health* or digital therap* or digital treat* or ehealth or e-health or etherap* or e-therap* or etreat* or e-treat* or mhealth or m-health or mobile health*

Medline Strategy, searched 18th July 2017 Database: Ovid MEDLINE(R) 1946 to July Week 1 2017 Search Strategy:
or telehealth* or tele-health* or telemedic* or tele-medic* or telecommunicat* or tele-communicat* or tele-homecare or telehomecare or tele-monitor* or telemonitor* or telemanage* or tele-manage* or teleconsult* or tele-consult* or telecare* or tele-care* or telepharmac* or tele-pharmac* or telenurs* or tele-nurs* or tele-support or telesupport).tw. 37 ((online or internet or remote or phone* or telephone*) adj2 (care or consult* or management* or monitor* or therap* or treatment*)).tw. 38 (android* or app or apps or blog* or facebook or facetime or face time or helpline* or hotline* or ipad* or iphone* or mobile phone* or cell phone* or personal digital assistant* or mp3* or podcast* or skype* or smartphone* or smart-phone* or social media or social network* or sms or text messag* or twitter or tweet* or tutorial* or wiki* or youtube*).tw. 39 ((digital* or mobile* or phone* or tablet* or portable) adj4 application*).tw. 40 (device* adj4 (handheld or palm* or pda or tablet*)).tw. 41 Reminder Systems/ 42 (reminder adj2 system*).tw. 43 Bibliotherapy/ 44 bibliotherap*.tw. 45 ((book* or information*) adj2 prescription*).tw. 46 or/13-45 47 12 and 46 48 animals/ not humans/ 49 47 not 48 50 limit 49 to english language 51 limit 50 to (letter or historical article or comment or editorial or news or case reports) 52 50 not 51 53 (200305* or 200306* or 200307* or 200308* or 200309* or 200310* or 200311* or 200312* or 2004* or 2005* or 2006* or 2007* or 2008* or 2009* or 201*).ed. 54 52 and 53

Note: In-house RCT and systematic review filters were appended

Study design filters and limits

The MEDLINE systematic review (SR) and Randomized Controlled Trial (RCT) filters were appended to the review question above and are presented below. They were translated for use in the MEDLINE In-Process and Embase databases.

Study design filters

The MEDLINE SR and RCT filters are presented below.
Systematic Review 1. Meta-Analysis.pt. 2. Meta-Analysis as Topic/ 3. Review.pt.

The MEDLINE SR and RCT filters are presented below.

4. exp Review Literature as Topic/
5. (metaanaly$ or metanaly$ or (meta adj3 analy$)).tw.
6. (review$ or overview$).ti.
7. (systematic$ adj5 (review$ or overview$)).tw.
8. ((quantitative$ or qualitative$) adj5 (review$ or overview$)).tw.
9. ((studies or trial$) adj2 (review$ or overview$)).tw.
10. (integrat$ adj3 (research or review$ or literature)).tw.
11. (pool$ adj2 (analy$ or data)).tw.
12. (handsearch$ or (hand adj3 search$)).tw.
13. (manual$ adj3 search$).tw.
14. or/1-13
15. animals/ not humans/
16. 14 not 15

RCT

1 Randomized Controlled Trial.pt.
2 Controlled Clinical Trial.pt.
3 Clinical Trial.pt.
4 exp Clinical Trials as Topic/
5 Placebos/
6 Random Allocation/
7 Double-Blind Method/
8 Single-Blind Method/
9 ((random$ or control$ or clinical$) adj3 (trial$ or stud$)).tw.
10 (random$ adj3 allocat$).tw.
11 placebo$.tw.
12 ((singl$ or doubl$ or trebl$ or tripl$) adj (blind$ or mask$)).tw.
13 or/1-12
14 animals/ not humans/
15 13 not 14

Note: analysts requested cross-over studies to be removed.

An English language limit has been applied. Animal studies and certain publication types (letters, historical articles, comments, editorials, news and case reports) have been excluded.

Searches were limited by date (1/05/2003-18/07/2017) from when previous guideline searches were undertaken.

Health Economics search strategy

Economic evaluations and quality of life data

Sources searched:

- NHS Economic Evaluation Database – NHS EED (Wiley) (legacy database)
- Health Technology Assessment (HTA Database)
- EconLit (Ovid)
- Embase (Ovid)
- MEDLINE (Ovid)
- MEDLINE In-Process (Ovid)

Search filters to retrieve economic evaluations and quality of life papers were appended to population search terms in MEDLINE, MEDLINE In-Process and EMBASE to identify relevant evidence and can be seen below. Searches were carried out on 5th May 2017 with a date limit from the previous search of January 2009 – May 2017. Searches were re-run in February 2018.

An English language limit has been applied. Animal studies and certain publication types (letters, historical articles, comments, editorials, news and case reports) have been excluded.

Health economics filters

The MEDLINE economic evaluations and quality of life search filters are presented below. They were translated for use in the MEDLINE In-Process and Embase databases.	
Economic evaluations	
1	Economics/
2	exp "Costs and Cost Analysis"/
3	Economics, Dental/
4	exp Economics, Hospital/
5	exp Economics, Medical/
6	Economics, Nursing/
7	Economics, Pharmaceutical/
8	Budgets/
9	exp Models, Economic/
10	Markov Chains/
11	Monte Carlo Method/
12	Decision Trees/
13	econom$.tw.
14	cba.tw.
15	cea.tw.
16	cua.tw.
17	markov$.tw.
18	(monte adj carlo).tw.
19	(decision adj3 (tree$ or analys$)).tw.

The MEDLINE economic evaluations and quality of life search filters are presented below. They were translated for use in the MEDLINE In-Process and Embase databases.

Economic evaluations

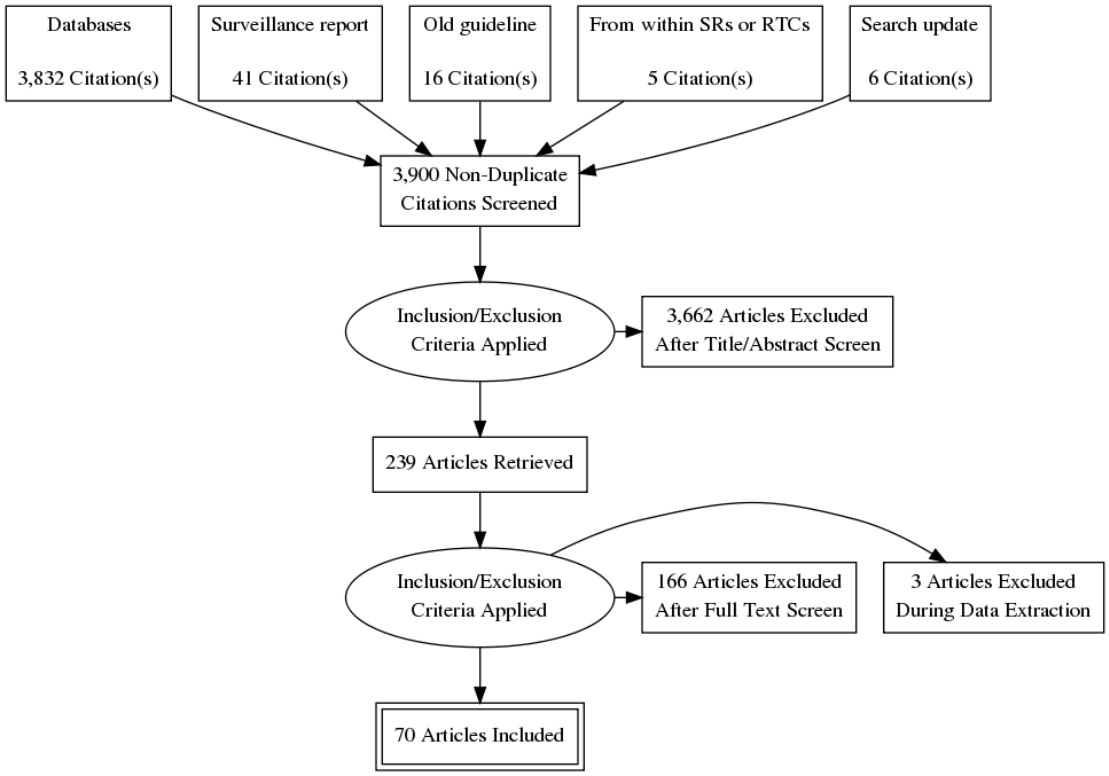
20 (cost or costs or costing$ or costly or costed).tw.
21 (price$ or pricing$).tw.
22 budget$.tw.
23 expenditure$.tw.
24 (value adj3 (money or monetary)).tw.
25 (pharmacoeconomic$ or (pharmaco adj economic$)).tw.
26 or/1-25

Quality of life

1 "Quality of Life"/
2 quality of life.tw.
3 "Value of Life"/
4 Quality-Adjusted Life Years/
5 quality adjusted life.tw.
6 (qaly$ or qald$ or qale$ or qtime$).tw.
7 disability adjusted life.tw.
8 daly$.tw.
9 Health Status Indicators/
10 (sf36 or sf 36 or short form 36 or shortform 36 or sf thirtysix or sf thirty six or shortform thirtysix or shortform thirty six or short form thirtysix or short form thirty six).tw.
11 (sf6 or sf 6 or short form 6 or shortform 6 or sf six or sfsix or shortform six or short form six).tw.
12 (sf12 or sf 12 or short form 12 or shortform 12 or sf twelve or sftwelve or shortform twelve or short form twelve).tw.
13 (sf16 or sf 16 or short form 16 or shortform 16 or sf sixteen or sfsixteen or shortform sixteen or short form sixteen).tw.
14 (sf20 or sf 20 or short form 20 or shortform 20 or sf twenty or sftwenty or shortform twenty or short form twenty).tw.
15 (euroqol or euro qol or eq5d or eq 5d).tw.
16 (qol or hql or hqol or hrqol).tw.
17 (hye or hyes).tw.
18 health$ year$ equivalent$.tw.
19 utilit$.tw.
20 (hui or hui1 or hui2 or hui3).tw.
21 disutili$.tw.
22 rosser.tw.
23 quality of wellbeing.tw.
24 quality of well-being.tw.
25 qwb.tw.
26 willingness to pay.tw.
27 standard gamble$.tw.
28 time trade off.tw.
29 time tradeoff.tw.
30 tto.tw.

The MEDLINE economic evaluations and quality of life search filters are presented below. They were translated for use in the MEDLINE In-Process and Embase databases.	
Economic evaluations	
31	or/1-30

Appendix D – Clinical evidence study selection



Appendix E – Clinical evidence tables

Self-management systematic reviews

Short Title	Title	Study characteristics	Risk of bias and directness
Howcroft (2016)	Action plans with brief patient education for exacerbations in chronic obstructive pulmonary disease	**Study type** Systematic review **Study details** Dates searched *All of the databases were searched from their inception to November 2015.* Databases searched *Trials were identified using the Cochrane Airways Group Specialised Register (CAGR). This contains trial reports identified through systematic searches of bibliographic databases, including the Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE, Embase, the Cumulative Index to Nursing and Allied Health Literature (CINAHL), the Allied and Complementary Medicine Database (AMED) and PsycINFO, and by hand searching of respiratory journals and meeting abstracts. Additional searches were carried out using: CENTRAL, MEDLINE, Embase, CINAHL, PsycINFO, ClinicalTrials.gov, the WHO trials portal and the Australian New Zealand Clinical Trials Registry (ANZCTR).* Sources of funding *Internal sources • Australia. University of Tasmania External sources • Commonwealth Department of Health and Ageing, Australia. Co-ordinator Support, Cochrane Airways Australia • Asthma Foundation Tasmania, Australia. Cochrane*	**Study eligibility criteria** Low risk of bias **Identification and selection of studies** Low risk of bias **Data collection and study appraisal** Low risk of bias **Synthesis and findings** Low risk of bias **Overall quality** High

Short Title	Title	Study characteristics	Risk of bias and directness
		Airways Australia Scholarship **Study inclusion criteria** RCTs *RCTs of action plans with a single educational component of short duration.* Quasi-RCTs *Quasi-RCTs of action plans with a single educational component of short duration.* **Study exclusion criteria** Studies that gave other treatments along with an action plan *Studies with broader self-management support interventions, such as individual or group education delivered in multiple sessions over a longer period or exercise programmes were excluded even if they contained an action plan component.* Cross-over trials **Participant exclusion criteria** Primary diagnosis of asthma *Unless separate results were available for participants with COPD.* **Interventions** Action plans with brief patient education *Action plans are aimed at allowing patients to recognise the signs that an exacerbation is beginning and then respond accordingly by following a pre-specified*	**Applicability as a source of data** Partially applicable *The list of interventions included in our review question is wider than this review.*

Short Title	Title	Study characteristics	Risk of bias and directness
		plan. Action plans provide guidelines detailing self-initiated actions such as changing medication or visiting a general practitioner (GP) or hospital. Prednisolone and an oral antibiotics may be prescribed alongside. Action plans are usually developed with the support of a healthcare professional and are tailored to the individual. They are a form of self-management and are often included in multi-component self-management plans. This systematic review focuses on action plan with a single educational component of short duration to allow the personalisation of the action plan. An action plan is defined as a written or oral guideline that details self-initiated interventions (such as changing medication regimens or visiting a GP or hospital) undertaken in response to alterations in symptoms of COPD. Ongoing support directed at use of the action plan delivered by telephone or direct contact is acceptable. The action plans are compared to usual care. **Outcome measures** Health-related quality of life (HRQoL) scores COPD self-management knowledge and intended actions *Based on participant interview* Number of hospital admissions *Respiratory related admissions* Number of GP visits due to COPD Number of exacerbations requiring emergency department visits Use of medication *Time to initiation of therapy after symptom onset; courses/duration of antibiotic or corticosteroid use, or both; participant initiation of antibiotic or steroid use, or both.* Anxiety and depression Lung function Mortality	

Short Title	Title	Study characteristics	Risk of bias and directness
		Respiratory-related and all-cause. Cost-effectiveness **Included studies from the Systematic review** McGeoch 2004 *(McGeoch 2006 is the published version of McGeoch 2004)* Rootmensen 2008 Trappenburg 2011 Watson 1997 Woods-Baker 2006 *published and unpublished data* **Excluded studies from the Systematic review** Martin 2004 *Participants do not have stable COPD at baseline and study is not an RCT* Rice 2010 *Included in another SR (Lenferink et al. 2017)*	
Lenferink (2017)	Self-management interventions including action plans for exacerbations versus usual care in patients with chronic obstructive pulmonary disease.	**Study type** Systematic review **Study details** Dates searched *1995 to May 2016.* Databases searched *The authors searched the Cochrane Airways Trials Register, which contains studies*	**Study eligibility criteria** Low risk of bias **Identification and selection of studies** Low risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
		from: Cochrane Central Register of Controlled Trials (CENTRAL), through the Cochrane Register of Studies Online (crso.cochrane.org); MEDLINE Ovid; Embase Ovid; PsycINFO Ovid; CINAHL EBSCO; AMED EBSCO and hand searches of the proceedings of major respiratory conferences. Sources of funding *External sources • Anke Lenferink, Australia. Lung Foundation Australia / Cochrane Airways Australia Scholarship 2016* **Study inclusion criteria** RCTs *Studies evaluating a self-management intervention for people with COPD published since 1995 that included a written action plan for acute exacerbations of COPD and an iterative process between participant and healthcare provider(s) in which feedback was provided. Randomised controlled trials (RCTs) reported in full text, those published as abstracts only and unpublished data from RCTs were included. Home-based (unsupervised) exercise programmes that included action plans for acute exacerbations of COPD were included, as these studies aimed to support the development of self-management skills.* **Study exclusion criteria** Studies published before 1995 *Excluded because the definition, content and focus of COPD self-management training in particular, and of COPD treatment in general, have dramatically changed over the past 20 years.* Studies examining disease management programmes *Pulmonary rehabilitation or exercise classes offered in a hospital, at a rehabilitation*	**Data collection and study appraisal** Low risk of bias **Synthesis and findings** Low risk of bias **Overall quality** High **Applicability as a source of data** Partially applicable *The list of interventions included in our review question is wider than this review.*

Short Title	Title	Study characteristics	Risk of bias and directness
		centre or in a community-based setting were excluded to avoid possible overlap with pulmonary rehabilitation as much as possible. The study was excluded if participants were randomised and allocated to self-management or usual care before pulmonary rehabilitation was complete. **Participant exclusion criteria** Primary diagnosis of asthma **Interventions** Multicomponent self-management interventions *COPD self-management interventions that included a written action plan for acute exacerbations of COPD (AECOPD) versus usual care were included. An action plan involves a set of tasks to be carried out at the start of an exacerbation. These may include contacting a healthcare professional and altered medication usage. There may also be a maintenance process which attempts to avoid triggering an exacerbation by avoiding situations in which viral infection might be prevalent, for example. The self-management intervention needed to include formal training on how and when to use an action plan for AECOPD. The formal training programme had to be an iterative process between participants and healthcare provider(s) in which feedback was provided to develop participants' self-management skills. The intervention could also include other components that were directed to achieving behaviour change (e.g., smoking behaviour, exercise or physical activity, diet, use of maintenance medication and correct device use, coping with breathlessness). Usual care was defined as routine clinical care.*	

Short Title	Title	Study characteristics	Risk of bias and directness
		Outcome measures Health-related quality of life (HRQoL) scores Number of COPD exacerbations Number of hospital admissions *Respiratory-related hospital admissions and all-cause admissions* Number of GP visits due to COPD Number of exacerbations requiring emergency department visits Use of (other) healthcare facilities *e.g. number of all-cause and respiratory-related hospitalisation days in total and per patient, number of nurse and specialist visits.* Use of medication *Rescue medication use* Self-efficacy Days lost from work Mortality *All-cause mortality* Health status **Included studies from the Systematic review** Bischoff 2012 Bosch 2007 *Study is in German and as a result data is only available from the Cochrane review.* Bourbeau 2003 Bucknall 2012 Fan 2012 Gallefoss 1999	

Short Title	Title	Study characteristics	Risk of bias and directness
		Khdour 2009 Kheirabadi 2008 Mitchell 2014 Monninkhof 2003 Ninot 2011 Osterlund Efraimsson 2006 Rice 2010 Tabak 2014 **Excluded studies from the Systematic review** Casas 2006 *Integrated care intervention* Garcia-Aymerich 2007 *Integrated care intervention* Hernandez 2015 *Integrated care intervention* Jenning 2015 *Self-management is part of a larger intervention including screening, smoking cessation counselling and inhaler training.* Martin 2004 *Participants do not have stable COPD at baseline and study is not an RCT* Rea 2004 *Intervention is a chronic disease management programme* Song 2014 *Study duration is < 12 weeks* Titova 2015 *Integrated care intervention*	

Short Title	Title	Study characteristics	Risk of bias and directness
McCabe (2017)	Computer and mobile technology interventions for self-management in chronic obstructive pulmonary disease	**Study type** Systematic review **Study details** Dates searched *From database inception to November 2016.* Databases searched *Trials were identified from the Cochrane Airways Group Specialised Register (CAGR). This is updated by systematic searching of the following databases: Cochrane Central Register of Controlled Trials (CENTRAL); MEDLINE; Embase; the Cumulative Index to Nursing and Allied Health Literature (CINAHL); the Allied and Complementary Medicine Database (AMED); and PsycINFO; and via hand searching of respiratory journals and meeting abstracts.* Sources of funding *Internal sources • Head of School, Professor Catherine Comiskey, School of Nursing and Midwifery, Trinity College Dublin, Ireland* **Study inclusion criteria** RCTs *Studies reported as full text and published as abstract only, as well as unpublished data provided by study authors on request. Studies containing an information and communication technology (ICT) self-management intervention were included (see intervention for details).* Cluster-randomised trials *Studies reported as full text and published as abstract only, as well as unpublished data provided by study authors on request. Studies containing an information and*	**Study eligibility criteria** Low risk of bias **Identification and selection of studies** Low risk of bias **Data collection and study appraisal** Low risk of bias **Synthesis and findings** Low risk of bias **Overall quality** High **Applicability as a source of data** Partially applicable *The list of interventions included in our review*

Short Title	Title	Study characteristics	Risk of bias and directness
		communication technology (ICT) self-management intervention were included (see intervention for details) **Study exclusion criteria** Mixed-participant studies where the people with COPD could not be separated from other participants *Mixed-participant studies included, for example, COPD, emphysema, asthma, lung cancer, or other conditions that affect breathing,* Studies examining monitoring devices (e.g. telehealth monitoring) *Theses were excluded because they involve the participation of more than one user.* **Participant exclusion criteria** None stated **Interventions** Computer and mobile technology interventions for self-management *These included remote and web-based interventions delivered via technologies that give patients access to ehealth information to change behaviours towards self-management of COPD. These technologies include personal computers (PCs) and applications (apps) for mobile technology such as iPad, Android tablets, smart phones, and Skype. Comparison group interventions included face-to-face and/or hard copy/digital documentary educational/self-management support.*	*question is wider than this review.*

Short Title	Title	Study characteristics	Risk of bias and directness
		Outcome measures Health-related quality of life (HRQoL) scores *As measured by St George's Respiratory Questionnaire (SGRQ), Clinical COPD Questionnaire (CCQ), Short Form (SF)-36, or any validated instrument)* Number of COPD exacerbations *Requiring general practitioner (GP) visit or additional treatment, or both.* Number of hospital admissions Anxiety and depression *Hospital Anxiety and Depression Scale, Centre for Epidemiological Studies Depression Scale (CES-D)* Self-efficacy *As measured by the COPD Self-Efficacy Scale or any validated instrument* Lung function *Forced expiratory volume in one second (FEV1) and FEV1 % predicted* Exercise capacity *Functional capacity (six-minute walking test or similar tests)* Cost-effectiveness Sustained behaviour change *Specifically smoking cessation and increased physical activity* **Included studies from the Systematic review** Moy 2015 Voncken-Brewster 2015	

Short Title	Title	Study characteristics	Risk of bias and directness
		Excluded studies from the Systematic review Tabak 2013 *Included already (from Lenferink et al. 2017 Cochrane review)*	
Zwerink (2014)	Self-management for patients with chronic obstructive pulmonary disease	**Study type** Systematic review **Study details** Dates searched *The most recent search was conducted in August 2011.* Databases searched *Cochrane Airways Group Specialised Register (CAGR), which contains trial reports identified through systematic searches of bibliographic databases, including the Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE, EMBASE, CINAHL, AMED and PsycINFO.* Sources of funding *Netherlands Asthma Foundation, Netherlands.* **Study inclusion criteria** RCTs *RCTs assessing self-management interventions for people with COPD* Non-randomised controlled trials *Studies assessing self-management interventions for people with COPD.*	**Study eligibility criteria** Low risk of bias **Identification and selection of studies** Low risk of bias **Data collection and study appraisal** Low risk of bias **Synthesis and findings** Low risk of bias **Overall quality** High **Applicability as a source of data**

Short Title	Title	Study characteristics	Risk of bias and directness
		Study exclusion criteria Studies published before 1995 *This date was chosen because the primary focus of self-management programmes before 1995 consisted of improving knowledge through education rather than initiating and enabling sustained behavioural change.* Studies examining disease management programmes *Disease management programmes classified as pulmonary rehabilitation offered in a hospital or rehabilitation centre, as well as community- or home-based pulmonary rehabilitation programmes solely directed towards exercise, were also excluded.* Studies examining education programmes *Interventions involving solely participant education were excluded.* **Participant exclusion criteria** Primary diagnosis of asthma **Interventions** Multicomponent self-management interventions *Defined as structured interventions for individuals with COPD aimed at improvement of self-health behaviours and self-management skills. These interventions required at least an iterative process of interaction between participant and healthcare provider, and ideally also included formulation of goals and provision of feedback. Interventions with fewer than two contact moments were excluded. At least two of the following components had to be part of the intervention: smoking cessation, self-recognition and self-treatment of exacerbations, an exercise or physical activity component, advice about diet, advice about medication or coping with breathlessness. Studies with usual care as a control group and those with an active*	Partially applicable *The list of interventions included in our review question is wider than this review.*

Short Title	Title	Study characteristics	Risk of bias and directness
		intervention as a control group were included. **Outcome measures** Health-related quality of life (HRQoL) scores Number of hospital admissions Length of stay in hospital Number of exacerbations requiring emergency department visits Use of (other) healthcare facilities Number of exacerbations requiring a course of oral corticosteroids or antibiotics Use of medication *Use of rescue medication* Symptom scores Anxiety and depression Self-efficacy Days lost from work Lung function Exercise capacity **Included studies from the Systematic review** Effing 2009 Koff 2009 Nguyen 2008 Wakabayashi 2011 **Excluded studies from the Systematic review** Akinci 2011	

Short Title	Title	Study characteristics	Risk of bias and directness
		Pulmonary rehabilitation intervention Bosch 2007 *Included already (from Lenferink et al. 2017 Cochrane review)* Bourbeau 2003 *Included already (from Lenferink et al. 2017 Cochrane review)* Casas 2006 *Integrated care intervention* Chuang 2011 *Study is not an RCT* Chavannes 2009 *Integrated disease management intervention* Coultas 2005a and 2005b *Nurse-assisted home care intervention* Effing 2011 *Exercise intervention on top of a self-management programme* Emery 1998 *Exercise intervention* Faulkner 2010 *Exercise intervention* Gallefoss 1999 *Included already (from Lenferink et al. 2017 Cochrane review)* Ghanem 2010 *Home-based pulmonary rehabilitation program* Hill 2010 *Included as a primary study for education* Kara 2004 *Study duration < 12 weeks* Khdour 2009	

Short Title	Title	Study characteristics	Risk of bias and directness
		Included already (from Lenferink et al. 2017 Cochrane review) Kheirabadi 2008 *Included already (from Lenferink et al. 2017 Cochrane review)* Monnikhof 2003 *Included already (from Lenferink et al. 2017 Cochrane review)* Moullec 2008 *Pulmonary rehabilitation intervention* Nguyen 2009 *Included as a primary study for telehealth monitoring* Ninot 2011 *Included already (from Lenferink et al. 2017 Cochrane review)* Osterlund Efraimsson 2006 *Included already (from Lenferink et al. 2017 Cochrane review)* Rea 2004 *Intervention is a chronic disease management programme* Rice 2010 *Included already (from Lenferink et al. 2017 Cochrane review)* Sassi-Dambron 1995 *Pulmonary rehabilitation intervention* Stulbarg 2002 *Physical exercise intervention* van Wetering 2009 *Pulmonary rehabilitation intervention*	

Self-management randomised controlled trials

Short Title	Title	Study characteristics	Risk of bias and directness
Bischoff (2012)	Comprehensive self-management and routine monitoring in chronic obstructive pulmonary disease patients in general practice: randomised controlled trial	Evidence table in systematic review *Please refer to Lenferink et al. 2017 Cochrane review*	**Random sequence generation** Low risk of bias **Allocation concealment** Unclear risk of bias *No information on who performed the allocation* **Blinding of participants and personnel** High risk of bias *No blinding carried out* **Blinding of outcome assessment**. Low risk of bias **Incomplete outcome data** Low risk of bias **Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
			Overall risk of bias Low risk of bias **Directness** Directly applicable
Bösch (2007)	COPD outpatient education programme (ATEM) and BODE index	Evidence table in systematic review *Please refer to Zwerink et al. 2014 Cochrane review*	**Random sequence generation** Unclear risk of bias *Method used was not reported* **Allocation concealment** Unclear risk of bias *Insufficient information provided* **Blinding of participants and personnel** Unclear risk of bias *No information provided* **Blinding of outcome assessment**. Unclear risk of bias *No information provided* **Incomplete outcome data** High risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
			Only participants who completed follow-up were included in the analysis and the reasons for the drop outs was not clearly reported. **Selective reporting** Unclear risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** High risk of bias *Due to the lack of information mentioned above and incomplete outcome data.* **Directness** Directly applicable
Bourbeau (2003)	Reduction of hospital utilization in patients with chronic obstructive pulmonary disease: a disease-specific self-management intervention	***Associated studies*** *Gadoury MA, Schwartzman K, Rouleau M, Maltais F, Julien M, Beaupré A, et al. Self-management reduces both short- and long-term hospitalisation in COPD. European Respiratory Journal 2005; 26(5):853-7.* *Sedeno MF, Nault D, Hamd DH, Bourbeau J. A self-management education program including an action plan for acute COPD exacerbations. COPD: Journal of chronic obstructive pulmonary disorder 2009; 6: 352-358*	**Random sequence generation** Low risk of bias **Allocation concealment** Low risk of bias **Blinding of participants and personnel**

Short Title	Title	Study characteristics	Risk of bias and directness
		Evidence table in systematic review *Please refer to Lenferink et al. 2017 Cochrane review*	High risk of bias *Due to a lack of blinding* **Blinding of outcome assessment**. Low risk of bias **Incomplete outcome data** Low risk of bias **Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** Low risk of bias **Directness** Directly applicable
Bove (2016)	Efficacy of a minimal home-based psychoeducative intervention in patients with advanced COPD: A randomised controlled trial	**Study type** • Randomised controlled trial **Study details** • Study location *Denmark*	**Random sequence generation** • Low risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
		• Study setting *Pulmonary outpatient clinics at Nordsjaellands Hospital.* • Study dates *Participants were recruited between February 2015 and January 2016.* • Duration of follow-up *3 months* • Sources of funding *Supported by a Danish Council for Strategic Research (DSF) grant.* **Inclusion criteria** • COPD classification GOLD C-D • HADS– A score of 8 or more • Willing to participate • Able to provide written consent **Exclusion criteria** • HADs –A score of less than 8 • Psychiatric diagnosis • Pulmonary cancer • Involvement in another trial **Sample characteristics** • Sample size *66* • Split between study groups	**Allocation concealment** • Low risk of bias **Blinding of participants and personnel** • High risk of bias *Participants and personnel are not blind to group allocation.* **Blinding of outcome assessment** • Low risk of bias **Incomplete outcome data** • Low risk of bias **Selective reporting** • Low risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
		Intervention: 30; control: 27. • Loss to follow-up *30/33 (90.9%) of the intervention group completed the trial. 27/33 (81.8%) of the control group completed the trial.* • % female *66.67%* • Mean age (SD) *70.20 (8.50)* • Current smoker *28.79%* **Interventions** • Psychoeducative breathing intervention *CBT and psychoeducation to give patients insight into the interaction of thoughts, emotions, bodily sensations and behaviour. Delivered by a nurse at home and based on a typical CBT session (1 hr duration). Participants showed cards with positive and negative breathing models and discuss their thoughts and feelings. Aim to challenge the way a patient approaches a situation. Psychoeducative component consisted of breathing strategies (pursed lip and diaphragmatic release) Booster session of 20 mins by phone offered 2 weeks after main intervention. Manual with step by step description of process also provided.* • Usual care *Usual care according to current guideline.*	**Other sources of bias** • Low risk of bias **Overall risk of bias** • Low **Directness** • Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		Outcome measure(s) • HADS- Depression • HADS- Anxiety • Number of hospitalisations • CRQ domain scores • Length of stay in hospital	
Bucknall (2012)	Glasgow supported self-management trial (GSuST) for patients with moderate to severe COPD: randomised controlled trial	Evidence table in systematic review *Please refer to Lenferink et al. 2017 Cochrane review.*	**Random sequence generation** Low risk of bias **Allocation concealment** Low risk of bias **Blinding of participants and personnel** High risk of bias *No blinding of participants or personnel* **Blinding of outcome assessment**. Unclear risk of bias *Outcome assessor partly blinded (researcher was blinded, participants were not blinded)*

Short Title	Title	Study characteristics	Risk of bias and directness
			Incomplete outcome data High risk of bias *There was a low completion rate for the questionnaires leading to a lot of missing data.* **Selective reporting** High risk of bias *Information on healthcare usage and number of hospital stays was collected but not reported.* **Other sources of bias** Low risk of bias **Overall risk of bias** High risk of bias **Directness** Directly applicable
Effing (2009)	(Cost)-effectiveness of self-treatment of exacerbations on the severity of exacerbations in patients with COPD: the COPE II study	Evidence table in systematic review *Please refer to Zwerink et al. 2014 Cochrane review* **Associated studies** *Zwerink Marlies, Kerstjens Huib Am, van der Palen , Job , van der Valk , Paul , Brusse-Keizer Marjolein, Zielhuis Gerhard, and Effing Tanja (2016)*	**Random sequence generation** Low risk of bias **Allocation concealment** Low risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
		(Cost-) effectiveness of self-treatment of exacerbations in patients with COPD: 2 years follow-up of a RCT. Respirology (Carlton, and Vic.) 21, 497-503	**Blinding of participants and personnel** High risk of bias *Participants and personnel were not blinded* **Blinding of outcome assessment**. Low risk of bias **Incomplete outcome data** Low risk of bias **Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** Low risk of bias **Directness** Directly applicable
Fan (2012)	A comprehensive care management program to prevent chronic	Evidence table in systematic review *Please refer to Lenferink et al. 2017 Cochrane review*	**Random sequence generation**

Short Title	Title	Study characteristics	Risk of bias and directness
	obstructive pulmonary disease hospitalizations: a randomized, controlled trial		Low risk of bias **Allocation concealment** Low risk of bias **Blinding of participants and personnel** High risk of bias *No blinding of participants and personnel.* **Blinding of outcome assessment**. Low risk of bias **Incomplete outcome data** Unclear risk of bias *There is incomplete outcome data due to early termination of the study* **Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias**

Short Title	Title	Study characteristics	Risk of bias and directness
			Moderate risk of bias **Directness** Directly applicable
Gallefoss (2000)	Impact of patient education and self-management on morbidity in asthmatics and patients with chronic obstructive pulmonary disease.	Evidence table in systematic review *Please refer to Lenferink et al. 2017 Cochrane review* ***Associated studies*** *Other papers reporting data from this trial are: Gallefoss F, Bakke PS, Kjaersgaard P. Quality of life assessment after patient education in a randomised controlled study on asthma and chronic pulmonary obstructive disease. American Journal of respiratory and critical care medicine 1999; 159: 812-817. Gallefoss F, Bakke PS. How does patient education and self-management among asthmatics and patients with chronic obstructive pulmonary disorder disease affect medication? American Journal of respiratory and critical care medicine 1999b; 160: 2000-2005. Gallefoss F. The effects of patient education in COPD in a 1 year follow-up randomised controlled trial. Patient education and counselling 2004; 3: 259-266.*	**Random sequence generation** Low risk of bias *Randomisation using random number tables.* **Allocation concealment** Unclear risk of bias *No information provided* **Blinding of participants and personnel** High risk of bias *Participants and personnel were aware of their group allocation.* **Blinding of outcome assessment** Unclear risk of bias *Unclear whether outcome assessors were blinded to group allocation.*

Short Title	Title	Study characteristics	Risk of bias and directness
			Incomplete outcome data Low risk of bias **Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** Low *Awareness of the allocation to intervention or usual care is unlikely to alter the outcomes reported in the trial.* **Directness** Directly applicable
Howard (2014)	'The COPD breathlessness manual': a randomised controlled trial to test a cognitive-behavioural manual versus information booklets on health service use, mood and health status, in patients	**Study type** Randomised controlled trial **Study details** Study location *UK* Study setting *Participants were identified through 10 GP practices in North West London* Study dates	**Random sequence generation** Low risk of bias **Allocation concealment** Unclear risk of bias *No information was provided*

Short Title	Title	Study characteristics	Risk of bias and directness
	with chronic obstructive pulmonary disease	*Participants were recruited into the trial between January and August 2011.* Duration of follow-up *12 months* Sources of funding *Central and North West London NHS Foundation Trust innovations department funded this research.* **Inclusion criteria** Diagnosis of COPD *Verified by being on the COPD disease register at the GP practice (based on the NICE 2010 COPD guidelines).* FEV1/FVC *< 0.7* FEV1, % predicted *If FEV1 is equal to or above 80% predicted normal then the participants had to have other respiratory symptoms such as breathlessness or cough.* Patient gave informed consent to participate in trial *Participants were also willing to participate* Breathlessness *Medical Research Council (MRC) dyspnoea (breathlessness) scale of 3 or more* Fluent in English *Participants were able to read and write in English alone or with assistance.* **Exclusion criteria** Cognitive impairment	**Blinding of participants and personnel** Low risk of bias *Both groups received an intervention (COPD manual or information booklet), and staff were unaware of group allocation* **Blinding of outcome assessment** Low risk of bias **Incomplete outcome data** High risk of bias *Due to the small number of participants completing the trial (54.5%)* **Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** High *Due to the large loss to*

Short Title	Title	Study characteristics	Risk of bias and directness
		Cognitive impairment and dementia Psychiatric illness *Known psychosis and personality disorders* Attendance of a pulmonary rehabilitation programme *Participating in pulmonary rehabilitation, or having had pulmonary rehabilitation within the previous six months* Unsuitable to participate in trial *Due to verbal and/or written communication problems* Receiving psychological therapy **Sample characteristics** Sample size *222* Split between study groups *Intervention: 112 Control: 110* Loss to follow-up *121/222 (54.5%) of participants completed the trial. Intervention 60/112, control 61/110. Data for health care usage outcomes was collected for 100% of the participants.* % female *51.8%* Mean age (SD) *72.2 years (10.9)* Smoking status and history *Ever/never smoked (number of pack years as mean, SD) Intervention: 94%/6% (38.2, 18.2) Control: 94%/6% (37.1, 18.3) Current smoker at baseline (no. per day as mean, SD) Intervention: 27% (3.6, 6.9) Control: 30% (3.5, 6.9)*	*follow-up (nearly 50%), although data was collected from hospital and GP records where possible.* **Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		FEV1, % predicted (mean, SD) *Intervention: 55.9 (15.7) (n= 93) Control:59.6 (15.9) (n=93)* **Interventions** *Both groups received a 90-min home visit involving obtaining signed informed consent, baseline measures, a semi-structured interview and introducing the intervention. Participants were encouraged to follow their programme for approximately 1 h per day (broken up throughout the day) over a 5-week period. Participants received two 30-min telephone call booster sessions at weeks 3 and 6.* **Self-management** *Participants were encouraged to follow their programme for approximately 1 h per day (broken up throughout the day) over a 5-week period. Participants received two 30-min telephone call booster sessions at weeks 3 and 6. Participants were asked to complete self-help tasks as well as a weekly mood and breathlessness rating.* ***Education*** *Education was provided to help participants distinguish between a COPD exacerbation and a panic attack alongside self-management guidance.* ***Breathing exercises/managing breathlessness*** *Participants received the COPD breathlessness manual (CM), which was developed as a guided self-help intervention that individuals complete in their own time at home, with support from a facilitator. It consisted of consisted of a 5-week intervention, with each week divided into six sections. For example, week 1: 'Understanding COPD and the experience of breathlessness' was divided into the following six sections: Section 1: What is COPD all about? Section 2: Focus on breathlessness—part 1*	

Short Title	Title	Study characteristics	Risk of bias and directness
		Section 3: How to control breathlessness and panic Section 4: Daily exercises Section 5: Relaxation CD: Introduction and exercise 1: Breathing control Section 6: Summary and weekly record. *The main theme was breaking the cognitive-behavioural maintenance cycle of breathlessness, panic, frustration and depression, with a specific focus on ways to manage distress (for both patients and carers) to ultimately prevent inappropriate A&E attendance and hospital admissions. The manual was accompanied by a relaxation CD.* ***Psychological therapy*** *The manual applies CBT techniques within a self-management framework and specifically targets the cognitive-behavioural aspects of breathlessness and panic.* **Another control intervention** *Control group participants received a series of British Lung Foundation COPD booklets and were encouraged to work through them over 5 weeks.* **Outcome measure(s)** Number of emergency department visits due to COPD Number of hospitalisations due to COPD Length of stay in hospital *For COPD related admissions* Disease specific health-related quality of life (Chronic Respiratory Questionnaire, CRQ) *Self-Reported Chronic Respiratory Questionnaire (CRQ-SR)* Hospital Anxiety and Depression Scores (HADS)	

Short Title	Title	Study characteristics	Risk of bias and directness
Jarab (2012)	Impact of pharmaceutical care on health outcomes in patients with COPD.	**Study type** Randomised controlled trial **Study details** Study location *Jordan* Study setting *Outpatient clinic at the Royal Medical Services Hospital in Jordan* Study dates *Not stated, but patients were recruited over a period of 3 months from January to April, 2011.* Duration of follow-up *6 months* Sources of funding *Alzaytoonah University of Jordan* **Inclusion criteria** Age *> 35 years old* Diagnosis of COPD *Diagnosis (of at least one year) confirmed by the hospital consultant* FEV1, % predicted *30-80% of the predicted normal value* Location of patient/ clinic attendance *Patient only attends the Royal Medical Services outpatient clinic* Permission from health provider *Hospital consultant considers the patient suitable for the trial*	**Random sequence generation** Low risk of bias *Study participants were randomly assigned to intervention and control groups via a minimisation technique using MINIM software.* **Allocation concealment** Unclear risk of bias *No information provided* **Blinding of participants and personnel** High risk of bias *Participants were aware of their group allocation.* **Blinding of outcome assessment** Unclear risk of bias *It is unclear if the outcome assessors were blind to group allocation*

Short Title	Title	Study characteristics	Risk of bias and directness
		Exclusion criteria Heart failure Moderate to severe learning difficulties Mobility problems Confusion Terminal illness Disorientation Attendance of a pulmonary rehabilitation programme *In the last 6 months* Pulmonary nurse or clinical pharmacist consultation *In the last 6 months* **Sample characteristics** Sample size *133* Split between study groups *Intervention: 66 Control 67* Loss to follow-up *127/133 (95.5%) completed the trial* % female *59.4* Mean age (SD) *62.5 years (14.5)* Smoking status and history *Intervention: 54.5% Control: 56.7%* FEV1, % predicted (mean, SD) *Intervention: 53.7 (SD 15.9) Control: 52.8 (SD 17.8)*	**Incomplete outcome data** Low risk of bias **Selective reporting** Low risk of bias **Other sources of bias** High risk of bias *Participants in the intervention arm only were referred to a smoking cessation programme. This may cause serious confounding of outcome effects.* **Overall risk of bias** Low *Awareness of the allocation to intervention or usual care is unlikely to alter the outcomes reported in the trial. The smoking cessation programme is unlikely to alter adherence to medicine regimens or COPD specific knowledge. Other outcomes that could be affected will*

Short Title	Title	Study characteristics	Risk of bias and directness
		Interventions **Self-management** ***Education*** *A booklet covering the topics discussed was given to the participants to keep. A structured patient education about COPD and management of its symptoms was delivered by the clinical pharmacist. The clinical pharmacist also completed a medication table designed specifically to discuss types, indications, doses, frequency of administration, and possible side effects for each prescribed medication. The importance of exercise, symptom control and the technique for expectoration was also discussed.* ***Smoking cessation*** *Smoking cessation programme offered to the intervention group. Issue of confounding as effects on FEV1% and quality of life could be due to smoking cessation rather than education, and therefore these outcomes were excluded.* **Usual care** *No information provided* **Outcome measure(s)** COPD specific knowledge *COPD knowledge questionnaire* Number of emergency department visits Number of hospitalisations Adherence (compliance) with a medication regimen *Morisky scale* Disease specific health-related quality of life (St. George respiratory questionnaire, SGRQ)	*not be analysed.* **Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
Johnson-Warrington (2016)	Can a supported self-management program for COPD upon hospital discharge reduce readmissions? A randomized controlled trial	***Associated studies*** *The self-management Programme of Activity, Coping and Education for Chronic Obstructive Pulmonary Disease (SPACE for COPD) intervention is explained in detail in: Apps LD, Mitchell KE, Harrison SL, Sewell L, Williams JE et al. The development and pilot testing of the Self-management Programme of Activity, Coping and Education for Chronic Obstructive Pulmonary Disease (SPACE for COPD). International Journal of COPD 2013; 8: 317- 327.* *This intervention is used in another included clinical trial with participants being recruited from primary care (Mitchell K, Johnson-Warrington V, Apps LD, Bankart J et al. Self-management programme for COPD: a randomised controlled trial. Eur Respir J 2014; 44: 1538–1547.* **Study type** Randomised controlled trial **Study details** Study location *UK* Study setting *Participants were recruited from University Hospitals Coventry and Warwickshire and University Hospitals of Leicester NHS Trusts.* Study dates *January 2013–September 2014* Duration of follow-up *3 months* Sources of funding	**Random sequence generation** Low risk of bias **Allocation concealment** Unclear risk of bias *No information provided* **Blinding of participants and personnel** High risk of bias *Participants and personnel were not blinded to group allocation as this was not possible with this type of intervention* **Blinding of outcome assessment** Low risk of bias **Incomplete outcome data** Low risk of bias **Selective reporting** Low risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
		Not stated **Inclusion criteria** Diagnosis of COPD Breathlessness *Grade 2–5 dyspnoea (breathlessness) according to the Medical Research Council* Recruited from hospital *Participants were recruited from University Hospitals Coventry and Warwickshire and University Hospitals of Leicester NHS Trusts.* **Exclusion criteria** Attendance of a pulmonary rehabilitation programme *Within the last 6 months* Admission to hospital was not due to an acute exacerbation of COPD Number of recent hospital admissions *Four or more hospital admissions in the previous 12 months* Previously received SPACE for COPD intervention *Within the last 6 months* Involvement in other research trials Inability to safely participate in unsupervised exercise *Due to psychiatric, locomotive, cardiac, or neurological impairments etc.* Unable to participate due to a language barrier *Inability to communicate in written or spoken English* **Sample characteristics** Sample size *78*	**Overall risk of bias** Low *Due to assessor blinding and the nature of the outcomes making it less likely that participant knowledge of group allocation would alter the effects reported.* **Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		Split between study groups *Intervention: 39 Control: 39* Loss to follow-up *71/78 (91.0%) completed the trial* % female *64.1* Mean age (SD) *68.0 years (8.1)* Smoking status and history *Intervention current: 14 ex-smoker: 24 never smoker: 1 Control current smoker: 18 ex-smoker: 21 never smoker: 0 Smoking pack years* *Intervention: 52.39 (SD 34.32) Control: 48.33 (SD 29.02)* FEV1, % predicted (mean, SD) *Intervention: 40.47 (SD 15.71) Control: 42.45 (SD 11.73)* **Interventions** **Self-management** *A Self-management Program of Activity, Coping, and Education for COPD (SPACE for COPD). Participants were introduced to the manual and exercises by a trained physiotherapist in a one-to-one session lasting 30–45 minutes. Participants received structured phone calls within 72 hours and at 2 weeks, 4 weeks, 6 weeks, 8 weeks, and 10 weeks from hospital discharge with the aim of reinforcing skills, helping identify and manage exacerbations, promoting an active lifestyle, and providing encouragement, while tailoring to patient needs.* ***Education*** *Content included information on: what is happening to the patient's lungs, controlling breathing, medication management, nutritional advice, how to*	

Short Title	Title	Study characteristics	Risk of bias and directness
		manage on days when the patient feels unwell, healthy eating, and fitness advice. Goal-setting text, case studies for peer discussion, and activities to encourage problem solving and support behaviour change were included in the 176 page manual. The manual appendix contains information on topics such as smoking cessation and oxygen therapy. ***Physical exercise*** *Home-based exercise program (consisting of a daily walking-based aerobic program and thrice weekly resistance training using free weights of the upper and lower limbs).* ***Motivational interviewing to enhance personal commitment to change*** *Participants were introduced to the manual and exercises by a trained physiotherapist in a one-to-one session lasting 30–45 minutes, using motivational interviewing techniques to facilitate behaviour change, goal setting, and problem solving.* **Usual care** *No information provided* **Outcome measure(s)** COPD specific knowledge (Bristol COPD knowledge questionnaire, BCKQ) Number of hospitalisations due to COPD Disease specific health-related quality of life (Chronic Respiratory Questionnaire, CRQ) *Chronic Respiratory Questionnaire – self reported (CRQ-SR)* Hospital Anxiety and Depression Scores (HADS) Incremental Shuttle Walk Test (ISWT)	

Short Title	Title	Study characteristics	Risk of bias and directness
		Endurance Shuttle Walking Test (ESWT) "Ready for Home" survey Pulmonary Rehabilitation Adapted Index of Self-Efficacy	
Jonsdottir (2015)	Effectiveness of a partnership-based self-management programme for patients with mild and moderate chronic obstructive pulmonary disease: a pragmatic randomized controlled trial	**Study type** Randomised controlled trial **Study details** Study location *Iceland* Study setting *Reykjavik are primary healthcare practices and the offices of private lung physicians.* Study dates *June 2009-March 2013* Duration of follow-up *6 months* Sources of funding *Icelandic Research Fund, University of Iceland's Research Fund, Landspitali-University Hospital's Research Fund, Icelandic Nurses' Association's Research Fund and the Oddur Olafsson Fund.* **Inclusion criteria** Age *45- 60 years old* Diagnosis of COPD *Mild-moderate COPD* FEV1/FVC *< 0.7*	**Random sequence generation** Low risk of bias **Allocation concealment** Unclear risk of bias *No information provided* **Blinding of participants and personnel** High risk of bias *Due to the nature of the intervention, participants and personnel were not blind to group allocation.* **Blinding of outcome assessment** Unclear risk of bias *No information is provided* **Incomplete outcome data** Low risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
		FEV1, % predicted *Between 30 and <80% (GOLD GRADE II and III)* **Exclusion criteria** Asthma *If the person had >200 ml or 12% increase in FEV1 after inhaling 20 micrograms of albuterol.* Significant co-morbidities Unable to participate due to a language barrier *Not able to speak Icelandic* Not able to visit the treatment site **Sample characteristics** Sample size *119* Split between study groups *Intervention: 60 Control: 59* Loss to follow-up *100/119 (84.0%) of participants completed the trial* % female *45.4* Mean age (SD) *59.0 years (4.5)* Smoking status and history *Intervention, n (%) Current smoker: 24 (50.0) Ex-smoker: 24 (50.0) Control Current smoker: 36 (69.2) Ex-smoker: 16 (30.8)* FEV1, % predicted (mean, SD)	**Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** Moderate *Due to the lack of blinding of participants and personnel, and the lack of information about blinding of the outcome assessors.* **Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		Intervention: 54.0 (17.58) Control: 60.85 (17.26) **Interventions** **Self-management** *Based on the theoretical framework 'Partnership with people with COPD and their families'. This consisted of 3 main components: patient/family conversations; smoking cessation treatment and a group meeting.* *The patient/family conversations consisted of three to four 30-45 minute semi-structured conversations with a respiratory specialist nurse. Content covered included the nature of the disease* ***Education*** *The group meetings were used for the research team to present information in a number of ways: oral presentations by researchers and a volunteer with COPD, written educational material and group discussions facilitated by the researchers. These covered self-management topics such as knowledge about COPD symptoms and treatment, management of daily life, the importance of exercise, relaxation and good nutrition, maintaining a safe environment and communication with professionals and family.* ***Smoking cessation*** *This consisted of at least one face-to-face meeting with a nurse specialist in this area plus ≥3 other conversations on the phone or in person.* *Participants were given advice on how to quit (replacement patches and medication). There was discussion about the process of becoming a non-smoker and the need for motivation and belief in the person's ability to quit.* ***Motivational interviewing to enhance personal commitment to change*** *The patient/family conversations consisted of three to four 30-45 minute semi-structured conversations with a respiratory specialist nurse. The participant was asked about their concerns and symptoms initially. Then the*	

Short Title	Title	Study characteristics	Risk of bias and directness
		discussion covered issues such as the nature of the disease, its management, use of healthcare, negative feelings associated with the disease, how to prevent worsening of symptoms and enhance wellbeing. **Usual care** *Usual care was defined as care provided by the general physician at primary healthcare centres or during visits to lung physicians.* **Outcome measure(s)** Number of exacerbations Disease specific health-related quality of life (St. George respiratory questionnaire, SGRQ) Hospital Anxiety and Depression Scores (HADS) Health-related quality of life measures (others) *Illness Intrusiveness Rating Scale (IIRS)* Physical activity (other) *International Physical Activity Questionnaire short version (IPAQ)*	
Khdour (2009)	Clinical pharmacy-led disease and medicine management programme for patients with COPD.	Evidence table in systematic review *Please refer to Lenferink et al. 2017 Cochrane review*	**Random sequence generation** Low risk of bias **Allocation concealment** Low risk of bias **Blinding of participants and personnel** High risk of bias *Blinding of participants and personnel was not reported*

Short Title	Title	Study characteristics	Risk of bias and directness
			Blinding of outcome assessment. Unclear risk of bias *Outcome assessment was not blinded.* **Incomplete outcome data** Low risk of bias **Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** Moderate risk of bias for health-related quality of life outcomes, low risk of bias for other outcomes. **Directness** Directly applicable
Kheirabadi (2008)	Effect of add-on "Self-management and behaviour modification" education on severity of COPD	Evidence table in systematic review *Please refer to Lenferink et al. 2017 Cochrane review*	**Random sequence generation** Unclear risk of bias *The method of*

Short Title	Title	Study characteristics	Risk of bias and directness
			randomisation concealment was not reported **Allocation concealment** Unclear risk of bias *The method of allocation concealment was not reported* **Blinding of participants and personnel** High risk of bias *Blinding of participants and personnel was not reported* **Blinding of outcome assessment**. Unclear risk of bias *Blinding of outcome assessment was not reported* **Incomplete outcome data** Low risk of bias **Selective reporting** Low risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
			Other sources of bias Low risk of bias **Overall risk of bias** Moderate risk of bias *Due to the lack of blinding and the outcome analysed (disease specific quality of life)* **Directness** Directly applicable
Koff (2009)	Proactive integrated care improves quality of life in patients with COPD	Evidence table in systematic review *Please refer to Zwerink et al. 2014 Cochrane review*	**Random sequence generation** Unclear risk of bias *The method of random sequence generation was not reported* **Allocation concealment** Low risk of bias **Blinding of participants and personnel** High risk of bias *Blinding of participants and personnel was not performed*

Short Title	Title	Study characteristics	Risk of bias and directness
			Blinding of outcome assessment. High risk of bias *Blinding of outcome assessment was not performed; the assessor of the primary outcome was involved in the intervention* **Incomplete outcome data** Low risk of bias **Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** High risk of bias for subjective outcomes, low risk of bias for hospitalisations and resource use as they are not as vulnerable to bias from unblinded outcome assessors. **Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
Kuo (2013)	Effects of self-regulation protocol on physiological and psychological measures in patients with chronic obstructive pulmonary disease	**Study type** Randomised controlled trial **Study details** Study location *Taiwan* Study setting Study dates *January -July 2008* Duration of follow-up *13 weeks* Sources of funding *Chi-Mei Medical Centre of Taiwan (CMFHR9667)* **Inclusion criteria** Age *>= 20 years old* Diagnosis of COPD Can communicate in Mandarin or Taiwanese *With at least elementary level education* **Exclusion criteria** Respiratory conditions other than COPD *Conditions that can affect respiration such as lung cancer, pulmonary tuberculosis.* Heart failure *Congestive heart failure* Psychiatric illness	**Random sequence generation** Low risk of bias **Allocation concealment** Unclear risk of bias *No information was provided.* **Blinding of participants and personnel** High risk of bias *Participants were blind to their group allocation, but personnel were not.* **Blinding of outcome assessment** High risk of bias *The outcome assessors and researchers carrying out data analysis were not blind to group allocation.* **Incomplete outcome data** Low risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
		Visual or aural impairment **Sample characteristics** Sample size *64* Split between study groups *Intervention: 33 Control: 31* Loss to follow-up *64/70 (91.4%) of the participants completed the trial.* % female *6.25* Age *41- 50 years: 1 51-60 years: 13 61-70 years: 18 >70 years: 32* Smoking status and history *Smoking history,% (both groups combined): Never: 23.44 Ex-smoker: 42.19 Sometimes: 4.69 Daily: 29.69* **Interventions** **Self-management** *The intervention process lasted for 4 weeks and consisted of 2 stages: learning self-regulation and performing self-regulation.* ***Education*** *Both groups received a self-management guidebook and a metre to measure Peak Expiratory Flow (PEF) and were instructed in their use. The guidebook was divided into 3 sections: self-monitoring record sheets (e.g. level of breathlessness, frequency of contact with risk factors for exacerbations); self-judgement record sheets and self-reaction guidelines (e.g. how to do pulmonary rehabilitation exercise, avoid risk factors, use*	**Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** Moderate *Due to the lack of blinding of personnel and outcome assessors* **Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		inhalers correctly and treat exacerbations). ***Motivational interviewing to enhance personal commitment to change*** *The intervention group also received 5-7 telephone calls and undertook an interactive learning process to facilitate implementation of the self-management skills. Learning self-regulation consisted of individualised health education sessions that lasted 15-20 minutes, explaining the characteristics of COPD exacerbations and how to avoid them. They also covered use of the guidebook and the development of a strategy to reduce exacerbations by decreasing exposure to risk factors and better symptom recognition. Performing self-regulation consisted of the participant putting the earlier training into use. They had a number of phone interviews to support this process and address any issues arising. Participants were also given feedback and encouragement.* **Second self-management intervention** ***Education*** *The control group also received a self-management guidebook and a metre to measure Peak Expiratory Flow (PEF).* **Outcome measure(s)** Breathlessness *Borg Dyspnoea (breathlessness) Scale* Self-efficacy *COPD self-efficacy scale* Functional status by forced spirometry *Peak expiratory flow* Symptom distress	

Short Title	Title	Study characteristics	Risk of bias and directness
		Using a revised version of the McCorkle and Young respiratory subscale. Pulmonary function status *Pulmonary Functional Status Scale* Number of unscheduled visits to a physician due to a COPD exacerbation	
Leiva-Fernandez (2014)	Efficacy of a multifactorial intervention on therapeutic adherence in patients with chronic obstructive pulmonary disease (COPD): A randomized controlled trial	**Study type** Randomised controlled trial **Study details** Study location ***Spain*** Study setting *Unspecified health centre, Málaga.* Study dates *Not stated* Duration of follow-up *12 months* Sources of funding *Not stated, but the authors declare no competing interests*. **Inclusion criteria** Diagnosis of COPD Patient gave informed consent to participate in trial Inhaled therapy prescription Location of patient/ clinic attendance *Patient registered in Malaga area for treatment* **Exclusion criteria** Respiratory conditions other than COPD	**Random sequence generation** Low risk of bias **Allocation concealment** Unclear risk of bias *No information provided.* **Blinding of participants and personnel** High risk of bias Participants were not blind to their group allocation. *Unclear whether study personnel were blind to the allocations.* **Blinding of outcome assessment** Unclear risk of bias *No information on blinding of outcome assessors*

Short Title	Title	Study characteristics	Risk of bias and directness
		Bronchiectasis, asthma or cystic fibrosis Cognitive impairment Dementia, Alzheimer's, Parkinson's or cognitive decline **Sample characteristics** Sample size *146* Split between study groups *Intervention: 72 Control: 74* Loss to follow-up *104/146 (71.2%) completed the trial* % female *8.2* Mean age (SD) *69.1 years (8.8)* **Interventions** **Self-management** *Strategy in 3 parts. Part 1: Motivational aspects used to improve adherence Part 2: Cognitive aspects related to treatment adherence.* *Part 3: Skills development involving training in inhalation techniques* *Audio-visual and written materials were used in parts 2 and 3 of the intervention (a leaflet describing the most relevant aspects of the disease and a scheme on inhalation techniques).* ***Education provided by health professional in person*** *Part 1: Motivational aspects used to improve adherence.*	**Incomplete outcome data** High risk of bias *Only 71% participants completed the trial* **Selective reporting** High risk of bias *Evidence is not presented for a number of the measured outcomes or is presented in an inaccessible format.* **Other sources of bias** Low risk of bias **Overall risk of bias** High *Due to the high risk of selective reporting bias and large number of participants lost to follow-up.* **Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		Focus group discussion about patient experiences and points of view about their illness and treatment, including treatment adherence. This session was videotaped with the patients' formal consent for later analysis. Researchers analysed these videos to determine the main motivational aspects to focus on during the individual visits. *Part 2: Cognitive aspects related to treatment adherence. The intervention group received information about the disease so they could be more confident and more conscious about the importance of their daily treatment*. ***Training in inhaler use*** *Part 3: Skills development involving training in inhalation techniques. The intervention group was trained in the use of their inhalers according to SEPAR (Sociedad Española de Neumología y Cirugía Torácica) guidelines, received explanations as to why a good technique is important, and practiced the proper technique with placebo inhalers.* **Usual care** *Plus three follow-up visits at 3,6, 12 months* **Outcome measure(s)** COPD specific knowledge *Batalla Test* Adherence (compliance) with a medication regimen *Therapeutic adherence represented the percentage of patients classified as adherent, evaluated using dose or pill count.* Inhaler use skills *Patient's skills at performing inhalations techniques were measured following SEPAR guidelines.* Disease specific health-related quality of life (St. George respiratory	

Short Title	Title	Study characteristics	Risk of bias and directness
		questionnaire, SGRQ) Generic health-related quality of life (EuroQoL-5D questionnaire) Functional status by forced spirometry	
Liu (2013)	Effects of an animated diagram and video-based online breathing program for dyspnoea in patients with stable COPD	**Study type** Randomised controlled trial **Study details** Study location *People's Republic of China* Study setting *The Respiratory Department of No 1 Yancheng Hospital ran the study.* Study dates *Participants were recruited between December 2009 and October 2011.* Duration of follow-up *4 months* Sources of funding *Not stated* **Inclusion criteria** Diagnosis of COPD *Diagnosis according to the 2007 guidelines of the Chinese Society of Respiratory Disease and a test for bronchiectasis was negative.* Stable COPD *Participants clinical condition was stable at the time of inclusion. No oral glucocorticoid treatment had been taken within the previous three months.* Patient gave informed consent to participate in trial Access to the internet plus or minus phone *A computer with Internet access was available in the home and familiarity*	**Random sequence generation** Low risk of bias **Allocation concealment** Low risk of bias *Allocation was performed by sealed opaque envelope* **Blinding of participants and personnel** High risk of bias *Participants were not blind to their group allocation.* **Blinding of outcome assessment** Low risk of bias *The respiratory nurses who collected the study data were blinded to patient treatment allocation, as were the data investigators until the analysis was deemed to*

Short Title	Title	Study characteristics	Risk of bias and directness
		with logging onto the Internet, navigating their way to a website, and using a computer mouse, and were able to watch an instruction video and graph on the computer screen and listen to an instructional audio with relaxing music. **Exclusion criteria** Asthma *History of asthma* Heart failure Significant co-morbidities *Distal arteriopathy, and severe endocrine, hepatic, or renal disease.* Cancer **Sample characteristics** Sample size *60* Split between study groups *Intervention: 30 Control: 30* Loss to follow-up *57/60 (95.0%) of participants completed the trial* % female *22.8% of the people who completed the trial* Mean age (SD) *69.1 years (2.4)* Smoking status and history *Intervention: Never smokers (n): 5 Smokers (n): 10 Former smokers (n): 14 Control: Never smokers (n): 8 Smokers (n): 8 Former smokers (n): 12* *Pack-years: Intervention: 44.4 (1.7) Control: 46.9 (2.3)*	*be complete.* **Incomplete outcome data** Low risk of bias **Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** Low **Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		FEV1, % predicted (mean, SD) *Intervention: 49.2 (0.5) Control: 49.8 (0.7)* **Interventions** **Self-management** *Patients in the online breathlessness group undertook a home-based video rehabilitation program comprising four stages of diagrammatic breathing exercises.* ***Breathing exercises/managing breathlessness*** *Patients in the online breathlessness group undertook a home-based video program consisting of an animated diagram and video-guided instruction on pulmonary function, exercise capacity, and health-related quality of life in patients with COPD. The programme focused on four stages of diagrammatic breathing exercises: pursed -lip breathing; deep inhale-slow slowing – making a fist; deep inhale-holding-slow exhale and global exercise. Each stage lasted for one month.* *Participants followed the breathing exercises on the programme website while watching the video and animated diagrams, selected text, received audio instruction, selected relaxing music, and could contact medical staff. The program was tailored to exercise tolerance on an individualized basis. Exercise duration and breathing times were recorded by the online program, so that the patients, their significant others, and nurses could review their progress by clicking on "history record". People who had not logging onto the online program regularly would receive a reminder by telephone from the respiratory nurse.* **Another control intervention** *Patients in the control group were instructed on the importance of exercise in the same way as the online program but instead by a respiratory nurse*	

Short Title	Title	Study characteristics	Risk of bias and directness
		at discharge from the hospital. Handouts with pictures of breathing exercises were given to the controls, with advice to perform these exercises for four months. **Outcome measure(s)** Pulmonary function tests *FVC, forced vital capacity; FEV1, forced expiratory volume in 1 second; FEV1 % predicted; FEV1/FVC; PEF, peak expiratory flow.* Disease specific health-related quality of life (St. George respiratory questionnaire, SGRQ) 6 minute walk distance (6MWD)	
McGeoch (2006)	Self-management plans in the primary care of patients with chronic obstructive pulmonary disease	Evidence table in systematic review *Please refer to Lenferink et al. 2017 Cochrane review*	**Random sequence generation** Unclear risk of bias *No information was provided on how the practices were randomised but participants were randomly selected from the general practices for screening against the inclusion criteria using a random numbers table.* **Allocation concealment** Unclear risk of bias *No information was provided, but all participants were allocated to the*

Short Title	Title	Study characteristics	Risk of bias and directness
			intervention or control group at the whole practice level. **Blinding of participants and personnel** High risk of bias *Participants and personnel were not blind to group allocation* **Blinding of outcome assessment** High risk of bias *Nursing staff were not blind to group allocation.* **Incomplete outcome data** Low risk of bias **Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias *Variation due to clustering was addressed statistically and the authors concluded that there was no significant*

Short Title	Title	Study characteristics	Risk of bias and directness
			additional variation due to this issue. **Overall risk of bias** Moderate *Due to the lack of information regarding randomisation and group allocation, and the lack of blinding of participants, personnel and outcome assessors. Not rated as high risk due to the very high percentage of people completing the trial and lack of selective reporting.* **Directness** Directly applicable
Mitchell (2014)	A self-management programme for COPD: a randomised controlled trial	Evidence table in systematic review *Please refer to Howcroft et al. 2016 Cochrane review* ***Associated studies*** *Education for Chronic Obstructive Pulmonary Disease (SPACE for COPD) intervention is explained in detail in: Apps LD, Mitchell KE, Harrison SL, Sewell L, Williams JE et al. The development and pilot testing of the Self-management Programme of Activity, Coping and Education for Chronic*	**Random sequence generation** Low risk of bias **Allocation concealment** Unclear risk of bias *No information provided*

Short Title	Title	Study characteristics	Risk of bias and directness
		Obstructive Pulmonary Disease (SPACE for COPD). International Journal of COPD 2013; 8: 317- 327. *This intervention is used in another included clinical trial (Johnson-Warrington 2016) with participants being recruited at release from hospital for a COPD-related event. Johnson-Warrington V, Rees K, Gelder C, Morgan M, Singh SJ. Can a supported self-management program for COPD upon hospital discharge reduce readmissions? A randomized controlled trial. International Journal of COPD 2016:11 1161–1169.*	**Blinding of participants and personnel** High risk of bias *Participants and personnel were not blind to group allocation.* **Blinding of outcome assessment** Low risk of bias **Incomplete outcome data** Unclear risk of bias *There was some loss to follow-up, but 78% of participants completed the trial.* **Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** Low *Due to assessor blinding and the nature of the*

Short Title	Title	Study characteristics	Risk of bias and directness
			outcomes making it less likely that participant knowledge of group allocation would alter the effects reported. **Directness** Directly applicable
Monninkhof (2003)	Effects of a comprehensive self-management programme in patients with chronic obstructive pulmonary disease	Evidence table in systematic review *Please refer to Lenferink et al. 2017 Cochrane review*	**Random sequence generation** Low risk of bias **Allocation concealment** Low risk of bias **Blinding of participants and personnel** High risk of bias *Participants and personnel were not blinded* **Blinding of outcome assessment**. Low risk of bias **Incomplete outcome data** Low risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
			Selective reporting Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** Low risk of bias **Directness** Directly applicable
Moy (2015)	An Internet-Mediated Pedometer-Based Program Improves Health-Related Quality-of-Life Domains and Daily Step Counts in COPD: A Randomized Controlled Trial	Evidence table in systematic review *Please refer to McCabe et al. 2017 Cochrane review*	**Random sequence generation** Low risk of bias **Allocation concealment** Low risk of bias **Blinding of participants and personnel** High risk of bias *Blinding was not possible* **Blinding of outcome assessment**. High risk of bias *No blinding of outcome assessors*

Short Title	Title	Study characteristics	Risk of bias and directness
			Incomplete outcome data Unclear risk of bias *Reasons for missing outcome data not reported* **Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** High risk of bias *For quality of life outcome due to a lack of blinding* Low risk of bias *For exacerbations and hospitalisation outcomes as they are not subjective* **Directness** Directly applicable
Nguyen (2013)	Internet-based dyspnoea self-management support for patients with chronic obstructive pulmonary disease	**Study type** Randomised controlled trial **Study details** Study location *USA*	**Random sequence generation** Unclear risk of bias *No details on method provided*

Short Title	Title	Study characteristics	Risk of bias and directness
		Study setting *Two academic medical centres in San Francisco, California, and Washington, Seattle.* Study dates *Participants were recruited from March 2007 to April 2010.* Duration of follow-up *12 months (repeated measures at 0, 3, 6, 12 months)* Sources of funding *NIH grant R01 NR008938, UCSF & UW GCRCs (MO1-RR-000037 & MO1 RR-00079)and 1KL2RR025015, 1 UL1 RR025014. Dr. Reinke has funding through the Oncology Nursing Society and the Department of Veterans Affairs.* **Inclusion criteria** Diagnosis of COPD Stable COPD *For at least one month* FEV1/FVC *<0.7 or <0.6 (with FEV1>80% predicted) or CT confirmed emphysema* FEV1, % predicted *<80% or >80% with FEV1/FVC <0.60 or CT confirmed emphysema* Breathlessness *Activities limited by breathlessness* Oxygen saturation *>85% on room air on ≤6L/min of oxygen at the end of a six-minute walk test (6MWT).* Access to the internet plus or minus phone	**Allocation concealment** Unclear risk of bias *No information provided* **Blinding of participants and personnel** High risk of bias *All participants received an intervention, but they were not blind to their group allocation and the control educational group were offered the DSMP at the end of the trial. Personnel were not blind to group allocation.* **Blinding of outcome assessment** Low risk of bias *Participants returned to the medical centre for testing by study staff who were not involved in the intervention.* **Incomplete outcome data** Low risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
		Able to use the Internet **Exclusion criteria** Significant co-morbidities *e.g. cancer, heart failure* Attendance of a pulmonary rehabilitation programme *In the last 6 months* Currently participating in more than two days a week of supervised exercise **Sample characteristics** Sample size *125* Split between study groups *Intervention 1 (eDSMP): 43* *Intervention 2 (fDSMP): 41* *Intervention 3 (education): 41* Loss to follow-up *110/125 (88.0%) of participants completed the trial* *Intervention 1 (eDSMP): 38/43* *Intervention 2 (fDSMP): 35/41* *Intervention 3 (education): 37/41* % female *45.6* Mean age (SD) *68.7 years (9.7)*	**Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** Low **Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		Smoking status and history *Currently smoking n/total (%):* *Intervention 1 (eDSMP): 2/43 (5)* *Intervention 2 (fDSMP): 2/41 (5)* *Intervention 3 (education): 3/41 (7)* FEV1, % predicted (mean, SD) *Intervention 1 (eDSMP): 53.3 (20.4)* *Intervention 2 (fDSMP): 50.6 (18.2)* *Intervention 3 (education): 49.4 (19.8)* **Interventions** **Self-management** *This intervention tested two versions of a dyspnoea (breathlessness) self-management program (DSMP), one conducted using traditional mediums i.e. face-to-face and telephone (fDSMP) and an ICT-enabled version (eDSMP). All DSMP participants received a home visit by an advanced practice nurse. Both programs provided similar content and "contact" time and differed only in the mode of delivery.* *Core components for both interventions are listed here:* *- Self-monitoring of symptoms and exercise* *- Breathlessness and Exercise Consultation* *- Exercise Program* *- Collaborative Self-Monitoring and Reinforcement* *- Structured Education Sessions and Peer Interactions*	

Short Title	Title	Study characteristics	Risk of bias and directness
		Participants returned to the medical centre at three, six, and 12 months for follow-up assessments. **Self-management** ***Education*** *All participants received education on shortness of breath (SOB), breathing strategies to reduce SOB, exercise and SOB, modifying activities to reduce SOB, coping with SOB and stress, and medications to manage SOB and COPD flare-ups. The content from these modules was reinforced by the nurses during six, monthly, face-to-face meetings at the respective medical centres. These education sessions were designed to encourage peer interactions and mutual support. fDSMP participants were given a paper copy of the modules on these six topics.* ***Collaborative goal setting*** *fDSMP participants completed paper diaries and mailed them back weekly to the study office. The fDSMP group set exercise goals during the telephone calls and on their paper logs. The nurses used this information to provide individualized feedback and reinforcement to participants regarding their use of breathlessness management strategies and exercise progress via telephone (fDSMP) weekly for the first month and then biweekly for 11 months. These contacts were designed to be as similar as possible for the two groups. There were no email alerts for the nurses regarding the fDSMP participants.* ***Physical exercise*** *A tailored exercise and activity plan with biweekly personalized reinforcement and feedback. This component was the same for both groups. During the consultation visit, the nurse and participant developed an individualised exercise plan that was based on the participant's*	

Short Title	Title	Study characteristics	Risk of bias and directness
		baseline exercise performance, breathlessness with exercise testing, oxygen saturation, stage of exercise motivational readiness and exercise preferences. The homebased exercise program included a combination of endurance (e.g., walking, cycling, or swimming) and arm strengthening (bicep curls, triceps curls, side arm raises, and upper arm raises) exercises. Participants were encouraged to complete endurance exercises at least four times per week for 30 minutes per session and arm strengthening exercises at least three times per week. ***Breathing exercises/managing breathlessness*** *Demonstration of breathlessness self-management strategies. For both groups, an advanced practice nurse visited participants in their homes within one week of their baseline visits to conduct a 1.5–2 hour face-to-face breathlessness assessment and consultation. An individualised exercise plan was developed with the participants, and actions that they could take to prevent and manage future COPD exacerbations were discussed.* **Second self-management intervention** *eDSMP differences to fDSMP programme listed here only. For common components see fDMSP above.* ***Education*** *The eDSMP group accessed web-based education modules. The web-based flash modules, which were written at the eighth-grade level or lower, also had non-digitized audio, pictures, and animations. The content from these modules was reinforced by the nurses during six, monthly, live chat sessions with participants.* ***Collaborative goal setting*** *eDSMP participants submitted real-time information about their symptoms*	

Short Title	Title	Study characteristics	Risk of bias and directness
		(breathlessness, cough, and sputum) and exercise (mode, duration, and worst breathlessness) using their desktop computer or smartphone; if they reported not exercising, they were asked to select from a list of reasons that kept them from exercising that particular day. eDSMP participants were encouraged to communicate their exercise goals and progress to the nurse by using a web-based goal setting tool on their desktop. The nurses used this information to provide individualized feedback and reinforcement to participants regarding their use of breathlessness management strategies and exercise progress via email. Automated real-time email alerts were sent to the nurses if eDSMP participants reported worsening of symptoms. ***Physical exercise*** *As for fDMSP above* ***Breathing exercises/ managing breathlessness*** *As above plus the eDSMP participants were provided a detailed paper "Help Manual" and training on how to navigate and use the website tools and study-issued smartphone.* **Another control intervention** *Control participants received a home visit by a graduate research assistant. The control group was given general health education. They received a home visit from one of the study staff, participated in monthly face-to-face education classes that focused on health topics of interest to middle- and older aged adults and unrelated to lung disease (e.g., nutrition, general safety with medications). Participants were mailed the educational materials if they did not attend the sessions. Participants also received biweekly phone calls that provided general health information. GHE participants were offered the opportunity to participate in the DSMPs*	

Short Title	Title	Study characteristics	Risk of bias and directness
		at the end of the control period. Participants returned to the medical centre at three, six, and 12 months for follow up assessments. **Outcome measure(s)** Breathlessness *Modified Borg scale* Disease specific health-related quality of life (Chronic Respiratory Questionnaire, CRQ) *Breathlessness with activities was measured with the Chronic Respiratory Questionnaire dyspnoea (breathlessness) (CRQ-D) subscale.* Generic health-related quality of life (Medical Outcomes Study Short Form Health Survey, SF-36) 6 minute walk distance (6MWD) A symptom-limited incremental treadmill test (ITT) Physical activity (other) *Participants were asked about the frequency and duration of endurance (walking, biking, swimming) and strengthening exercises for a typical week during the last month.* Patient satisfaction survey *Participants also were asked two questions about their perception of support from the study nurses for initiating and maintaining an exercise program.* Self-efficacy *Self-efficacy for managing breathlessness was measured with one validated question, "How confident are you that you can keep your shortness of breath from interfering with what you want to do?," using a 0 (not at all confident) to 10 (totally confident) point scale.*	

Short Title	Title	Study characteristics	Risk of bias and directness
Ninot (2011)	Cost-saving effect of supervised exercise associated to COPD self-management education program.	Evidence table in systematic review *Please refer to Lenferink et al. 2017 Cochrane review*	**Random sequence generation** Low risk of bias **Allocation concealment** High risk of bias *Allocation was carried out by fax* **Blinding of participants and personnel** High risk of bias *Participants and personnel were not blind to group allocation due to the nature of the intervention* **Blinding of outcome assessment** High risk of bias *Assessors were not blind to the group allocation, but were not part of the intervention team and participants were asked not to divulge their allocation during assessments.*

Short Title	Title	Study characteristics	Risk of bias and directness
			Incomplete outcome data Unclear risk of bias *3 participants in the intervention arm were lost to follow-up due to exacerbations and were excluded from data analysis, but 84.4% participants completed the trial.* **Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** Moderate *Due to lack of blinding of outcome assessors which has the potential to alter some outcome measures (such as 6MWD) in particular whilst other (such as hospital admissions) are less likely to be altered. Also the loss to follow up of 3 people in the intervention*

Short Title	Title	Study characteristics	Risk of bias and directness
			arm due to exacerbations. **Directness** Directly applicable
Rice (2010)	Disease management program for chronic obstructive pulmonary disease: a randomized controlled trial	Evidence table in systematic review *Please refer to Lenferink et al. 2017 Cochrane review*	**Random sequence generation** Low risk of bias **Allocation concealment** Unclear risk of bias *Lack of information on method of allocation concealment* **Blinding of participants and personnel** High risk of bias *Participants and personnel were not blinded* **Blinding of outcome assessment**. Low risk of bias **Incomplete outcome data** Unclear risk of bias *For the SGRQ due to low*

Short Title	Title	Study characteristics	Risk of bias and directness
			completion rates at the end of the study Low risk of bias *For the data on healthcare utilisation* **Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** High risk of bias *For the SGRQ outcome due to incomplete data and lack of blinding.* Low risk of bias *For the healthcare usage outcomes.* **Directness** Directly applicable
Rootmensen (2008)	The effects of additional care by a pulmonary nurse for asthma and COPD patients at a respiratory outpatient clinic: results from a	Evidence table in systematic review *Please refer to Howcroft et al. 2016 Cochrane review*	**Random sequence generation** Low risk of bias **Allocation concealment** Low risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
	double blind, randomized clinical trial		**Blinding of participants and personnel** Low risk of bias **Blinding of outcome assessment**. Low risk of bias **Incomplete outcome data** Unclear risk of bias *Data were available for only 90 of 117 participants with COPD for subjective outcomes (quality of life).* **Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** Low risk of bias **Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
			Data was extracted for participants with COPD from a mixed population.
Sanchez-Nieto (2016)	Efficacy of a self-management plan in exacerbations for patients with advanced COPD	**Study type** Randomised controlled trial **Study details** Study location *Spain* Study setting *Patients were recruited from two hospitals (Hospital Morales Meseguer for the health area VI and Hospital Arrixaca for the health area I) in the Autonomous Region of Murcia (Spain).* Study dates *Not stated, but patients were recruited between February 2012 and March 2013.* Duration of follow-up *12 months* Sources of funding *Not stated, but the authors report no conflicts of interest in this work.* **Inclusion criteria** Stable COPD *At least 3 months had elapsed since the episode of hospital care with no change in medication or usual symptoms.* Active or ex-smoker *Prior history of smoking of at least 10 pack-years* FEV1/FVC	**Random sequence generation** Low risk of bias **Allocation concealment** Unclear risk of bias *No information provided* **Blinding of participants and personnel** High risk of bias *Due to the nature of the intervention participants and personnel were not blinded to group allocation.* **Blinding of outcome assessment** Low risk of bias **Incomplete outcome data** Low risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
		<0.7 Treated in accident and emergency at study hospital Hospital admissions due to COPD exacerbation *At least once during the year prior to inclusion in the study* Normal cognitive status *Assessed by the intersecting pentagons test, to ensure the participant could read and understand written texts, and receive training in inhalation techniques or self-care education sessions.* **Exclusion criteria** Asthma Cognitive impairment *Specifically dementia* Heart failure *Advanced heart failure* Terminal illness Psychiatric illness *Uncontrolled psychiatric illness* Attendance of a pulmonary rehabilitation programme *In the previous year* Inability to undertake an exercise regime **Sample characteristics** Sample size *96* Split between study groups *Intervention: 51 Control: 45* Loss to follow-up	**Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** Low *Due to blinding of outcome assessors and the nature of the outcomes.* **Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		85/96 (88.5%) participants completed the trial % female *9.4* Mean age (SD) *67.7 years (7.0)* Smoking status and history *Active smokers Intervention: 37.3% Control: 35.6% Pack years index Intervention: 56.9 (SD 44.3) Control: 52.5 (SD 26.2)* FEV1, % predicted (mean, SD) *Intervention: 47.3 (SD 14.4) Control: 44.3 (SD 11.9)* **Interventions** **Self-management** *COPD self-management program (SMP-COPD). The intervention group received two extra visits with a respiratory nurse (at 1 and 3 months into the study), primarily to check on the correct use of the treatment instructions sheets and inhalation techniques. The intervention was run by health professionals trained in the intervention's features.* ***Education*** *Group education session on the main characteristics of the disease. This consisted of a PowerPoint presentation with 20 slides on the main characteristics of the disease, symptoms of exacerbation, and inhaled medicines. At the end, there was a chance for questions and a physiotherapist demonstrated how to do a series of basic physical exercises. Each session was delivered by a previously trained nurse to a group of six to eight patients.* ***Action plans for exacerbations*** *An action plan with written material consisting of color-coded sheets with*	

Short Title	Title	Study characteristics	Risk of bias and directness
		treatment instructions for the stable periods, including recommendations for physical exercise (green) and exacerbations (orange). The action plan consisted of instructions on treatment and physical exercises for stable periods (green), treatment sheets for exacerbations (orange), and a red sheet with instructions to follow in the case of their condition becoming serious or an emergency. The fourth sheet contained instructions for inhalation techniques. The exacerbation sheets explained the symptoms of bronchial infection for which they should start antibiotics and that if the symptoms did not improve within 48 hours or they developed breathlessness, they should start a course of oral glucocorticoids for 6 days. There were also instruction sheets on inhalation techniques, which explained the correct use and main features of the type of inhaler indicated for each patient. ***Training in inhaler use*** *An individual training session on inhalation techniques according to the devices indicated for each patient. This was a systematic, protocol-based training all patients in the intervention group, individually teaching correct administration technique for each prescribed inhaler, with particular emphasis on both avoiding critical errors and adherence.* **Usual care** *No information provided.* **Outcome measure(s)** Mortality Number of emergency department visits due to COPD *Defined as remaining in this area for over 8 hours and receiving treatment with bronchodilators, parenteral corticosteroids, and oxygen.*	

Short Title	Title	Study characteristics	Risk of bias and directness
		Number of hospitalisations due to COPD *Defined as any admission where a hospital bed was used, in any unit and of any duration, and for which the diagnosis was listed as COPD aggravation or exacerbation.* Length of stay in hospital Numbers receiving antibiotics, steroids or other medication *Numbers receiving antibiotic or glucocorticoid treatment*	
Tabak (2014)	A telehealth program for self-management of COPD exacerbations and promotion of an active lifestyle: a pilot randomized controlled trial	Evidence table in systematic review *Please refer to Lenferink et al. 2017 Cochrane review*	**Random sequence generation** Low risk of bias **Allocation concealment** Low risk of bias **Blinding of participants and personnel** High risk of bias *No blinding of participants or personnel* **Blinding of outcome assessment**. Unclear risk of bias *Unclear whether outcome assessors were blinded* **Incomplete outcome data** High risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
			Large number of withdrawal for the 9 month follow up so most outcome measures are reported at 3 months. **Selective reporting** High risk of bias *Some outcomes were not reported at 9 months and data missing on the use of diaries in the control group.* **Other sources of bias** Unclear risk of bias *Per protocol analysis was used* **Overall risk of bias** High risk of bias **Directness** Directly applicable
Taylor (2012)	Self-management support for moderate-to-severe chronic obstructive pulmonary disease: A pilot	**Study type** Randomised controlled trial **Study details** Study location *UK*	**Random sequence generation** Low risk of bias **Allocation concealment** Unclear risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
	randomised controlled trial	Study setting *Patients were recruited from suburban areas of very high COPD prevalence via their primary care providers.* Study dates *Not stated* Duration of follow-up *6 months* Sources of funding *National Institute for Health Research (NIHR) under its Research for Patient Benefit programme (Grant no. PB-PG-0906-11172).* **Inclusion criteria** Age *>35 years* Diagnosis of COPD FEV1/FVC *< 0.7* FEV1, % predicted *< 80%* Exacerbations during the past 12 months *Either an exacerbation of COPD leading to unscheduled health care within the past year or FEV1 < 80% predicted* **Exclusion criteria** Lack of informed consent to participate in trial *Participant was unable to give informed consent* Significant co-morbidities *Life-threatening comorbidities*	*No information provided.* **Blinding of participants and personnel** High risk of bias *Due to the nature of the intervention participants were aware of group allocations, but primary care teams were unaware of patients' allocated groups.* **Blinding of outcome assessment** Low risk of bias *Questionnaires were self-completed by patients at home, in the presence of a researcher not associated with the intervention and data on health service use was collected from records for all participants.* **Incomplete outcome data** High risk of bias *Due to <80% of participants completing the trial, but data*

Short Title	Title	Study characteristics	Risk of bias and directness
		Psychiatric illness *Major psychological illness* Unable to participate due to a language barrier *Insufficiently fluent in English* Previous participation in another self-management programme **Sample characteristics** Sample size *116* Split between study groups *Intervention: 78 Control: 38* Loss to follow-up *91/116 (78.4%) of the participants completed the follow- up questionnaire; data from GP records was available for 100% of participants. 17/78 (intervention) and 8/38 (control) did not provide questionnaire data at 6 months.* % female *52.6%* Mean age (SD) *69.5 years (9.9)* Smoking status and history *Current smoker, n (%)* *Intervention: 24 (31) Control: 8 (21)* *Ever smoker, n (%)* *Intervention: 68 (87) Control: 33 (87)* *Mean pack-years (SD) Intervention: 47.6 (30.6) Control: 50.2 (35.8)*	*on health service use was collected from records for all participants.* **Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** Moderate risk of bias *Due to <80% of the participants completing the trial.* **Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		FEV1, % predicted (mean, SD) *Intervention: 53.9 (22.6) Control: 54.6 (23.4)* Pulmonary rehabilitation *Had pulmonary rehab, n (%) Intervention: 10 (13) Control: 10 (26)* **Interventions** **Self-management** *Better Living with Long term Airways disease (BELLA), was a new disease-specific adaptation of the generic CDSMP developed by the Expert Patient Programme (EPP) Community Interest Company in the UK. The course addressed five core self-management skills: defining the problem, decision making, finding and using resources, forming partnerships with healthcare providers, and taking action (making a short-term action plan and acting on it). Each course involved two trained lay (peer) tutors (at least one of whom had COPD), who delivered a structured, manualised, 3-hour session once a week for 7 weeks at a local community centre. During the sessions, the peer leaders modelled good self-management behaviours and responses. Each session covered six to eight different topics lasting 15–25 minutes and each week participants set themselves a personal goal for the next week and, at the subsequent meeting, discussed their success in achieving this goal. Other topics included: understanding the role of health beliefs, relaxation, energy conservation, managing fatigue, increasing physical activity, healthy eating and addressing the emotional aspects of COPD.* ***Education*** *Medication information provided by a respiratory physician- interactive session. Participants were also given a copy of the generic Expert Patient*	

Short Title	Title	Study characteristics	Risk of bias and directness
		Programme manual. ***Action plans for exacerbations*** *Making a short-term action plan and acting on it.* **Usual care** *Patients in the control arm only received usual COPD care, which was not standardised in the area studied; some patients had regular outpatient follow-up in a community respiratory clinic or hospital, with a respiratory physician or specialist nurse; others were followed up on a regular or ad hoc basis in primary care.* **Outcome measure(s)** Number of emergency department visits Number of hospitalisations Number of nurse visits Number of telephone consultations Number of outpatient visits to a specialist Number of visits to general practitioner (GP) *Also number of home visits by GP* Prescription of COPD-related medication Disease specific health-related quality of life (St. George respiratory questionnaire, SGRQ) Hospital Anxiety and Depression Scores (HADS) Generic health-related quality of life (EuroQoL-5D questionnaire) Daily physical activity Costs of intervention *Unit costs of resources used were obtained from national reference cost databases.*	

Short Title	Title	Study characteristics	Risk of bias and directness
		Self-efficacy *Stanford self-efficacy scales around managing disease in general and communicating with physicians* Self-management measures *Stanford self-management behaviour scales for exercise and communication with physicians.* Patient wellbeing *Participants were also asked to rate their current general health as very good, good, fair, poor, or very poor.*	
Trappenburg (2011)	Effect of an action plan with ongoing support by a case manager on exacerbation-related outcome in patients with COPD: a multicentre randomised controlled trial	Evidence table in systematic review *Please refer to Howcroft et al. 2016 Cochrane review*	**Random sequence generation** Low risk of bias **Allocation concealment** Low risk of bias **Blinding of participants and personnel** Low risk of bias **Blinding of outcome assessment**. Low risk of bias **Incomplete outcome data** Low risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
			Selective reporting Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** Low risk of bias **Directness** Directly applicable
Voncken-Brewster (2015)	A randomized controlled trial evaluating the effectiveness of a web-based, computer-tailored self-management intervention for people with or at risk for COPD	Evidence table in systematic review *Please refer to McCabe et al. 2017 Cochrane review*	**Random sequence generation** Low risk of bias **Allocation concealment** Unclear risk of bias *Lack of information on allocation of the general practice group* **Blinding of participants and personnel** High risk of bias *Lack of blinding of participants*

Short Title	Title	Study characteristics	Risk of bias and directness
			Blinding of outcome assessment. High risk of bias *Lack of blinding of participants who completed a self-administered web-based questionnaire.* **Incomplete outcome data** High risk of bias *80.8% of the participants overall completed the questionnaire at 6 months, but this was only 53.3% for general practice group.* **Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** High risk of bias *For the health related quality of life questionnaire* Low risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
			For breathlessness status **Directness** Directly applicable
Wakabayashi (2011)	Efficient integrated education for older patients with chronic obstructive pulmonary disease using the Lung Information Needs Questionnaire	Evidence table in systematic review *Please refer to Zwerink et al. 2014 Cochrane review*	**Random sequence generation** Low risk of bias **Allocation concealment** Low risk of bias **Blinding of participants and personnel** High risk of bias *Due to the nature of the intervention personnel and participants were not blind to group allocation.* **Blinding of outcome assessment** Low risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
			Incomplete outcome data Low risk of bias **Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** Low risk of bias *Although participants were not blind to their group allocation, the blinding of the outcome assessors makes this less likely to alter the outcomes measures*. **Directness** Directly applicable
Walters (2013)	Effects of telephone health mentoring in	**Associated studies** *Schuz N, Walters JAE, Cameron-Tucker H, Scott J, Baker-Wood R, Walter*	**Random sequence generation**

Short Title	Title	Study characteristics	Risk of bias and directness
	community-recruited chronic obstructive pulmonary disease on self-management capacity, quality of life and psychological morbidity: a randomised controlled trial	*H. Patient anxiety and depression moderate the effects of increased self-management knowledge on physical activity: a secondary analysis of a randomised controlled trial on health-mentoring in COPD. COPD: Journal of chronic obstructive pulmonary disease 2015; 12: 502-509.* **Study type** Cluster randomised controlled trial **Study details** Study location *Australia* Study setting *Participants were recruited from general practices in Tasmania* Study dates *May 2008 and December 2010* Duration of follow-up *12 months* Sources of funding *National Health and Medical Research Council (NHMRC) project grant ID490028, a Royal Hobart Hospital Research Foundation grant and a University of Tasmania Institutional Research Grant.* **Inclusion criteria** Age *> 45 years* Diagnosis of COPD *Diagnostic code for COPD on participant record at GP or prescription of tiotropium.*	Low risk of bias **Allocation concealment** Low risk of bias **Blinding of participants and personnel** High risk of bias *Blinding of participants or research officers was not possible given the nature of the study.* **Blinding of outcome assessment** Low risk of bias *Assessments were conducted by research officers not directly involved in delivering the intervention.* **Incomplete outcome data** Low risk of bias **Selective reporting** Low risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
		Smoking history *>10 pack-years* FEV1/FVC *<0.7* FEV1, % predicted *30–80%* Patient gave informed consent to participate in trial Location of patient/ clinic attendance *GP attendance within the previous 12 months* **Exclusion criteria** Cognitive impairment *unable to participate in self-care activities due to mental incapacity.* Terminal illness *End-stage cancer* Residence in a long-term care facility *Nursing home residents were excluded* Unable to participate due to a language barrier *Poor English language skills* Unsuitable to participate in trial *Unable to participate in self-care activities due to physical incapacity.* **Sample characteristics** Sample size *31 practices* Split between study groups *Intervention: 18 practices (92 people) Control : 13 practices (90 people)* Loss to follow-up	**Other sources of bias** Low risk of bias *To ensure that there was no leakage of therapy components, a random sample of 10% of calls in the control arm was timed and the content assessed. Statistical analysis was used to allow for clustering within practices.* **Overall risk of bias** Low **Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		154/182 (84.6%) of participants completed the trial Intervention: 79/90 received the intervention; 74/90 analysed Control: 90/92 received control calls; 80/92 analysed % female *47.3* Mean age (SD) *67.7 years (7.7)* Smoking status and history *Smoking history pack-years mean (SD)* *Intervention: 53.9 (26.3)* *Control: 43.4 (21.4)* *Current smoker* *Intervention: 43 (48)* *Control: 33 (36)* FEV1, % predicted (mean, SD) *Intervention: 54.0 (13.4) Control: 56.4 (13.2)* **Interventions** **Self- management** *Self- management intervention delivered by telephone rather than in person by a health professional. Community health nurses were trained for 12 hours over 2 days and covered: COPD management (1 h), chronic disease self-management and health behaviour change components including practice role plays (7.25 h), online training and study methods (3.75 h). The nurses received ongoing support via a resource manual and*	

Short Title	Title	Study characteristics	Risk of bias and directness
		regular meetings with each other facilitated by the trainers. The nurses made 16x 30 min calls to participants over the 12 months with increasing time between calls. Participants set medium-term to long-term goals in collaboration with their nurse mentors using a specified framework of health behaviour targets, namely: Smoking, Nutrition, Alcohol, Physical activity, Psychosocial well-being and Symptom management. Achievement of such plans and goals was reviewed and revisions made collaboratively. ***Action plans for exacerbations*** *Individualised 'action' plans to reach their goals were specified by participants in negotiation with the nurse mentors during phone calls. Achievement of such plans and goals was reviewed and revisions made collaboratively.* ***Physical exercise*** *Participants set medium-term to long-term goals in collaboration with their nurse mentor.* ***Smoking cessation*** *Participants set medium-term to long-term goals in collaboration with their nurse mentor.* ***Nutritional goals*** *Participants set medium-term to long-term goals in collaboration with their nurse mentor for nutrition and alcohol use.* **Usual care** *Usual care as provided by a GP plus regular monthly phone calls from a research nurse, to avoid confounding by difference in periodic contact. The telephone calls did not provide specific psychological advice or skills training.*	

Short Title	Title	Study characteristics	Risk of bias and directness
		Outcome measure(s) COPD specific knowledge *Partners in Health (PIH) knowledge subscale* Number of hospitalisations due to COPD MRC dyspnoea (breathlessness) score Disease specific health-related quality of life (St. George respiratory questionnaire, SGRQ) Hospital Anxiety and Depression Scores (HADS) Alternative anxiety and depression measures *Centre for Epidemiologic Studies-Depression (CES-D) Questionnaire and the Post-Traumatic Stress Disorder Checklist-Civilian Version (PCL-C).* Generic health-related quality of life (Medical Outcomes Study Short Form Health Survey, SF-36) Health-related quality of life measures (others) *14-Item Partners In Health (PIH) Questionnaire* Daily physical activity Self-efficacy *Self- Efficacy for Managing Chronic Disease (SE MCD) questionnaire* Patient wellbeing *Satisfaction With Life Scale (SWLS)*	
Watson (1997)	Evaluation of a self-management plan for chronic obstructive pulmonary disease.	Evidence table in systematic review *Please refer to Howcroft et al. 2016 Cochrane review*	**Random sequence generation** Low risk of bias **Allocation concealment** Low risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
			Blinding of participants and personnel High risk of bias *Participants and personnel were not blinded to group allocation*. **Blinding of outcome assessment**. High risk of bias *Participants completed daily diary cards recording healthcare utilisation and the quality of life assessment at the end of the study was carried out by staff who were not blinded.* **Incomplete outcome data** Unclear risk of bias *Group allocation status of 13 withdrawals was not given* **Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
			Overall risk of bias High risk of bias *For quality of life assessment due to the lack of blinding* Low risk of bias *For healthcare utilisation and mortality* **Directness** Directly applicable
Wood-Baker (2006)	Written action plans in chronic obstructive pulmonary disease increase appropriate treatment for acute exacerbations	Evidence table in systematic review *Please refer to Howcroft et al. 2016 Cochrane review*	**Random sequence generation** Low risk of bias **Allocation concealment** Unclear risk of bias *Practice level was allocated but no information was published on method of allocation to groups* **Blinding of participants and personnel** High risk of bias *Participants and personnel were not blinded to group allocation*

Short Title	Title	Study characteristics	Risk of bias and directness
			Blinding of outcome assessment. High risk of bias *For quality of life outcomes as staff were not blinded* Low risk of bias *For healthcare utilisation data even though staff not blinded* **Incomplete outcome data** Low risk of bias **Selective reporting** Low risk of bias **Other sources of bias** Unclear risk of bias *Analysis did not take into account clustering by GP* **Overall risk of bias** High risk of bias *For quality of life outcomes due to the lack of blinding* Low risk of bias *For healthcare utilisation outcomes*

Short Title	Title	Study characteristics	Risk of bias and directness
			Directness Directly applicable

Education randomised controlled trials

Short Title	Title	Study characteristics	Risk of bias and directness
Hill (2010)	Disease-specific education in the primary care setting increases the knowledge of people with chronic obstructive pulmonary disease: a randomized controlled trial	**Study type** Randomised controlled trial **Study details** Study location *Ontario, Canada* Study setting *Not stated* Duration of follow-up *12 weeks* Sources of funding *Government of Ontario, Ontario Lung association.* **Inclusion criteria** Age *≥ 40 years* Diagnosis of COPD *Recent COPD diagnosis. Criteria for diagnosis not stated.* Smoking history *≥ 20 pack-years* FEV1/FVC *<0.7*	**Random sequence generation** Low risk of bias *Randomisation using a computer generated random number sequence.* **Allocation concealment** Unclear risk of bias *No information provided.* **Blinding of participants and personnel** High risk of bias *Participants and the COPD study educator were aware of the group allocations.* **Blinding of outcome assessment** High risk of bias *Participants and the educator*

Short Title	Title	Study characteristics	Risk of bias and directness
		FEV1, % predicted *<80 % predicted* **Exclusion criteria** Inability to perform spirometry for a medical reason Unable to participate due to a language barrier *Inability to communicate in written or spoken English* **Sample characteristics** Sample size *100* Split between study groups *Intervention: 55 Control: 45* Loss to follow-up *93/100 (93%) completed the trial* %female *54.8% (of the participants that completed the trial)* Mean age (SD) *64.5 years (9.7)* Smoking status and history *Current smokers: 46.2% Current non-smokers 53.8%* FEV1, % predicted (mean, SD) *59.2% (SD 14.3)* **Interventions** ***Education*** Booklet/leaflet *A written teaching manual from the 'Living with COPD' programme was used in the educational sessions and provided to the participant to take home after*	*were not blind to the group allocations. Physicians were blinded, but it is unclear who was responsible for scoring the results.* **Incomplete outcome data** Low risk of bias **Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** Low *Knowledge of group allocation would not alter the ability of participants to answer the questionnaire and the scoring does not appear subjective.* **Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		completion of the second session. Education provided by health professional in person *Two one-to-one education sessions at one month post-randomisation and a month later. Content was standardised, COPD specific and aimed at improving self-efficacy. Content covered: normal lung function; how COPD affects the lungs; symptoms and what makes them worse; strategies for smoking cessation; respiratory medications; symptoms of an acute exacerbation and the role of regular exercise.* ***Usual care*** *No information provided* **Outcome measure(s)** COPD specific knowledge (Bristol COPD knowledge questionnaire, BCKQ) *Data provided for all domains and as a total score.*	
Siddique (2012)	Randomized trial of pragmatic education for low-risk COPD patients: impact on hospitalizations and emergency department visits	**Study type** Randomised controlled trial **Study details** Study location *USA* Study setting *Three veterans Affairs (VA) medical centres in the upper Midwest (Minneapolis Veterans Affairs Health Care Centre, Minneapolis MN; the St Cloud Veterans Affairs Health Care Centre, St Cloud MN; and the Omaha Veterans Affairs Health Care Centre, VA Nebraska-Western Iowa Health Care System).* Study dates *Not stated* Duration of follow-up *12 months*	**Random sequence generation** Low risk of bias **Allocation concealment** Unclear risk of bias *No information provided.* **Blinding of participants and personnel** High risk of bias *Participants were not blind to group allocation. Unclear whether medical personnel*

Short Title	Title	Study characteristics	Risk of bias and directness
		Sources of funding *Not stated, but the authors declare that they have no conflicts of interest.* **Inclusion criteria** Diagnosis of COPD FEV1/FVC *< 0.7* FEV1, % predicted *<80%* **Exclusion criteria** Subject refusal to participate in the study COPD exacerbation requiring an emergency department visit or hospitalisation *Within the last 12 months* **Sample characteristics** Sample size *4425* Split between study groups *Intervention: 2243 Control: 2182* Loss to follow-up *4390/4425 (99.2%) completed the trial.* %female *2.46%* Mean age (SD) *70 years (10)* **Interventions**	*were blind to allocation.* **Blinding of outcome assessment** Unclear risk of bias *VA medical personnel may have known about patient allocation, but external centres were less likely to have this information.* **Incomplete outcome data** Low risk of bias **Selective reporting** Low risk of bias **Overall risk of bias** Low *The study outcomes were not likely to be altered by knowledge of group allocation.* **Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		Education Booklet/leaflet *A locally-developed educational brochure was mailed to patients in the education group. The content of the brochure included: recommendations for smoking cessation, influenza and pneumococcal vaccinations, regular exercise, information about medications for COPD, and information about recognizing and treating COPD exacerbations. The brochure included a recommendation that patients contact their medical providers to discuss these treatments if they experienced symptoms of COPD exacerbation. In addition, the first mailing included a disease-specific, personal goal-setting questionnaire (smoking cessation, increasing daily activity, eating a healthy diet, losing weight, or receiving an influenza vaccination). After 3 months, patients were mailed a second brochure containing a brief review of the information in the first brochure, as well as local patient testimonials about the benefits of adherence to evidence-based COPD treatment.* ***Usual care*** *No information provided* **Outcome measure(s)** COPD specific knowledge *Assessed using a locally-developed COPD knowledge test.* Mortality Number of emergency department visits due to COPD *Within the VA hospital system and to non-VA facilities.* Number of hospitalisations due to COPD *Within the VA hospital system and to non-VA facilities.* Number of all cause hospitalisations Number of all cause emergency department visits	

Telehealth monitoring randomised controlled trials

Short Title	Title	Study characteristics	Risk of bias and directness
Antoniades (2012)	Pilot study of remote telemonitoring in COPD	**Study type** Randomised controlled trial **Study details** Study location *Australia* Study setting *Austin hospital, Heidelberg, Victoria, Australia.* Study dates *Not stated, but participants were recruited between June 2006 and April 2008.* Duration of follow-up *12 months* Sources of funding *Department of Human services, Victoria, Australia.* **Inclusion criteria** Diagnosis of COPD *Moderate to severe based on the COPDX criteria* FEV1, % predicted *< 60* Hospital admissions due to COPD exacerbation *At least one hospitalisation in the last 12 months* Fluent in English **Exclusion criteria** Cognitive impairment Significant co-morbidities	**Random sequence generation** Low risk of bias **Allocation concealment** Low risk of bias **Blinding of participants and personnel** High risk of bias *Due to the nature of the intervention, participants and personnel were not blind to group allocation.* **Blinding of outcome assessment** High risk of bias *The study nurses were not blind to group allocation and it is unclear whether the medical staff administering the non-automated (including the tests 6 minute walk test) and collecting other outcome data were blinded.*

Short Title	Title	Study characteristics	Risk of bias and directness
		Including cancer and renal failure **Sample characteristics** Sample size *44* Split between study groups *Intervention: 22 Control: 22* Loss to follow-up *36/44 (81.8%) of participants completed the trial* %female *54.5* Mean age (SD) *69 years (9.5)* Smoking status and history *Intervention: Non-smoker: 4 Current smoker: 0 Control: Non-smoker: 2 Current smoker: 6* Pulmonary rehabilitation *2 subjects in the intervention group and 2 in the control group underwent pulmonary rehabilitation during the trial.* **Interventions** ***Telehealth monitoring*** *Usual care plus daily monitoring of spirometry, weight, temperature, blood pressure, oxygen saturation by pulse oximetry, electrocardiogram, sputum colour and volume, symptoms and medical usage. The telehealth system consisted of a laptop computer with digitally integrated equipment for measure the above outcomes. The system also allowed the patients to enter symptoms (including changes in overall health on a visual analogue scale and changes in medication usage). Ongoing support was provided after the initial training and on-screen*	**Incomplete outcome data** Low risk of bias **Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** Low *Despite the lack of blinding of participants, personnel and outcome assessors the outcomes measured were not considered likely to be affected by bias.* **Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		boxes prompted the user to complete the symptom and medical usage questionnaires. Measurements were performed at the same, convenient time each day. Data was transmitted to the study nurse, who reviewed the information daily (during the week) to look for adverse changes in the outcomes. In the case of a significant worsening then the nurse could contact the patient, a doctor or outreach nurse. The nurse could also request that the patient repeat the measurements if needed. ***Usual care*** *Clinical management according to the Australian and New Zealand guidelines. This included outreach nursing, a written action plan and access to pulmonary rehabilitation.* **Outcome measure(s)** Number of hospitalisations Length of stay in hospital Disease specific health-related quality of life (Chronic Respiratory Questionnaire, CRQ) Generic health-related quality of life (Medical Outcomes Study Short Form Health Survey, SF-36) 6 minute walk distance (6MWD) Patient acceptance of telehealth monitoring *Including patient adherence to telehealth monitoring requirements and satisfaction with intervention*	
Bentley (2014)	A pilot randomised controlled trial of a Telehealth intervention in patients with chronic obstructive	**Study type** Randomised controlled trial **Study details** Study location *UK*	**Random sequence generation** Low risk of bias **Allocation concealment** High risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
	pulmonary disease: challenges of clinician-led data collection	Study setting *Participants were recruited from a primary care trust in the North of England.* Study dates *Not stated* Duration of follow-up *8 months* Sources of funding *Not stated* **Inclusion criteria** Diagnosis of COPD Patients referred to the primary care trust hospital discharge service *Additional requirements included: a safe discharge environment, temperature <37.8°C.* Hospital admissions due to COPD exacerbation *Between 1 and 3 previous admissions (including the current admission) in the previous 12 months from the current date of discharge where COPD is the primary or secondary documented reason for hospitalisation.* Fluent in English Respiratory rate <25 Oxygen saturation *SpO2 > 90% on air or pO2 > 7 kPa/pH 7.35–7.45* Systolic blood pressure 90–180 mm/Hg Orientated and alert/able to give consent Willing to consider using Telehealth as part of the discharge plan *Also have a telephone landline in the home (a requirement of the technology).* **Exclusion criteria** Cognitive impairment	*Random allocation to the two arms of the trial was generated through a web-based programme, accessed by the administrator for the COPD service, who generated the allocation online and informed the clinician immediately following receipt of consent.* **Blinding of participants and personnel** High risk of bias *Due the nature of the intervention, personnel and participants were not blind to group allocation.* **Blinding of outcome assessment** Low risk of bias *The outcome questionnaires and diaries of health service use were completed by the patients directly.* **Incomplete outcome data** High risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
		Significant co-morbidities *That require ongoing intervention from other community services.* Number of recent hospital admissions *More than three hospital admissions for COPD in the last 12 months.* Unsuitable to participate in trial *General practitioner (GP) identifies that person is unsuitable to participate (e.g., due to a mental health condition which could affect outcome measurements).* *Other significant impairment(s) which restrict ability to participate.* **Sample characteristics** Sample size *63* Split between study groups *Intervention: 32 Control: 31* Loss to follow-up *48/63 (76.1%) of participants completed the trial* %female *64.2* Mean age (SD) *66.6 years (10.5)* **Interventions** ***Telehealth monitoring*** *Participants received usual care plus the telehealth monitoring intervention for 8 weeks with 6 months follow-up after this period. The Telehealth system (Doc@Home) enables the patient to undertake daily vital signs monitoring. If monitored signs and symptoms fall outside anticipated parameters for the individual, or if the user fails to undertake monitoring activity, clinician alerts are generated so that appropriate action can be taken.*	*5 participants discontinued the intervention and only 76.1% of participants completed the trial.* **Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** Moderate *Despite the lack of blinding of participants and personnel the outcomes measured were not considered likely to be affected by these risks of bias, but a large number of people were lost to follow up which could have introduced bias.* **Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		Usual care *The supported discharge service consisted of six home visits over the 8-week time frame, resulting in a conservative estimate of 8 hours and 25 minutes of time spent with each patient.* **Outcome measure(s)** Number of hospitalisations due to COPD *The proportion of participants re-admitted to hospital with COPD during the 8-week intervention and 6-month follow-up.* The proportion of patients requiring unscheduled healthcare support Disease specific health-related quality of life (St. George respiratory questionnaire, SGRQ) Costs of intervention *Cost-effectiveness through quality adjusted life years (QALYs)*	
Cordova (2016)	A Telemedicine-Based Intervention Reduces the Frequency and Severity of COPD Exacerbation Symptoms: A Randomized, Controlled Trial	**Study type** • Randomised controlled trial **Study details** • Study location *Pennsylvania, USA.* • Study setting *Outpatient practices of study principal investigators.* • Study dates *Not stated.* • Duration of follow-up *No set follow-up time. Intervention group mean study duration was 323+/- 223 days, control group 364+/- 210 days.* • Sources of funding	**Random sequence generation** • Low risk of bias **Allocation concealment** • Low risk of bias **Blinding of participants and personnel** • High risk of bias *Participants and personnel were not blind to group*

Short Title	Title	Study characteristics	Risk of bias and directness
		Pennsylvania Department of Health. **Inclusion criteria** • Age 40-80 years old • Diagnosis of COPD • Current or former smoker • COPD hospitalisation in the past year or current home oxygen use **Exclusion criteria** • No significant co-morbidity **Sample characteristics** • Sample size *79* • Split between study groups *Intervention: 39; control 40.* • Loss to follow-up *34/39 (87.2%) in the intervention arm completed the trial; 33/40 (82.5%) in the control arm completed the trial.* • % female *61.2%* • Mean age (SD) *Intervention: 64 (6); control 63 (8) years.* • Smoking, pack-years, mean (SD)	*allocation.* **Blinding of outcome assessment** • Low risk of bias **Incomplete outcome data** • Low risk of bias **Selective reporting** • Low risk of bias **Other sources of bias** • Low risk of bias **Overall risk of bias** • Low **Directness** • Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		Intervention: 43(22); control 54 (25) **Interventions** • Usual care *This group followed their normal care plan. They were assessed at baseline and filled in an electronic diary, but this was not monitored.* • Heath focused telehealth monitoring *This group was assessed at baseline and filled in an electronic symptom assessment diary daily (including questions on sputum quantity colour and consistency; peak flow measurement using the peak flow metre supplied; breathlessness and cough). Information relayed to a central database. The electronic diary was evaluated using a computerised algorithm that compared the symptoms to baseline and generated an alert. If an alert was generated, the patients received a message to call the office. Monitored by a nurse and physician who prescribed interventions as needed.* **Outcome measure(s)** • Mortality • SGRQ and SF-36 scores • Number of hospitalisations • Borg dyspnoea score • Duke activity status index	
Demeyer (2017)	Physical activity is increased by a 12-week semiautomated telecoaching	**Study type** • Randomised controlled trial	**Random sequence generation**

Short Title	Title	Study characteristics	Risk of bias and directness
	programme in patients with COPD: a multicentre randomised controlled trial	**Study details** • Study location *Belgium, Greece, UK, Switzerland and The Netherlands* • Study setting *Six unspecified medical centres across Europe (Edinburgh, London, Athens, Leuven, Zurich and Groningen).* • Study dates *Not stated, but participants were enrolled between June and December 2014.* • Duration of follow-up *12 weeks* • Sources of funding *The PROactive project is funded by the Innovative Medicines Initiative Joint Undertaking (IMU JU) #115011. The Leuven study group was supported by the Flemish Research Foundation (grant # G.0871.13). HD is the recipient of a joint ERS/SEPAR Fellowship (LTRF 2015). ZL is the recipient of an ERS fellowship (LTRF 2016). The Zurich study group was supported by an additional grant of the Lung League Aargau (non-profit organisation) as well as by Swisscom AG who provided 30 sim cards and data usage of up to 1 GB per month. MIP's contribution to this work was supported by the NIHR Respiratory Biomedical Research Unit at the Royal Brompton and Harefield NHS Foundation Trust and Imperial College, London UK who part fund his salary.* **Inclusion criteria** • Age *> 40 years old* • Diagnosis of COPD • Stable COPD *Stable patients and those with a COPD exacerbation in the last month were*	• Low risk of bias **Allocation concealment** • Low risk of bias **Blinding of participants and personnel** • High risk of bias *Participants and personnel were not blinded to group allocation.* **Blinding of outcome assessment** • Unclear risk of bias *Unclear whether the personnel assessing the 6MWD and other outcomes at the second and final visits were blinded to group allocation.* • Low risk of bias *Activity was measured automatically via the step counter for the primary*

Short Title	Title	Study characteristics	Risk of bias and directness
		enrolled. • Smoking history *≥ 10 pack-years* **Exclusion criteria** • Respiratory conditions other than COPD *As the primary diagnosis* • Attendance of a pulmonary rehabilitation programme *Actively participating in, or planning to begin, pulmonary rehabilitation at the start of the trial.* • Inability to undertake an exercise regime • Unable to learn to use the telehealth device **Sample characteristics** • Sample size *343* • Split between study groups *Intervention: 172 Control: 171* • Loss to follow-up *318/343 (92.7%) of participants completed the trial and there was equal loss/ withdrawal in each arm of the study.* • % female *36.2* • Mean age (SD) *66.5 (8.0)* • FEV1, % predicted (mean, SD) *Intervention: 55 (20) Control: 57 (21)*	*outcome* **Incomplete outcome data** • Low risk of bias **Selective reporting** • Low risk of bias **Other sources of bias** • Low risk of bias **Overall risk of bias** • Moderate risk of bias *For the 6MWD outcome due to the lack of blinding of participants and uncertainty around blinding of outcome assessors* **Directness** • Partially directly applicable *Study includes people who have had a recent exacerbation (within the last month) as well as people with stable COPD.*

Short Title	Title	Study characteristics	Risk of bias and directness
		Interventions **• Telehealth monitoring** *Patients in the IG received the usual care plus the telecoaching intervention. This intervention included several components: a one-to-one interview with the investigator during the second visit discussing motivation, barriers, favourite activities and strategies to become more active; a step counter providing direct feedback on the step count, on a 2 × 3 cm display; a smartphone with the monitoring programme and a project-tailored coaching application. This application was specifically designed for use by patients with COPD in the present project. It provided automated coaching by displaying an activity goal (number of steps) and feedback on a daily basis. The feedback included a graphical representation of that day's performance and an educational tip. Patients' targets were automatically revised every Sunday, based on performance in the preceding week. Investigators could alter or 'lock' the goals if needed, based on interaction with the patient. Participants also received a booklet containing home exercises and a weekly group text message with activity proposals sent by the investigator, taking into account the local weather forecast. Telephone contacts were triggered in the case of non-compliance with wearing the step counter, failure to transmit data or failure to progress.* **• Usual care** *Patients in both groups received a standard leaflet explaining the importance of physical activity in COPD as well as information about physical activity recommendations. This leaflet was discussed with all patients in a 5–10 min one-to-one discussion with the investigator during the second visit. The usual medical treatment was not altered throughout the study.*	

Short Title	Title	Study characteristics	Risk of bias and directness
		Outcome measure(s) • 6 minute walk distance (6MWD) • Physical activity (other) *The increase in the number of steps per day over 3 months was the primary outcome. Time in at least moderate intense PA (MPA), walking time and movement intensity during walking were chosen as secondary PA outcomes.* • COPD Assessment Test (CAT)	
De San (2013)	Telehealth remote monitoring for community-dwelling older adults with chronic obstructive pulmonary disease	**Study type** Randomised controlled trial **Study details** Study location *Australia* Study setting *Study conducted by Silver Chain, a large health and community care organisation based in Western Australia.* Study dates *Not stated* Duration of follow-up *6 months* Sources of funding *Not stated* **Inclusion criteria** Diagnosis of COPD Location of patient/ clinic attendance *Lived in the metropolitan area and were clients of Silver Chain* Fluent in English Oxygen therapy	**Random sequence generation** Low risk of bias **Allocation concealment** Low risk of bias **Blinding of participants and personnel** High risk of bias *Due the nature of the intervention, personnel and participants were not blind to group allocation.* **Blinding of outcome assessment** Low risk of bias *No information provided, but the patients self-administered the CRQ-SAS questionnaire and data on healthcare usage*

Short Title	Title	Study characteristics	Risk of bias and directness
		Participants were receiving domiciliary oxygen **Exclusion criteria** Cognitive impairment *Specifically dementia* Motor deficits that might prevent the use of the telehealth measurement apparatus *Also cognitive issues that might have the same effect* Lack of a home telephone line **Sample characteristics** Sample size *80* Split between study groups *Intervention: 40 Control: 40* Loss to follow-up *71/80 (88.8%) of the participants completed the trial* %female *24.0% of the participants that completed the trial* Mean age (SD) *72.5 years (SD no data provided) for the participants that completed the trial* **Interventions** ***Telehealth monitoring*** *Telehealth monitoring using the HealthHUB device, which is a small unit with an integrated screen and large keys. Participants are trained in the use of the machine and given an educational book about COPD. Participants measured their vital signs (blood pressure, weight, temperature, oxygen saturation) and answered questions relating to their general health on a daily basis. The data was transmitted to a monitoring centre and reviewed by a telehealth nurse. Any*	*came from hospital records.* **Incomplete outcome data** Low risk of bias **Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** Low **Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		abnormal readings (baseline specified by GP or specialist) triggered an alert. The nurse would then phone the patient to discuss the measurements, provide advice/ support or recommend a visit to the GP. ***Usual care*** *The control group also received a visit from the telehealth nurse and were given the same COPD education booklet, but there was no other contact apart from data collection.* **Outcome measure(s)** Number of emergency department visits due to COPD Number of emergency department visits *Due to non-COPD symptoms and all events pooled* Number of hospitalisations due to COPD Number of all cause hospitalisations *Also hospitalisations due to non-COPD symptoms (reported separately)* Length of stay in hospital *Due to COPD or non-COPD symptoms or all causes (reported separately)* Number of telehealth nurse visits *Also duration of visits, number of telephone calls* Number of outpatient visits to a specialist *Due to COPD and non-COPD symptoms or all causes (reported separately)* Number of visits to general practitioner (GP) *Due to COPD and non-COPD symptoms (reported separately)* Disease specific health-related quality of life (Chronic Respiratory Questionnaire, CRQ) *Self-Administered Standardised version (CRQ-SAS)* Patient satisfaction survey Costs of intervention	

Short Title	Title	Study characteristics	Risk of bias and directness
Farmer (2017)	Self-Management Support Using a Digital Health System Compared With Usual Care for Chronic Obstructive Pulmonary Disease: Randomized Controlled Trial	**Study type** Randomised controlled trial **Study details** Study location *UK* Study setting *People with COPD attending respiratory hospital outpatient clinics and pulmonary rehabilitation courses in the adjacent counties of Oxfordshire and Berkshire, UK.* Study dates *The first participant was randomized on June 26, 2013 and follow-up was completed on July 27, 2015.* Duration of follow-up *12 months* Sources of funding *Department of Health and Wellcome Trust through the Health Innovation Challenge (HIC) Fund commissioned by the Health Innovation Challenge Fund (HICF-1010-032), a parallel funding partnership between the Wellcome Trust and the Department of Health.* **Inclusion criteria** Age *≥40 years* Diagnosis of COPD *Defined as a forced expiratory volume in 1 s (FEV1), post-bronchodilation of <70%, and a predicted ratio of FEV1 to forced vital capacity of <0.70.* Smoking history *>10 pack-years* FEV1/FVC	**Random sequence generation** Low risk of bias **Allocation concealment** Unclear risk of bias *No information provided* **Blinding of participants and personnel** High risk of bias *Due to the nature of the intervention, participants and personnel were not blind to group allocation.* **Blinding of outcome assessment** Low risk of bias *No information is provided about whether the outcome assessors were blind to group allocation, but the outcomes were recorded by the participants and confirmed by consulting GP and hospital admission records where possible.*

Short Title	Title	Study characteristics	Risk of bias and directness
		<0.7 FEV1, % predicted *<70%* Breathlessness *Medical Research Council dyspnoea (breathlessness) score of ≥2* Exacerbations during the past 12 months *>1 exacerbation of COPD requiring home treatment or hospital admission in the previous year* Registered with a general practitioner (GP) Referred for pulmonary rehabilitation **Exclusion criteria** Respiratory conditions other than COPD *Other significant lung disease* Cognitive impairment Heart failure *Chronic heart failure (defined by the New York Heart Association classification system as severe (grade IV))* Outside of the internet coverage area *People living in areas without access to an Internet-enabled mobile phone network are excluded.* Life expectancy *< 3 months* **Sample characteristics** Sample size *166* Split between study groups *Intervention: 110 Control: 56*	**Incomplete outcome data** Low risk of bias **Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** Low **Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		Loss to follow-up *141/166 (84.9%) of participants completed the trial. Intervention: 14/110 withdrew or died (12.7%) Control: 7/56 withdrew or died (12.5%)* %female *34.6* Mean age (SD) *69.8 years (9.6)* Smoking status and history *Smoking history n (%) Intervention: Current: 23 (20.9) Ex-smoker (<2 years):17 (15.5) Ex-smoker (≥2 years): 70 (63.6) Control: Current: 13 (23.2) Ex-smoker (<2 years): 8 (14.3) Ex-smoker (≥2 years): 35 (62.5)* **Interventions** ***Telehealth monitoring*** *Participants were randomised to receive a system of care (the EDGE intervention) delivered via a digital health Internet-linked platform implemented on a low-cost tablet computer (the EDGE platform) providing monitoring and self-management support. The EDGE intervention incorporates a daily symptom diary consisting of standard questions about symptoms. 30-s period of data acquisition using a Bluetooth-enabled pulse oximeter with finger probe allows daily collection of heart rate and oxygen saturation data. Mood screening questionnaires were presented each month for completion. The EDGE platform also includes a number of software modules, including videos tailored to the patient's entries in the symptom diary or answers to the mood-screening questionnaires. These videos provide additional self-management support. These include inhaler techniques, pulmonary rehabilitation exercises, and self-management techniques for breathlessness.* *Participants were informed that the EDGE platform was not a replacement for their usual clinical care, and that in the event of deterioration in their health they*	

Short Title	Title	Study characteristics	Risk of bias and directness
		should contact their general practitioner or community respiratory nurse as usual. Baseline data was collected for 6 weeks to establish the normal range of readings for each individual. After this time the data was reviewed twice weekly by a health professional or sooner if an alert was issued by the system. This happened when readings were missing or outside the normal range. The participant was contacted if there was judged to be a clinically important change. ***Usual care*** *Participants allocated to receive standardized usual care were provided with all the information given to those allocated to use the EDGE system, but without the use of a tablet computer or the facility for daily monitoring of symptoms and physiological variables. Participants were provided with leaflets based on those currently produced by the Oxfordshire Community Respiratory service.* **Outcome measure(s)** Mortality Number of hospitalisations Length of stay in hospital Number of exacerbations *Defined as episodes in which antibiotics or oral steroids were prescribed or in which the patients were seen in the accident and emergency department or admitted to hospital in the presence of an acute change in respiratory symptoms.* Time to first exacerbation Adherence (compliance) with a medication regimen *Medication Adherence Report Schedule* Disease specific health-related quality of life (St. George respiratory questionnaire, SGRQ) Alternative anxiety and depression measures *Mood measured with the Standard Checklist 20-item Questionnaire (SCL-20) for*	

Short Title	Title	Study characteristics	Risk of bias and directness
		depression and the Standard Checklist 10-item Anxiety Measure (SCL-10A). Generic health-related quality of life (EuroQoL-5D questionnaire) Beliefs about respiratory medicine use *Beliefs about Medicines Questionnaire* Smoking cessation	
Ho (2016)	Effectiveness of Telemonitoring in Patients with Chronic Obstructive Pulmonary Disease in Taiwan-A Randomized Controlled Trial	**Study type** Randomised controlled trial **Study details** Study location *Taiwan* Study setting *National Taiwan University Hospital, a tertiary-care referral centre in Northern Taiwan.* Study dates *Not stated, but participants were recruited between December 2011 and July 2013.* Duration of follow-up *6 months* Sources of funding *This study was supported by a grant from the National Taiwan University (NTUCESRP- 101R7608-3).* **Inclusion criteria** Age *≥ 20 years old* Diagnosis of COPD Active or ex-smoker FEV1/FVC	**Random sequence generation** Low risk of bias **Allocation concealment** Unclear risk of bias *No information provided* **Blinding of participants and personnel** High risk of bias *Due to nature of the intervention, participants and personnel were not blind to group allocation* **Blinding of outcome assessment** Unclear risk of bias *No information provided* **Incomplete outcome data** Low risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
		< 0.7 Admitted to the hospital multidisciplinary combined care wards *With COPD exacerbation as the main diagnosis* Discharge to home Access to the internet plus or minus phone *Phone required* **Exclusion criteria** Subject refusal to participate in the study Involvement in other research trials Inability to access the trial website **Sample characteristics** Sample size *106* Split between study groups *Intervention: 53 Control: 53* Loss to follow-up *106/106 (100%) of participants completed the trial* %female *23.6* Mean age (SD) *80.2 years (8.7)* Smoking status and history *Smoking, pack-years Intervention: 58 (SD 43) Control: 47 (SD 31)* FEV1, % predicted (mean, SD) *Intervention: 62 (SD2 3) Control: 62 (SD 21)*	**Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** Low *Despite the lack of blinding of participants, personnel and uncertainty surrounding the blinding of outcome assessors the outcomes measured were not considered likely to be affected by bias.* **Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		Interventions ***Telehealth monitoring*** *Patients continued to receive usual care from their primary care physicians and had access to a dedicated phone line was available for medical counselling provided by study nurses from 8 am to 8 pm on a daily basis. In addition, intervention group patients were trained to use a pulse oximeter, thermometer and sphygmomanometer and how to keep an online diary. The patients were instructed to report their symptoms using the electronic diary on the website each day for two months after discharge. The diary consisted of eight questions involving disease-related symptoms, vital signs and weight, and took about two min to complete. The submitted data was processed based on a pre-define algorithm and a warning was generated if the data indicated a potential exacerbation. The system notified the study nurses and attending pulmonologists to assess the data and respond to the situation by contacting and evaluating the patient by phone as clinically indicated. Based on the best clinical judgment, the patient could be referred to the clinic or emergency department.* ***Usual care*** *Patients continued to receive usual care from their primary care physicians and had access to a dedicated phone line was available for medical counselling provided by study nurses from 8 am to 8 pm on a daily basis.* **Outcome measure(s)** Number of all cause hospitalisations Time to first emergency department visit for COPD exacerbation Number of all cause emergency department visits Time to first hospital admission due to a COPD exacerbation *A COPD exacerbation was considered the primary diagnosis if the presenting*	

Short Title	Title	Study characteristics	Risk of bias and directness
		symptoms were consistent with and the patients were treated for COPD exacerbation, and no other disease was managed as a priority.	
Jodar-Sanchez (2013)	Implementation of a telehealth programme for patients with severe chronic obstructive pulmonary disease treated with long-term oxygen therapy	**Study type** Randomised controlled trial **Study details** Study location *Spain* Study setting *Not stated* Study dates *Participants were recruited between September and December 2010.* Duration of follow-up *4 months* Sources of funding *Funded by the Spanish Ministry of Science and Innovation, Linde Healthcare (medical equipment) and a grant form Network for Innovation in Medical Technologies and Health, promoted by the Carlos III Health Institute.* **Inclusion criteria** Diagnosis of COPD *Diagnosed with COPD and chronic respiratory failure that requires long term oxygen according to international guidelines.* Stable COPD *Clinically stable for the last 3 months* Hospital admissions due to COPD exacerbation *For a respiratory illness in the last 12 months*	**Random sequence generation** Low risk of bias **Allocation concealment** Unclear risk of bias *No information provided* **Blinding of participants and personnel** High risk of bias *Participants and personnel were not blind to group allocation* **Blinding of outcome assessment** Unclear risk of bias *No information was provided* **Incomplete outcome data** Low risk of bias *Nearly all participants (2 died) completed the trial and all were included in the analysis.*

Short Title	Title	Study characteristics	Risk of bias and directness
		Exclusion criteria Lack of informed consent to participate in trial Patients who did not use long term oxygen (LTOT) Lack of a home telephone line **Sample characteristics** Sample size *45* Split between study groups *Intervention: 24 Control: 21* Loss to follow-up *43/45 (95.6%) of the participants completed the trial, but data was analysed for all participants. There were 2 deaths, one per trial arm.* %female *4.4* Mean age (SD) *72.6 years (8.9)* FEV1, % predicted (mean, SD) *Intervention: 38 (SD 10) Control: 37 (13)* **Interventions** ***Telehealth monitoring*** *Patients were trained in the use of the supplied equipment and monitored their vital signs from Monday to Friday at a set time using a spirometer, pulse oximeter, a heart rate and a blood pressure monitor. Initial data was collected at baseline by the clinical team and used to set thresholds for exacerbation alerts. The data collected by the patient was relayed daily to the clinical team who received an automated alert from the system indicating whether the readings were within normal limits (no further action required), needed repeating or if they fall outside of*	**Selective reporting** Low risk of bias *All participants were included in the analysis.* **Other sources of bias** Low risk of bias **Overall risk of bias** Low *Despite the lack of blinding of participants and personnel the outcomes measured were not considered likely to be affected by bias.* **Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		the predefined limits and a clinical response is needed. In this case the clinical team contact the patient to confirm symptoms and gather more information. If the alert is confirmed, the clinical team contacts the case manager who monitors the symptoms over 24hrs, recommends prescribed medications or refers to the patient to primary care in mild-moderate cases. In severe cases the patient is referred to specialised care on the same day and in very severe cases is referred to the emergency department. ***Usual care*** *Patients received conventional medical care.* **Outcome measure(s)** Number of emergency department visits Number of hospitalisations Number of exacerbations Disease specific health-related quality of life (St. George respiratory questionnaire, SGRQ) Generic health-related quality of life (EuroQoL-5D questionnaire) Patient satisfaction survey	
Kenealy (2015)	Telecare for diabetes, CHF or COPD: effect on quality of life, hospital use and costs. A randomised controlled trial and qualitative evaluation	**Study type** Randomised controlled trial **Study details** Study location *New Zealand* Study setting *The study was based in 3 areas. Site B is a major city hospital and contributed patients with chronic obstructive pulmonary disease (COPD).* Study dates	**Random sequence generation** Low risk of bias **Allocation concealment** Low risk of bias **Blinding of participants and personnel** High risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
		September 2010 and February 2012 Duration of follow-up *3 to 6 months* Sources of funding *Not stated* **Inclusion criteria** Age *≥ 16 years old* Diagnosis of COPD Fluent in English Participant lived at home Ability to physically manage equipment *Or have a person willing to assist* **Exclusion criteria** Cognitive impairment *< 8/10 on the Abbreviated Mental Test Score* Significant co-morbidities *Serious current physical or mental illness.* Involvement in other research trials *Previous use of telecare.* **Sample characteristics** Sample size *48* Split between study groups *Intervention: 24 Control: 24* Loss to follow-up	*Once allocation was assigned, neither patients nor their health professionals were blind to the intervention.* **Blinding of outcome assessment** Low risk of bias *Blind adjudication over whether hospital admissions and outpatient appointments were relevant to COPD was conducted by two study authors.* **Incomplete outcome data** Low risk of bias **Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** Low

Short Title	Title	Study characteristics	Risk of bias and directness
		The COPD study was part of a larger trial looking at telehealth monitoring congestive heart failure and diabetes as well as COPD. No patients were lost to follow up, but some discontinued the trial due to deaths in the intervention arm (2) and in the control arm (2). One person in the control arm withdrew during the trial. Data was analysed from all 48 participants (100%) of the COPD trial, but there was partial data in 11/24 people in the intervention arm and 9/24 in the control arm. %female *37.5* Median age (IQR) *Intervention: 67 (64-74) Control: 67.5 (63-72.5)* Co-morbidities *Intervention: 4/24 with diabetes, 5/24 with congestive heart failure Control: 2/24 with diabetes, 5/24 with congestive heart failure* **Interventions** ***Telehealth monitoring*** *Intervention patients were provided with a 'health hub' supplied by Docobo. The hub was a small device with a LCD display to provide instructions, ask pre-programmed disease-specific questions, or convey short messages from the nurses monitoring the data. Patients entered data manually using buttons on the hub. Patients with COPD were provided with scales and a pulse oximeter. Patients entered the data manually. Data were collected by Docobo and relayed to the monitoring stations where they were viewed on a proprietary web-based interface. Each intervention patient was initially clinically reviewed either in clinic by a respiratory nurse specialist in the patient's home. Following this, patients were visited at home by nurses who set up the telecare equipment and trained patients, and family members where relevant, to use it. Data were routinely collected once a day, usually in the morning, and transmitted in batches to*	**Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		Docobo at midnight, for review by nurses the following weekday morning. There was provision for patients to send additional data when required, such as if the monitoring nurse contacted them and requested additional measurements. At the monitoring stations, the nurses would see summary information from each patient on a single screen, annotated with red, yellow or green indicating whether readings were within targets set for that patient. Black indicated that no data had been received. Nurses were expected to use the system to record their response to abnormal or absent results. There were no set guidelines provided for clinicians to follow in the intervention other than to provide best practice care based on the review of the their (near) daily feedback via telecare. The advice given to patients was not different from than given if the clinician had seen the patient in a face to face consultation, however the clinicians were able to initiate a phone call or other contact. ***Usual care*** *Patients were often followed by telephone and/or by home visit after leaving hospital.* **Outcome measure(s)** Number of emergency department visits Number of hospitalisations Length of stay in hospital Number of outpatient visits to a specialist Disease specific health-related quality of life (St. George respiratory questionnaire, SGRQ) Hospital Anxiety and Depression Scores (HADS) Generic health-related quality of life (Medical Outcomes Study Short Form Health Survey, SF-36) Costs of intervention	

Short Title	Title	Study characteristics	Risk of bias and directness
		Self-efficacy *For Managing Chronic Disease*	
McDowell (2015)	A randomised clinical trial of the effectiveness of home-based health care with telemonitoring in patients with COPD	**Study type** Randomised controlled trial **Study details** Study location *UK* Study setting *Two unspecified centres in Northern Ireland. Patients were recruited from a specialist respiratory service there.* Study dates *Not stated, but participants were recruited between August 2009 and January 2010.* Duration of follow-up *6 months* Sources of funding *Grant from the European Centre for Connected Health.* **Inclusion criteria** Diagnosis of COPD *Moderate to severe (GOLD stage 2 or 3)* Other conditions *At least 2 of the following: emergency department admissions; hospital admission or emergency GP contacts in the 12 months before the study.* **Exclusion criteria** Respiratory conditions other than COPD Cognitive impairment	**Random sequence generation** Low risk of bias **Allocation concealment** Low risk of bias **Blinding of participants and personnel** High risk of bias *Due to the nature of the intervention participants and personnel were not blind to group allocation.* **Blinding of outcome assessment** Unclear risk of bias *No information provided, but outcome data collected from hospital records is less likely to have been affected by bias.* **Incomplete outcome data** Low risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
		Patients cognitively unable to learn the process of telehealth monitoring **Sample characteristics** Sample size *110* Split between study groups *Intervention: 55 Control: 55* Loss to follow-up *100/110 (91.0%) of participants completed the trial (5 withdrew from the telehealth arm, and 5 people died in total)* %female *56.4* Mean age (SD) *70.0 years (7.3)* Smoking status and history *Current smokers (%) Intervention: 38.2 Control: 32.7 Smoking history (pack years, mean, SD) Intervention: 49.4 (25.4) Control: 43.0 (19.9)* FEV1, % predicted (mean, SD) *Intervention: 45.5 (13.7) Control: 43.4 (11.3)* **Interventions** ***Telehealth monitoring*** *Patients received the same care as the control group plus the telehealth monitoring intervention. The monitoring device was connected to the home telephone and pre-loaded with personal information (including monitoring start time; clinical observations and questions relating to symptoms). The patient was trained to use the machine. Each monitoring session lasted about 10 mins and the patient would attach a finger probe and blood pressure cuff and answer the set questions ('yes' or 'no). The monitoring was carried out at the same time each day*	**Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** Low *Despite the lack of blinding of participants, personnel (and possibly outcome assessors) most of the outcomes measured were not considered likely to be affected by bias.* **Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		for 5 days in a row. Data was transmitted and a trend report sent to the Community Respiratory Team (CRT) which was used to set normal limits for the individual patient. Patients were then monitored daily for 6 months by a dedicated nurse and an alert was issued if there were results outside normal levels or worrying answers to the questions. A second set of measurements would then be requested from the patient and if these were also abnormal then the CRT was alerted to decide whether a home visit or hospital admission was required. If the alert occurred at a weekend the nurse could contact an out of hours GP. If the patient had normal responses for 3-4 days in a row the nurse would call to check that everything was alright (no unreported issues, technology issues) and reassure the patient. ***Usual care*** *Participants received a standardised home-based programme of specialist respiratory assessment and monitoring by the local Community Respiratory Team (CRT) and GP, which was based on Department of health guidelines. The CRT nurse and physiotherapist offered each patient 2 home visits within 2 weeks of receiving the referral. During these visits the patients received education about their disease and recognising an exacerbation, smoking cessation information and a review of self-management techniques. If the patient experienced an exacerbation they contacted the CRT or GP and a decision was made about management of the exacerbation at home or in hospital. If managed at home they were monitored by the CRT until the exacerbation passed. All patients were offered access to pulmonary rehabilitation and a weekly maintenance exercise class.* **Outcome measure(s)** Number of exacerbations Disease specific health-related quality of life (St. George respiratory	

Short Title	Title	Study characteristics	Risk of bias and directness
		questionnaire, SGRQ) Hospital Anxiety and Depression Scores (HADS) Generic health-related quality of life (EuroQoL-5D questionnaire) Patient satisfaction survey Costs of intervention *Cost-effectiveness*	
Nguyen (2009)	Pilot study of a cell phone-based exercise persistence intervention post-rehabilitation for COPD	**Study type** Randomised controlled trial **Study details** Study location *USA* Study setting *Not stated* Study dates *Not stated* Duration of follow-up *6 months* Sources of funding *This study was supported in part by: R03 NR009361 and 1KL2RR025015-01; Omron Healthcare donated the pedometers.* **Inclusion criteria** Age *≥ 40 years* Stable COPD FEV1/FVC *Pulmonary function results show moderate to severe disease according to GOLD criteria (forced expiratory volume in one second [FEV1]/forced vital capacity [FVC]*	**Random sequence generation** Low risk of bias **Allocation concealment** Low risk of bias **Blinding of participants and personnel** High risk of bias *Due to the nature of the intervention participants and personnel were not blind to group allocation.* **Incomplete outcome data** Low risk of bias **Selective reporting** Low risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
		<70% and FEV1 <80%) Permission from health provider Fluent in English No plans to participate in a maintenance program Oxygen therapy *Patients receiving supplemental oxygen were acceptable providing O2 saturation was maintained at >88% on <6 L/min of nasal oxygen during the six minute walk (6MW) test.* **Exclusion criteria** Significant co-morbidities *Active symptomatic illness (e.g. cancer, heart failure, ischemic heart disease, neuromuscular disease, psychiatric illness)* Unsuitable to participate in trial *Unable (e.g. severe arthritis) or unwilling to use the study issued cell phone.* Outside of the internet coverage area **Sample characteristics** Sample size *17* Split between study groups *Intervention: 9 Control: 8* Loss to follow-up *16/17 (94.1%) participants completed the trial, but data was analysed for all participants.* %female *64.7* Mean age (SD) *68.2 years (10.4)*	**Other sources of bias** Low risk of bias **Overall risk of bias** Low *Despite the lack of blinding of participants, personnel (and possibly outcome assessors) most of the outcomes measured were not considered likely to be affected by bias.* **Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		FEV1, % predicted (mean, SD) *Intervention: 46.7 (18.7) Control: 34.4 (SD 15.0)* **Interventions** ***Telehealth monitoring*** *The MOBILE-Coached (MOBILE-C) intervention had 2 components: collaborative monitoring of symptoms and exercise and ongoing reinforcement feedback. Participants submitted daily information about their symptoms and exercise. Once the data were submitted participants received an instant text feedback summarizing the exercises they completed for that week. The data were transmitted to a central server and the nurse was able to review these data for each participant. Participants used Likert scales to rate their overall health. Automatic alerts were sent to the nurse's cell phone if participants responded having "marked" symptoms for two consecutive days. The nurse followed up via text messaging or telephone as necessary. Ongoing reinforcement feedback was provided via weekly short text messages to the participant's cell phone, by the nurse, based on submitted exercise and symptom information. Participants confirmed receipt of these messages by replying with short text responses or less frequently, with several follow up text messages. Participants were telephoned for situations where more extensive interactions was appropriate, e.g. coaching on problem solving strategies to overcome reported barriers to exercise, assessing whether participants were experiencing an exacerbation and encouraging follow up with their health provider, or assistance with adjustments to exercise goals in response to changes in health status.* ***Another control intervention*** *All participants were trained on entering data via the cell phone (Treo 650 or 700™, Palm Inc., Sunnyvale, CA, USA), asked to provide a return demonstration,*	

Short Title	Title	Study characteristics	Risk of bias and directness
		and were given a step-by-step help booklet with screenshots of the cell phone displays. *All participants were trained in the use of the exercise programme. The exercise program was individualized according to participants' performance on the exercise tests, breathlessness at end of exercise, access to community-based exercise facilities, and preferred exercise mode. They were encouraged to accumulate up to a total of 150 minutes of moderate-intensity endurance exercise per week (3–5 sessions per week) per national physical activity guidelines and to continue with upper and lower body resistance exercises initiated during PR. The nurse also discussed signs and symptoms participants typically experienced with the onset of a COPD exacerbation, strategies for self-care, and how to adjust exercise as needed during these episodes. Participants were given a copy of a generic exacerbation action plan with their specific signs and symptoms listed and were encouraged to discuss and modify the action plan with their health provider. They were provided a booklet with exercise tips, local resources, and pictures of stretching and strengthening exercise as well as an Omron HJ-112 digital pedometer. Control participants (MOBILE- Self-Monitored, MOBILE-SM) continued to use the cell phone to enter information about their symptoms and exercise on a daily basis and were encouraged to call the research office if they had questions about their exercise or COPD over the course of the study. A standard text message was sent to participants each week to thank and encourage them to continue to submit their data. MOBILE-SM participants did not receive any other prompting or personalized feedback; the symptom alert was also disabled.* **Outcome measure(s)** Disease specific health-related quality of life (Chronic Respiratory Questionnaire, CRQ)	

Short Title	Title	Study characteristics	Risk of bias and directness
		Generic health-related quality of life (Medical Outcomes Study Short Form Health Survey, SF-36) 6 minute walk distance (6MWD) Incremental cycle ergometer test Free-Living Ambulatory Physical Activity *Measured using a pager-sized, lightweight, Stepwatch® 3 Activity Monitor that directly and continuously records gait cycles (strides) based on acceleration, position, and timing information.* Self-efficacy *Self-efficacy for overcoming barriers to exercise was measured using a 15-item Exercise Barriers Efficacy Scale* Support for exercise *Support for exercise was measured with a 13-item Social Support and Exercise Survey*	
Pare (2013)	Comparing the costs of home telemonitoring and usual care of chronic obstructive pulmonary disease patients: A randomized controlled trial	**Study type** Randomised controlled trial **Study details** Study location *Canada* Study setting *Greater Montreal area - Service regional de soins a domicile (SRSAD) specialised home care service for people with chronic lung disease.* Study dates *Participants were recruited from September 2010- March 2011* Duration of follow-up *21.5 months (12 months pre-intervention, 6 month intervention, 3.5 months post-intervention)* Sources of funding	**Allocation concealment** Unclear risk of bias *No information provided* **Blinding of participants and personnel** High risk of bias *Due to the nature of the intervention, participants and personnel were not blinded to group allocation.* **Blinding of outcome assessment** Low risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
		Not stated **Inclusion criteria** Diagnosis of COPD FEV1, % predicted *< 45%* Hospital admissions due to COPD exacerbation *At least once during the year prior to inclusion in the study* Fluent in English *Or French* Willingness to manage health *With or without an informal carer* **Exclusion criteria** Cognitive impairment *That would make them unable to participate in their own treatment* Psychiatric illness *Uncontrolled psychiatric illness or psychological problems* Unable to learn and use the telehealth device *Due to a visual or motor deficit. Exceptions were made if a caregiver was available to help them.* Lack of a home telephone line **Sample characteristics** Sample size *120* Split between study groups *Intervention: 60 Control: 60* Loss to follow-up	*Data was collected from the administrative systems of hospitals in the Greater Montreal area.* **Incomplete outcome data** Low risk of bias *The study authors carried out a logistical regression analysis to examine the similarities between the drop-outs and the remaining participants in both study arms. Based on the results, they concluded that there was no evidence of attrition bias.* **Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** Low *Due to the nature of the outcomes, the lack of blinding of study participants and personnel is not thought to be*

Short Title	Title	Study characteristics	Risk of bias and directness
		100/120 (83.3%) of the participants completed the trial %female *68.3* Mean age (SD) *68.2 years (6.6)* **Interventions** ***Telehealth monitoring*** *Participants were provided with a touch screen with an integrated modem (TELUS system). A custom follow-up programme was set up and the patients were taught to use the device. Every day they had to complete a table documenting symptoms and medical consumption. They also read an educational module called 'Living well with COPD' which was aimed at improving self-management of the disease. The information was sent to the case managers for review and also automatically analysed by the system, with a warning given to both the patient and nurse if the data was outside normal levels for the individual patient. In these cases the system sent out pre-programmed advice to the patient (based on the Canadian Thoracic Society COPD guideline and the 'Living well with COPD' programme). The case nurse would also be alerted and contact the patients as needed or contact the attending physician to determine an appropriate response. The intervention lasted for 6 months and then there was a follow-up period of 3.5 months.* ***Usual care*** *Monitoring by the SRSAD team as normal.* **Outcome measure(s)** Number of emergency department visits due to COPD Number of hospitalisations due to COPD	*an issue.* **Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		Number of visits to general practitioner (GP) *Or visits from a nurse or physiotherapist* Costs of intervention *Also costs of the healthcare services consumed*	
Pinnock (2013)	Effectiveness of telemonitoring integrated into existing clinical services on hospital admission for exacerbation of chronic obstructive pulmonary disease: researcher blind, multicentre, randomised controlled trial	**Study type** Randomised controlled trial **Study details** Study location *UK* Study setting *Lothians region of Scotland* Study dates *Not stated, but participants were recruited between 21 May 2009 and 28 March 2011,* Duration of follow-up *12 months* Sources of funding *Support from the Chief Scientist Office of the Scottish government and NHS Lothian for the submitted work; one author is supported by a primary care research career award from the Chief Scientist's Office of the Scottish government; another 2 are supported via NHS Lothian through the Edinburgh Health Services Research Unit; another author is supported by the Commonwealth Fund, a private independent foundation based in New York City.* **Inclusion criteria** Diagnosis of COPD *Diagnosis of COPD was confirmed by the presence of chronic airflow limitation on spirometry normally performed at the baseline assessment by the research nurse*	**Random sequence generation** Low risk of bias **Allocation concealment** Low risk of bias *The research nurse phoned the randomisation service and informed the participant of the allocation.* **Blinding of participants and personnel** High risk of bias *Due to the nature of the intervention it was not possible to blind participants or personnel* **Blinding of outcome assessment** Low risk of bias *The research nurse responsible for follow-up assessments was different to*

Short Title	Title	Study characteristics	Risk of bias and directness
		trained in spirometry. COPD was confirmed if the post-bronchodilator forced expiratory volume in one second (FEV1) divided by the forced vital capacity was less than 0.7. FEV1/FVC *< 0.7* Patient gave informed consent to participate in trial **Exclusion criteria** None reported **Sample characteristics** Sample size *256* Split between study groups *Intervention: 128 Control: 128* Loss to follow-up *205/256 (80.0%) of participants completed the final questionnaire, but data was available from records for 254/245 (99.2%) of participants. Overall 37 people died during the trial.* %female *52.6* Mean age (SD) *68.9 years (8.6)* Smoking status and history *No of participants (%) Intervention: Never smoked: 2 (2) Ex-smoker: 89 (70) Current smoker: 37 (29) Control: Never smoked: 0 (0) Ex-smoker: 98 (77) Current smoker: 30 (23)* FEV1, % predicted (mean, SD)	*the nurse who performed randomisation, and data entry was undertaken by trial administrators blinded to allocation. All primary outcome assessors were blind to the allocation.* **Incomplete outcome data** Low risk of bias *Although only 80% participants completed the questionnaire at the end of the trial, data from records was available for 127/128 people in each arm.* **Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** Low *Due to the nature of the outcomes and the blinding of outcome assessors*

Short Title	Title	Study characteristics	Risk of bias and directness
		Intervention: 44.0 (SD 18.1) Control: 40.0 (17.0) **Interventions** ***Telehealth monitoring*** *Using the touch screen telehealth monitoring equipment, the participant recorded and transmitted a daily questionnaire about symptoms and use of treatment, and monitored oxygen saturation using linked validated instruments. The symptom score was based on validated diary cards, and the patient was asked to assess if their breathlessness, sputum purulence and volume, cough, wheeze had increased or if they had developed an upper respiratory tract infection or had a fever. The responses were weighted as described in the validation studies: positive answers to cardinal symptoms of an exacerbation of COPD scored 2, the remaining questions scored 1. This information was sent by a secure internet connection to a password protected server at the UK's health service, which was accessible to the supporting clinical team who monitored the online data daily. Algorithms, based on the symptom score, alerted the clinical monitoring team if daily readings had not been submitted or if a score of 4 or 5 had been recorded. The action taken was the responsibility of the monitoring clinician who took into account the patient's history. Typically, this involved contacting the patient by telephone and undertaking a further clinical assessment to enable a decision about further management (for example, commencing rescue treatment, a home visit, immediate admission, or reviewing the following day).* *Usual care* *Intervention and control groups were provided with the same clinical care (including self-management advice) according to the region in which they lived.* **Outcome measure(s)** Lung Information Needs Questionnaire (LINQ) Mortality	**Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		Due to COPD Number of emergency department visits *Number and duration of visits* Time to first hospital admission due to a COPD exacerbation *Primary diagnosis of an exacerbation of COPD up to one calendar year after randomisation. An exacerbation was considered the "primary diagnosis" if the presenting symptoms were consistent with and the participant was treated for an acute exacerbation of COPD, and if no other disease was treated as a priority.* Number of exacerbations Adherence (compliance) with a medication regimen *Medication Adherence Report Scale* Disease specific health-related quality of life (St. George respiratory questionnaire, SGRQ) Hospital Anxiety and Depression Scores (HADS)	
Ringbaek (2015)	Effect of tele health care on exacerbations and hospital admissions in patients with chronic obstructive pulmonary disease: a randomized clinical trial	**Study type** Randomised controlled trial **Study details** Study location *Denmark* Study setting *Participants were recruited from four hospitals with specialised pulmonary wards in Copenhagen (Hvidovre Hospital, Amager Hospital, Herlev Hospital, and Bispebjerg Hospital).* Study dates *Not stated, but the trial recruited participants between November 2013 and April 2014.* Duration of follow-up *6 months*	**Random sequence generation** Low risk of bias *1:1 allocation using randomized blocks of four (via numbered envelopes)* **Allocation concealment** Unclear risk of bias *Insufficient information provided* **Blinding of participants and personnel** High risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
		Sources of funding *Not stated* **Inclusion criteria** Diagnosis of COPD *COPD defined according to the GOLD criteria* FEV1/FVC *< 0.7* FEV1, % predicted *< 60* Location of patient/ clinic attendance *Residents in one of the six municipalities in the Copenhagen area and in the catchment area of one of the four recruiting hospitals* Hospital admissions due to COPD exacerbation *Within the previous 36 months and/or treated with LTOT for at least 3 months.* Regular scheduled visits to the respiratory outpatient clinics COPD judged by the study staff as the main cause of disability **Exclusion criteria** Recent exacerbation *COPD exacerbation within the 3 weeks prior to enrolment requiring a change in medical treatment* Subject refusal to participate in the study Cognitive impairment Unable to participate due to a language barrier Unable to learn to use the telehealth device *Unable to use a tablet computer* Lack of a home telephone line *Not possible to establish a working telephone line*	*Due to the nature of the intervention participants and personnel were not blind to group allocation.* **Blinding of outcome assessment** Low risk of bias *No information provided, but the Danish National Registry of Patients and the Danish National Registry of Deaths provided information on all hospital admissions, visits to emergency rooms, and vital status during the 6-month study period, so this would be less likely to result in a risk of bias even if the assessors were aware of the group allocations.* **Incomplete outcome data** Low risk of bias **Selective reporting** Low risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
		Planned vacation or other stay outside the catchment area for 2 weeks or more during the study period **Sample characteristics** Sample size *281* Split between study groups *Intervention: 141 Control: 140* Loss to follow-up *248/281 (88.3%) of participants completed the trial. 100% of participants were analysed for outcomes at 6 months or until death.* %female *53.0* Mean age (SD) *69.6 years (9.5)* Smoking status and history *Current smokers, N (%) Intervention: 35 (24.8%) Control: 47 (33.6%) Pack years, mean (range) (data missing for some participants) Intervention: 42.9 (0–210) Control: 41.0 (0–110)* FEV1, % predicted (mean, SD) *Intervention: 34.9 (13.3) Control: 33.8 (12.0) (missing data for one patient)* **Interventions** *All patients enrolled in the trial were managed according to national and international guidelines, including outpatient pulmonary rehabilitation for patients with COPD with FEV1 <50% predicted and Medical Research Council (MRC) dyspnoea (breathlessness) score ≥ 3 and supported discharge to selected in-hospital patients to reduce the risk of early readmission.*	**Other sources of bias** Low risk of bias **Overall risk of bias** Low *Due to the nature of the outcomes assessed and the sources of data used in the study it is less likely that a lack of blinding of participants, personnel and (perhaps) assessors would affect the outcomes.* **Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		Telehealth monitoring *The equipment comprised a tablet computer with a web camera, a microphone, and measurement equipment (spirometer, pulse oximeter, and bathroom scale). Patients also reported changes in breathlessness (self-reported MRC score), sputum colour, volume, and purulence. The observations were transferred to a call centre at each participant's local hospital and automatically categorized and prioritized (i.e. green–yellow–red-coded). The call centres were open weekdays between 9 am and 3 pm and were staffed by a specially trained respiratory nurse. The nurse could discuss the patients with a specialist in respiratory medicine at the hospital if values were alarming (a single measurement with red code or two consecutive measurements with yellow code); and the patient was contacted by the respiratory nurse if necessary. Measurements without video consultation were taken three times a week for the first 4 weeks and afterward once weekly. Video consultation with spirometry was performed once a week during the first 4 weeks of the study period and then once monthly. Patients were free to perform additional measurements at any time or phone the call centre during opening hours, if they considered it necessary. Patients randomized to the TM group were not seen at regular scheduled visits at the outpatient clinics, but unscheduled visits were arranged if the TM consultation was considered inadequate by the health care professional.* ***Usual care*** *Control group: Patients on LTOT were managed either by respiratory nurses at home or in the outpatient clinic depending on the patient's mobility. All other patients were seen for scheduled visits at the outpatient clinics once or twice a year and for unscheduled visits as required. Patients were informed that they could contact the staff at the outpatient clinic weekdays between 9 am and 3 pm, if they had acute respiratory problems.*	

Short Title	Title	Study characteristics	Risk of bias and directness
		Outcome measure(s) Mortality *All-cause mortality* Number of emergency department visits Number of hospitalisations due to COPD Number of all cause hospitalisations Length of stay in hospital Time to first hospital admission due to a COPD exacerbation Number of outpatient visits to a specialist *Including both respiratory and non-respiratory departments.* Number of COPD exacerbations requiring treatment with systemic steroid and/or antibiotics but not admission to hospital	
Segrelles (2014)	A home telehealth program for patients with severe COPD: the PROMETE study	**Study type** Cluster randomised controlled trial *Randomised at the primary care level* **Study details** Study location *Spain* Study setting *The trial was co-ordinated at the Pneumology Service of the Hospital Universitario La Princesa (HULP) with the Primary Care Centres (PCC) in its area of influence.* Study dates *Not stated* Duration of follow-up *7 months* Sources of funding *Not stated, but 2 authors work for Linde Healthcare.*	**Random sequence generation** Low risk of bias **Allocation concealment** Low risk of bias **Blinding of participants and personnel** High risk of bias *Due the nature of the intervention, participants and personnel were not blind to group allocations.* **Blinding of outcome assessment**

Short Title	Title	Study characteristics	Risk of bias and directness
		Inclusion criteria Age *≥ 50 years old* Diagnosis of COPD *Prior diagnosis of COPD according to GOLD criteria* Smoking history *Not a current smoker, for at least 6 months, determined by measuring carboxyhaemoglobin levels in arterial blood gas.* FEV1/FVC *< 0.7 (severe or very severe obstruction to airflow)* FEV1, % predicted *<50%* Location of patient/ clinic attendance *Admitted to Pneumology, Internal Medicine and Infectious Diseases services of the study hospital* Hospital admissions due to COPD exacerbation *Admitted during the period from January 1, 2010 to July 31, 2011.* Oxygen therapy *Participants were on long term oxygen therapy* **Exclusion criteria** Unable to learn and use the telehealth device Social issues *At risk of social exclusion or institutionalized* Enrolled in a palliative care program for lung or another disease **Sample characteristics** Sample size *60*	Low risk of bias *Due to the nature of the outcomes they would be collected from hospital and medical service records, apart from the patient satisfaction survey.* **Incomplete outcome data** Low risk of bias **Selective reporting** Low risk of bias **Other sources of bias** High risk of bias *No adjustment for clustering mentioned.* **Overall risk of bias** Moderate *Due to the lack of adjustment for clustering.* **Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		Split between study groups *Intervention: 30 Control: 30* Loss to follow-up *53/60 (88.3%) of participants completed the trial. Loss to follow up was 0%, with 1 withdrawal and 2 deaths in the intervention arm and 4 deaths in the control arm.* %female *26.7* Mean age (SD) *73.9 (9.5)* **Interventions** ***Telehealth monitoring*** *The PROMETE telehealth program was based on the daily follow-up of patients with severe COPD at the home by monitoring the following parameters: blood pressure, oxygen saturation and heart rate on a daily basis, and peak expiratory flow (PEF) three times a week. The patients took their measurements on a daily bases (Monday through Sunday) and these were assessed by the Clinical Monitoring Centre (CMC) from 9:00 to 17:00. During weekends, the data were directly analysed by a Pneumologist. The parameters were collected using the following devices: a spirometer, a pulse-oximeter, heart rate monitor and blood pressure monitor. Data were sent automatically daily. Patients entered the study in a stable situation, being exacerbation-free for at least 15 days. Entry into the study of patients in the exacerbation phase was postponed until it was over. The information was received, monitored, assessed and followed-up by the CMC through an application that acted as a traffic light system: Green: meant that measurements had been taken and were within the predefined limits, and no further action was required. Yellow: "technical alert". This means that the measurements had not been taken or had not been received. This alert could lead to a "clinical alert" due to a lack of adherence or discouragement. When the*	

Short Title	Title	Study characteristics	Risk of bias and directness
		parameters were not received the nurse at the CMC called the patient to find the reason behind the alert, and either ruled out medical causes or, if one, notified the Pneumologist leading the study. Red: "clinical alert". Meant that a measurement exceeded the limits that were previously pre-established for each patient. After verification of a Red Flag -Clinical Alert by the CMC, a protocolised escalation and clinical response procedure commenced. Whenever a Red Flag (clinical alert) was triggered the nurse at the CMC contacted the patient to verify the alert. When a Red Flag was confirmed, the nurse escalated the clinical alert to the Pneumologist who then classified the exacerbation as moderate, severe or very severe. For moderate exacerbations, advice to start medical treatment was given over the telephone; in severe cases, visits were made to the patient's home, and in the very severe cases the patient was advised to come to the emergency room department. ***Usual care*** *Both study groups continued with their scheduled medical visits during the entire study period. Patients in the control group had no intervention apart from this standard, conventional care, and no other proactive interventions during the entire study.* **Outcome measure(s)** Number of emergency department visits Number of hospitalisations Length of stay in hospital Time to the first emergency department visit Time to first hospitalisation Time to first exacerbation Patient satisfaction survey	

Short Title	Title	Study characteristics	Risk of bias and directness
Shany (2017)	A small-scale randomised controlled trial of home telemonitoring in patients with severe chronic obstructive pulmonary disease	**Study type** Randomised controlled trial **Study details** Study location *Australia* Study setting *Participants were recruited from the hospital-based Respiratory Ambulatory Care-Service-Plus (RACS-Plus) and lived in the suburbs of Sydney.* Study dates *March 2009-October 2010.* Duration of follow-up *12 months* Sources of funding *The Department of State and Regional Development of New South Wales Government; TeleMedCare; Australian Research Council; the Sydney West Area Health Service and University of New South Wales.* **Inclusion criteria** Diagnosis of COPD Hospital admissions due to COPD exacerbation *At least once during the year prior to inclusion in the study* **Exclusion criteria** Cognitive impairment Involvement in other research trials Unable to participate due to a language barrier *Unable to read English to the reading age of an 8-year-old* Motor deficits that might prevent the use of the telehealth measurement apparatus	**Random sequence generation** Low risk of bias **Allocation concealment** Unclear risk of bias *No information provided* **Blinding of participants and personnel** High risk of bias *Due to the nature of the intervention it was not possible to blind participants and personnel* **Blinding of outcome assessment** Low risk of bias *The data on the duration of emergency room and hospital treatment were collected from the blinded Health information Records Service in the hospital and was compared to the unblinded results from record searching carried out by one of the study authors. Health service costs were*

Short Title	Title	Study characteristics	Risk of bias and directness
		Lack of a home telephone line **Sample characteristics** Sample size *42* Split between study groups *Intervention: 21 Control: 21* Loss to follow-up *29/42 (69.0%) of participants completed the trial. In the intervention group 7 people stopped participating in the trial; there were 3 deaths in each arm of the trial.* %female *54.7* Mean age (SD) *73.2 years (8.3)* FEV1, % predicted (mean, SD) *Intervention: 39.7 (13.2) Control: 32.1 (16.0)* **Interventions** ***Telehealth monitoring*** *The intervention group used a telehealth unit to send data to a website for the study nurses. Training was provided. Patients recorded their symptoms and measurements (including respiratory rate using a spirometer, ECG readings, pulse oximetry, weight and temperature readings). Measurements were taken while on any prescribed supplemental oxygen and after taking normal medication, with a brief gap between bronchodilators and measurements. Patients recorded their readings once a day at any time. The study staff and community nurses reviewed the data. An alert system was in place to flag up patients with abnormal readings, but no details were provided regarding the actions taken at that point.*	*determined by a blinded researcher. Study participants completed the SGRQ and HADS themselves.* **Incomplete outcome data** High risk of bias *Only 69.0% of participants completed the trial, with 7/21 dropping out of the intervention arm.* **Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** Moderate *Due to only 69.0% of participants completing the trial.* **Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		Usual care *Both groups received at least one home visit a week by a respiratory community nurse and could speak to the nurses on the telephone 24hrs a day/7 days a week. They also attended scheduled visits to the respiratory rehabilitation outpatient clinic.* **Outcome measure(s)** Number of emergency department visits due to COPD Number of hospitalisations due to COPD Length of stay in hospital Disease specific health-related quality of life (St. George respiratory questionnaire, SGRQ) Hospital Anxiety and Depression Scores (HADS) Costs of intervention Questionnaire on the usability of the telehealth monitoring system	
Vianello (2016)	Home telemonitoring for patients with acute exacerbation of chronic obstructive pulmonary disease: a randomized controlled trial	**Study type** Randomised controlled trial **Study details** Study location *Italy* Study setting *Participants were recruited from the emergency department (after discharge) or after attending the Pulmonary Clinics of the City Hospitals of Padova, Treviso, Venice and Verona (Veneto region of Italy).* Study dates *Not stated, but participants were recruited between 1st November 2011 and 31st July 2012*	**Random sequence generation** Low risk of bias **Allocation concealment** Unclear risk of bias *No information provided* **Blinding of participants and personnel** High risk of bias *Due the nature of the intervention, participants and*

Short Title	Title	Study characteristics	Risk of bias and directness
		Duration of follow-up *12 months* Sources of funding *The study was part of the "RENEWING HEALTH" project, a research initiative founded by the European Commission (Grant Agreement No 250487).* **Inclusion criteria** Age *≥ 18 years old* Diagnosis of COPD *Class III-IV COPD according to the Global Initiative on Obstructive Lung Disease (GOLD) classification* Life expectancy > 12 months *According to Multiparametric Prognostic Index (MPI)* Ability to physically manage equipment *Capable of using the telehealth monitoring equipment alone or with assistance* **Exclusion criteria** Lack of informed consent to participate in trial Respiratory conditions other than COPD *Concomitant significant lung disease* Unsuitable to participate in trial *Due to the negative advice of the general practitioner (GP)* Unwillingness to use the equipment Social issues *Other serious social problems, including lack of adequate family support and/or other social support networks.*	*personnel were not blind to group allocations.* **Blinding of outcome assessment** Unclear risk of bias *No information provided about the personnel administering the questionnaires, but data on hospital admissions, healthcare service use including consultations with a pulmonary specialist and visits to the emergency service, and mortality were extracted from regional records at the end of the trial and should be less likely to be affected by assessor bias.* **Incomplete outcome data** Unclear risk of bias *19/230 allocated to the intervention did not receive it and 30/211 who received the intervention were lost to follow up, but 78% participants completed the*

Short Title	Title	Study characteristics	Risk of bias and directness
		Sample characteristics Sample size *334* Split between study groups *Intervention: 230 Control: 104* Loss to follow-up *262/334 (78.4%) of participants completed the trial. 53/334 were lost to follow up and 19/230 did not receive the intervention.* %female *28.1* Mean age (SD) *76.1 years (6.4)* Smoking status and history *Smoking habit (No of participants, %) Intervention: Current Smoker: 10 (4.35) Former Smoker: 153 (66.52) Non-Smoker: 65 (28.26) Packs/year [mean (SD)]: 42.35 (63.03) Control: Current Smoker: 3 (2.88) Former Smoker: 64 (61.54) Non-Smoker: 36 (34.62) Packs/year [mean (SD)]: 50.54 (90.50)* FEV1, % predicted (mean, SD) *Intervention: 41.90 (8.64) Control: 41.87 (8.30)* **Interventions** ***Telehealth monitoring*** *Patients in the intervention group were provided a telehealth monitoring system consisting of a finger pulse-oxymeter and a gateway device for data transmission over a telephone line to a central data management unit located at the Veneto Regional e-Health Centre. The patient/proxy could communicate with the trained operators manning the unit from 08:00–18:00 Monday through Friday. Patients transmitted their monitored Heart Rate (HR) and Oxygen Saturation (SpO2) values to the operator every other day and/or in the event of subjective clinical*	*trial* **Selective reporting** Low risk of bias **Other sources of bias** Low risk of bias **Overall risk of bias** Moderate *Due to the lack of information regarding blinding of the outcome assessors for the questionnaires, the large number of people who did not receive the intervention after randomisation and the numbers of people lost to follow up in each arm.* **Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		worsening. A 'spot check' or single measurement of SpO2 was also performed once a day. The operators daily (Monday–Friday) reviewed the online data of each patient and if the HR and/or SpO2 values that were transmitted were outside of the patient's normal" range, they contacted the patient and asked for a second measurement. If this was also outside of the patient's normal range the operator alerted the clinical staff. Values considered out-of-range were customized for every patient depending on his/her individual clinical situation. Once alerted, the specialist called the patient by telephone to verify if symptoms had stabilized or worsened or if new symptoms had arisen. In the latter event, the patient's adherence to therapy was checked and, if unsatisfactory, interventions promoting adherence were prescribed. If adherence to treatment proved satisfactory, the diagnosis of an acute COPD exacerbation was confirmed and, the specialist undertook one of the following actions: 1. Modified the patient's usual medication by telephone. 2. Sent a district nurse (a nurse employed by the National Health Service specialized in making home visits) for a home visit who made a report on the situation. The nurse assessed the subject's clinical status and adherence to treatment and decided if the patient required an examination by a pulmonary specialist. 3. Set up an office appointment with a pulmonary specialist. 4. Decided that the patient should be taken to the Emergency Department. ***Usual care*** *The participants in the two groups received the same clinical care and had access to the same healthcare services. If there were any variations in the clinical status of patients in the control group, he/she directly called/went to see the GP who decided if the patient required an urgent appointment with a pulmonary specialist or a visit to the ED; the former was arranged by the GP. The only difference between the intervention and control groups was that the former also had the TM service. Pharmacologic therapy was provided following international standardized*	

Short Title	Title	Study characteristics	Risk of bias and directness
		guidelines. **Outcome measure(s)** Mortality Number of emergency department visits Number of hospitalisations due to COPD *Due to an acute exacerbation of COPD* Number of all cause hospitalisations Number of readmissions due to acute exacerbation of COPD *Readmission was defined as a re-hospitalisation within 30 days of discharge from hospital related to an acute exacerbation of COPD* Number of any cause readmissions *Readmission was defined as a re-hospitalisation within 30 days of discharge from hospital* Length of stay in hospital *Due to an acute exacerbation of COPD and for any other cause* Number of outpatient visits to a specialist *The number of appointments with a pulmonary specialist* Hospital Anxiety and Depression Scores (HADS) Generic health-related quality of life (Medical Outcomes Study Short Form Health Survey, SF-36)	
Vitacca (2009)	Tele-assistance in chronic respiratory failure patients: a randomised clinical trial	***Associated studies*** *Vitacca M,Paneroni M, Grossetti F, Ambrosino N. Is There Any Additional Effect of Tele-Assistance on Long-Term Care Programmes in Hypercapnic COPD Patients? A Retrospective Study. COPD 2016; 13:576-582.* **Study type** Randomised controlled trial	**Random sequence generation** Low risk of bias **Allocation concealment** Unclear risk of bias *No information was provided*

Short Title	Title	Study characteristics	Risk of bias and directness
		Study details Study location *Italy* Study setting *The present prospective study was conducted in all patients with chronic respiratory failure (CRF) discharged from the Respiratory Department of Fondazione S. Maugeri Gussago/ Lumezzane (Italy).* Study dates *Not stated, but participants were recruited after they were discharged from hospital between April 30, 2004 and March 31, 2007.* Duration of follow-up *12 months* Sources of funding *Not stated* **Inclusion criteria** Diagnosis of COPD Hospital admissions due to COPD exacerbation *In the last 12 months* Oxygen therapy *Need for home mechanical ventilation or long term oxygen therapy (LTOT)* **Exclusion criteria** Subject refusal to participate in the study Residence in a long-term care facility Illiteracy Lack of a home telephone line No caregiver to facilitate telephone contacts	**Blinding of participants and personnel** High risk of bias *Due the nature of the intervention, participants and personnel were not blind to group allocations.* **Blinding of outcome assessment** Unclear risk of bias *No information was provided* **Incomplete outcome data** Low risk of bias **Selective reporting** High risk of bias *Data was only presented for the COPD subgroup for certain outcomes.* **Other sources of bias** Low risk of bias **Overall risk of bias** Moderate *Due to the selective reporting of COPD subgroup outcome*

Short Title	Title	Study characteristics	Risk of bias and directness
		Sample characteristics Sample size *240 people who had respiratory failure (100 with COPD)* Split between study groups *Intervention: 120 (57/118 with COPD at the end of the trial) Control: 120 (44/102 with COPD at the end of the trial)* Loss to follow-up *220/240 (91.7%) participants completed the trial* %female *32.3% of the people completing the trial* Mean age (SD) *61.2 years (17.5) of the people completing the trial* Smoking status and history *(Of the people completing the trial, n (%)) Intervention: Ex-smokers: 55 (47) Current smokers: 7 (6) Control: Ex-smokers: 43 (42) Current smokers: 9 (9)* FEV1, % predicted (mean, SD) *Intervention: 39 (23) (data available for n= 92/118 of the people who completed the trial) Control: 34 (16) (n=73/102)* **Interventions** ***Telehealth monitoring*** *Patients received a pulse oximetry device and in selected cases (severe clinical and pulse oximetric worsening in spite of drug therapy rearrangement, long term oxygen or mechanical ventilation resetting, correct titration of oxygen supply during night and activities of daily living, and suspicion of nocturnal hypoventilation) patients received a pulse oximeter with solid memory card plus a modem system which is able to transmit an arterial oxygen saturation measured by pulse oximetry (Sp,O2) trace. When necessary, the trace was sent to a receiving station where a nurse was available for 40 h per week (08:00 h to 16:00*	*data* **Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		h, 5 days per week) to provide a real-time tele-consultation. Unscheduled calls were transferred to the on-duty pulmonologist who provided a consultation. The call centre was able to receive data 24 h per day concerning patients' needs or questions and, when needed, the pulmonologist on duty was contacted. The intervention group patients had no scheduled outpatient visits with the pulmonologist. ***Usual care*** *Patients in the usual care group were evaluated by the physician before discharge. Follow-up outpatient visits aimed at assessing compliance to therapy, HMV and/or LTOT were scheduled every 3 months according to the usual procedures of the study centre. The discharge plan did not include home nurse visits.* **Outcome measure(s)** Mortality Number of emergency department visits Number of hospitalisations Time to first hospitalisation Number of exacerbations Time to first exacerbation Number of intensive care unit admissions Time to first GP contact Number of visits to general practitioner (GP) Costs of intervention	
Vorrink (2016)	Efficacy of an mHealth intervention to stimulate physical	**Study type** Randomised controlled trial	**Random sequence generation** Low risk of bias

Short Title	Title	Study characteristics	Risk of bias and directness
	activity in COPD patients after pulmonary rehabilitation	**Study details** Study location *The Netherlands* Study setting *Not stated, but participants were recruited by their physiotherapists from primary care physiotherapy practices with expertise in COPD that were involved with the Utrecht network for COPD physiotherapists.* Study dates *Not stated* Duration of follow-up *12 months* Sources of funding *Not stated* **Inclusion criteria** Age *⩾40 years* Diagnosis of COPD *Global Initiative for Chronic Obstructive Lung Disease (GOLD) stage 2 or 3* FEV1/FVC *<0.7 after bronchodilation* FEV1, % predicted *30–<80%* Lives independently Completed a pulmonary rehabilitation programme *Of 3 months in duration within the past 6 months* **Exclusion criteria** Significant co-morbidities	**Allocation concealment** Low risk of bias **Blinding of participants and personnel** High risk of bias *Due the nature of the intervention, participants and personnel were not blind to group allocations.* **Blinding of outcome assessment** Low risk of bias *Assessments were performed by two researchers that were blinded to the group allocation.* **Incomplete outcome data** High risk of bias *Only 66.1% of participants completed the trial* **Selective reporting** Low risk of bias

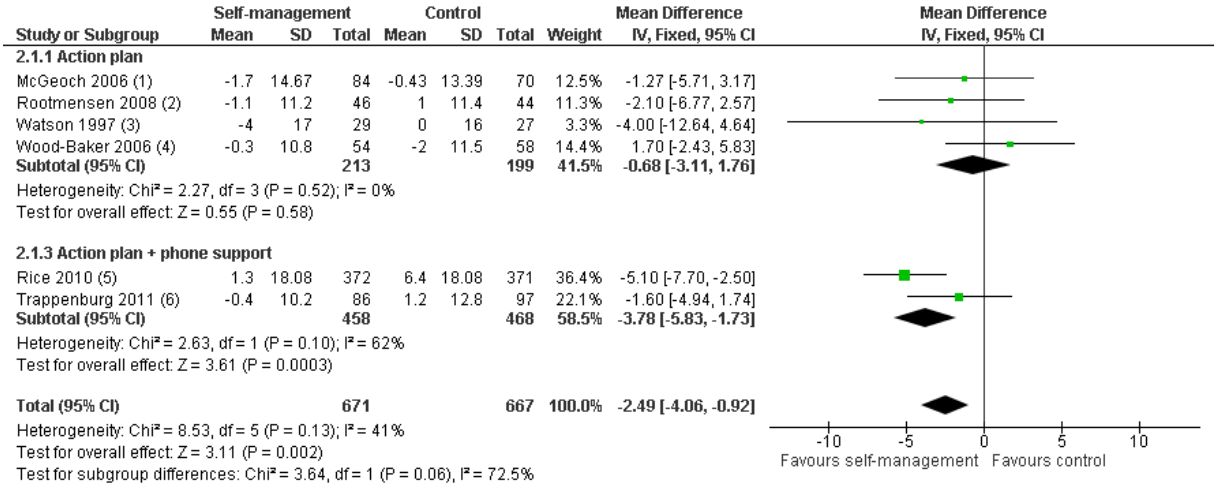
Short Title	Title	Study characteristics	Risk of bias and directness
		A comorbidity that greatly influences physical activity, using an assistive device for physical activity (e.g. walker or mobility scooter), COPD exacerbation requiring an emergency department visit or hospitalisation *Experienced an exacerbation resulting in a hospital admission in the 6 months prior to the commencement of the study.* Intermittently ceased the pulmonary rehabilitation programme **Sample characteristics** Sample size *183* Split between study groups *Intervention: 102 Control: 81* Loss to follow-up *121/183 (66.1%) of participants completed the trial. 17/102 in the intervention and 9/81 in the control group dropped out before the start of the trial and another 13/102 and 5/81 dropped out by 3 months.* %female *43.2* Mean age (SD) *62.4 years (8.6)* FEV1, % predicted (mean, SD) *Intervention: 59 (20) Control: 53 (15)* **Interventions** ***Telehealth monitoring*** *The intervention consisted of two components: 1) a smartphone application and 2) a website for the physiotherapists. The application showed physical activity in real time in quantitative and qualitative form, measured by the accelerometer embedded in the smartphone. Subjects were persuaded to achieve their*	**Other sources of bias** Low risk of bias **Overall risk of bias** High *Due to the high drop-out rate leading to only 66.1% of participants completing the trial* **Directness** Directly applicable

Short Title	Title	Study characteristics	Risk of bias and directness
		personalised physical activity goal by automated persuasive messages and an emoticon. The physiotherapists could monitor their patients via the (secure) website, which showed both the physical activity data from all the participants from their practice and a more detailed view of individual patients. The physiotherapist was able to adjust each patient's physical activity goal and send group or individual text messages. The intervention group were supplied with a smartphone/ internet contract and instructed in the use of the system. For the first week, physical activity goals were not set, and subjects were instructed to perform their day-to-day activities as usual. Afterwards, initial personal physical activity goals were calculated using data from this baseline week. After this initial physical activity goal setting, physiotherapists were given responsibility for physical activity goal adjustment. They could reduce or increase the amount and intensity of the physical activity goal via the website, based on the individual ability of their patient over time. ***Usual care*** *No details provided.* **Outcome measure(s)** Disease specific health-related quality of life (Chronic Respiratory Questionnaire, CRQ) *Self-administered standardised chronic respiratory questionnaire (CRQ-SAS).* 6 minute walk distance (6MWD) *Modified 6-min walk test (6MWT)* Daily physical activity *Using an accelerometer validated in patients with COPD* Body Mass Index (BMI)	

Appendix F – Forest plots

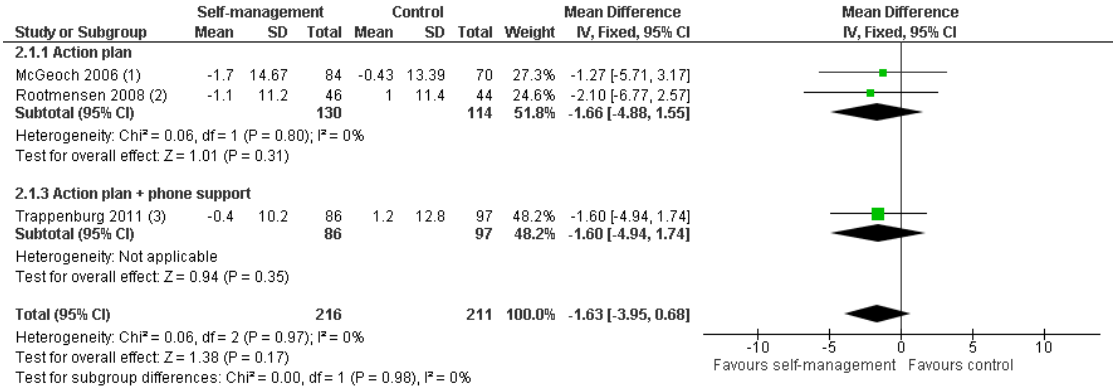
Self-management (action plans)

Respiratory-specific quality of life (St George's Respiratory Questionnaire)



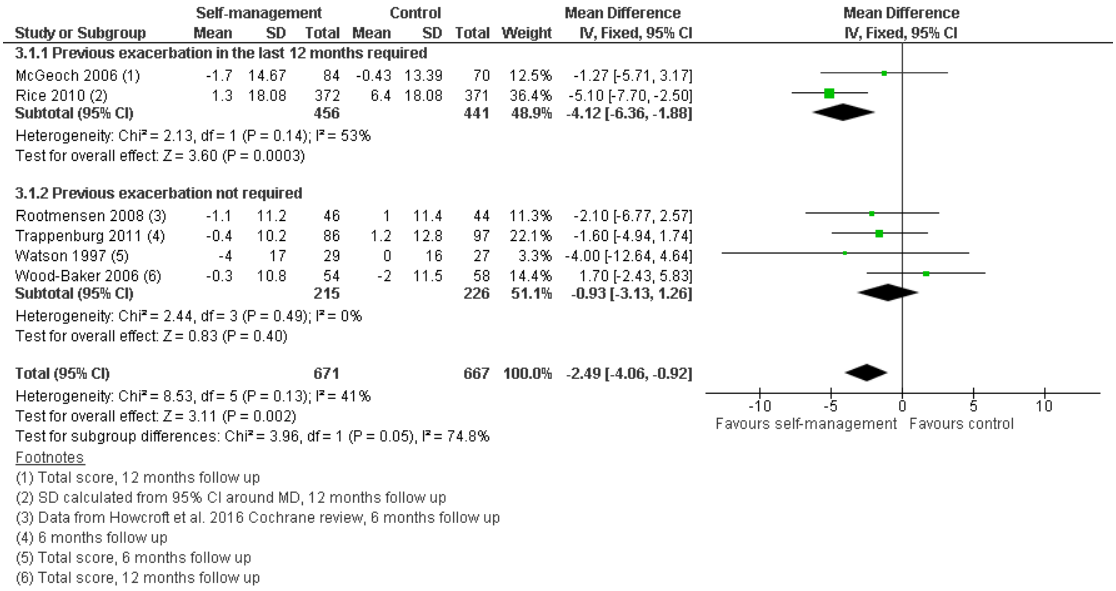
Footnotes
(1) Total score, 12 months follow up
(2) Data from Howcroft et al. 2016 Cochrane review, 6 months follow up
(3) Total score, 6 months follow up
(4) Total score, 12 months follow up
(5) SD calculated from 95% CI around MD, 12 months follow up
(6) 6 months follow up

Sensitivity analysis –SGRQ



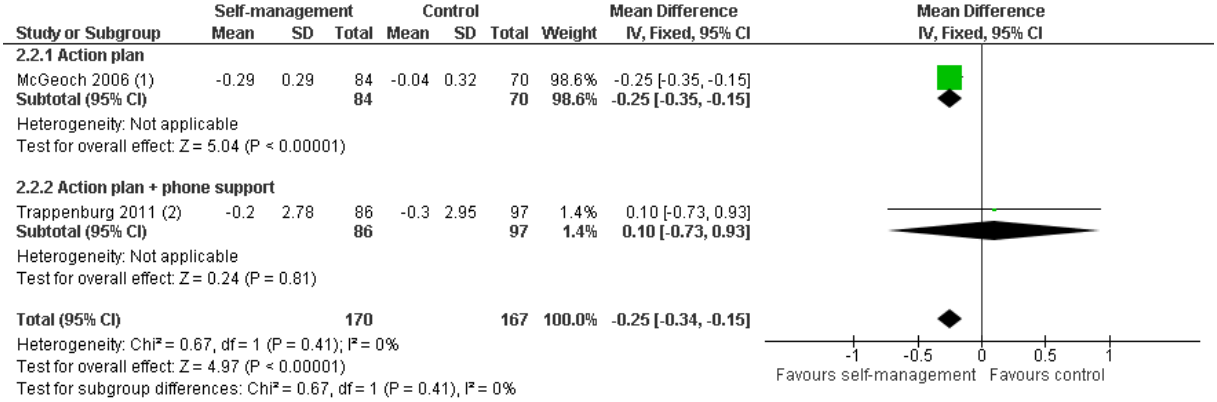
Footnotes
(1) Total score, 12 months follow up
(2) Data from Howcroft et al. 2016 Cochrane review, 6 months follow up
(3) 6 months follow up

Subgroup analysis for recruitment based on exacerbation history



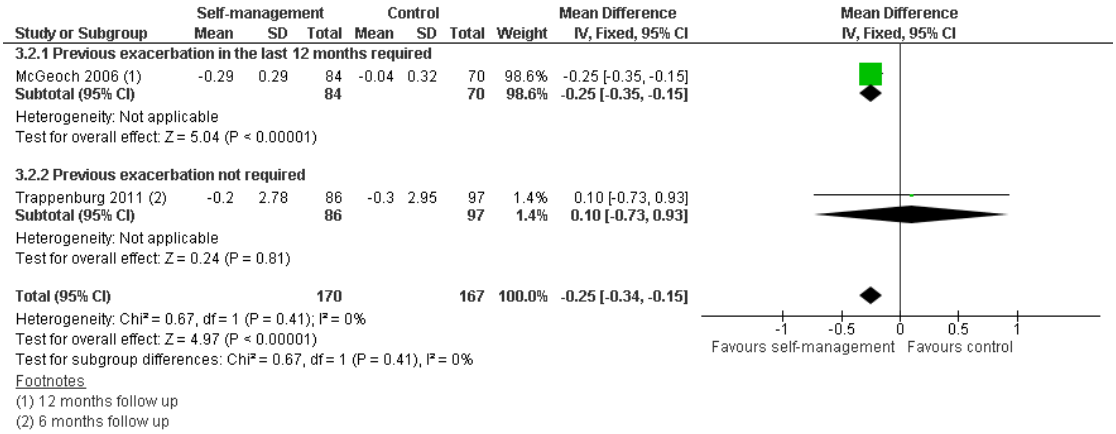
Footnotes
(1) Total score, 12 months follow up
(2) SD calculated from 95% CI around MD, 12 months follow up
(3) Data from Howcroft et al. 2016 Cochrane review, 6 months follow up
(4) 6 months follow up
(5) Total score, 6 months follow up
(6) Total score, 12 months follow up

Depression (HADS)

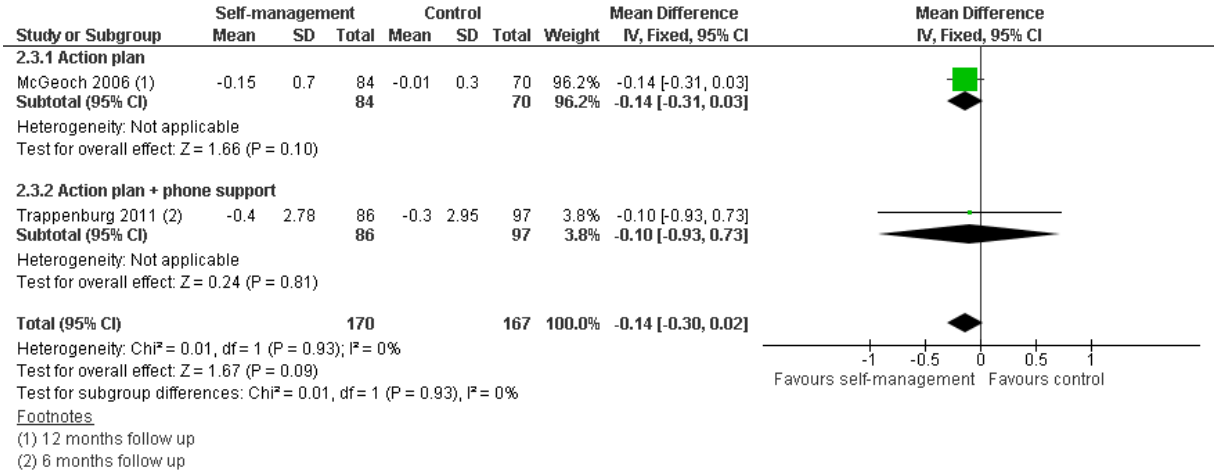


Footnotes
(1) 12 months follow up
(2) 6 months follow up

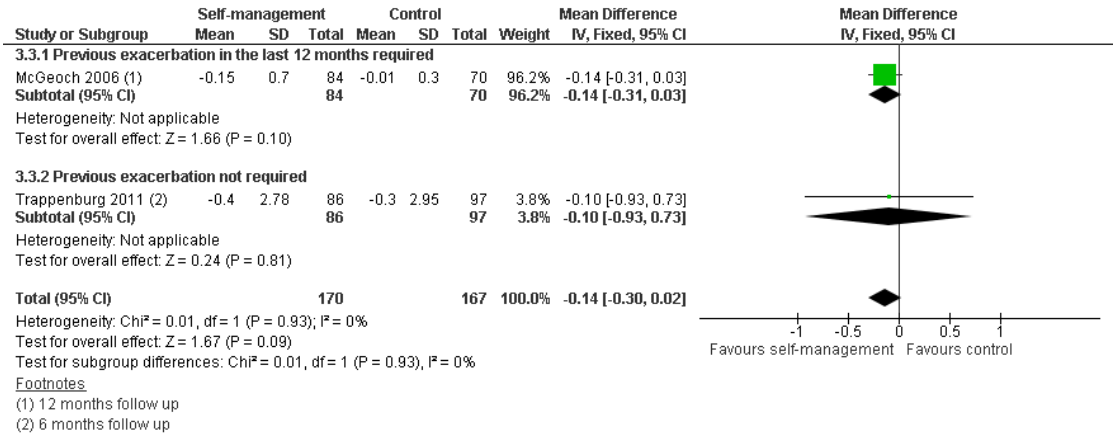
Subgroup analysis for recruitment based on exacerbation history



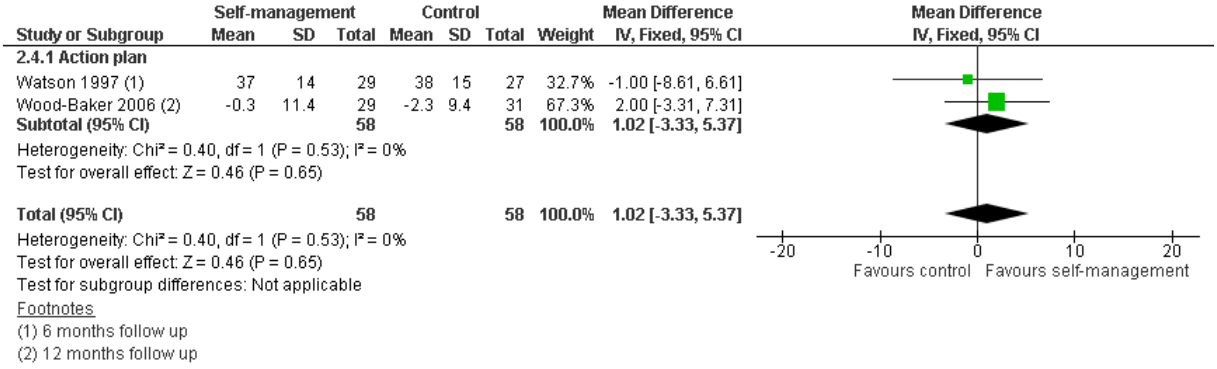
Anxiety (HADS)



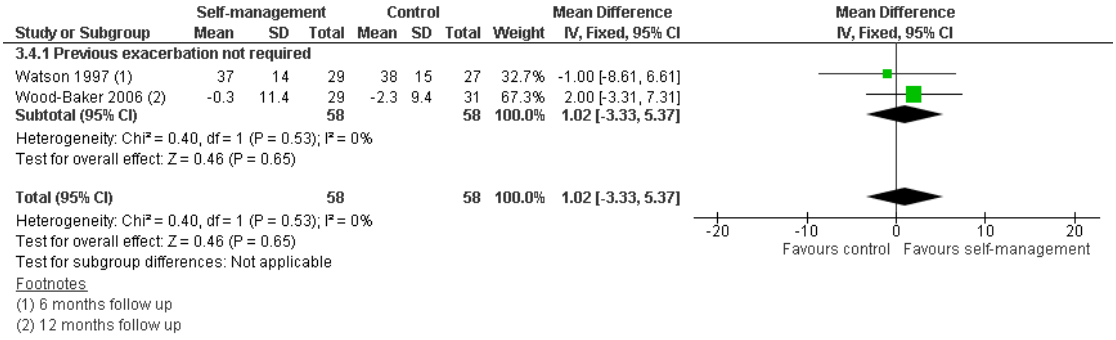
Subgroup analysis for recruitment based on exacerbation history



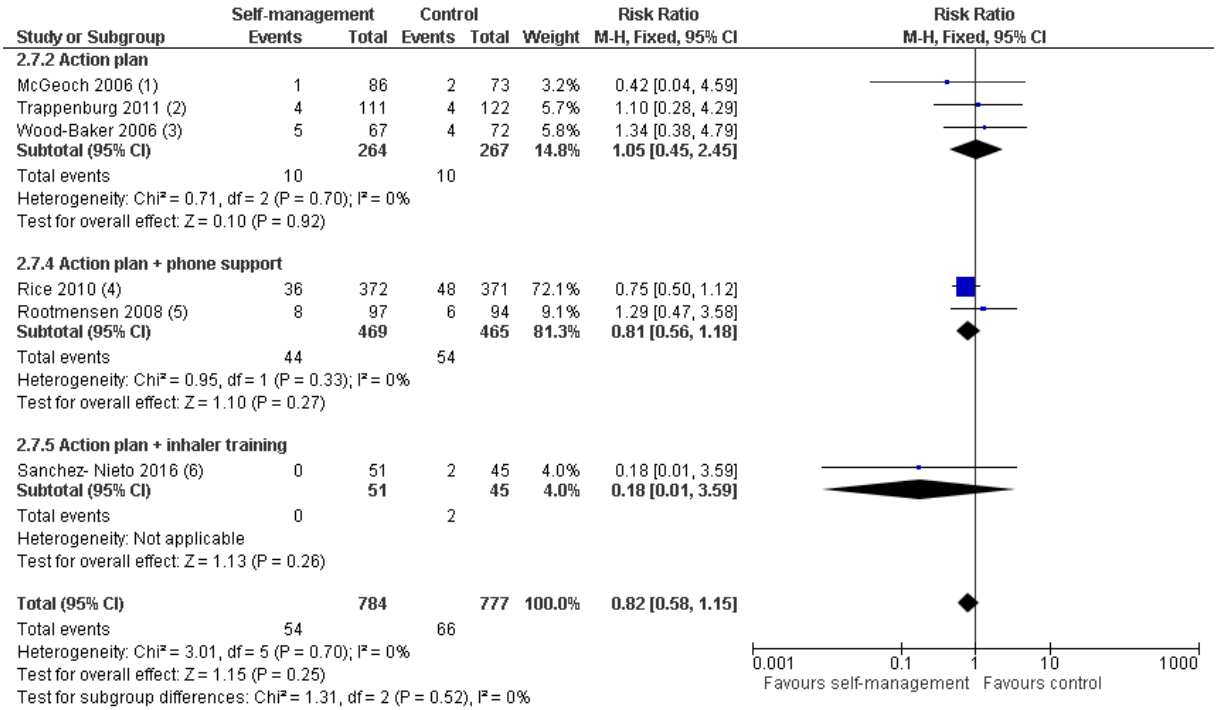
FEV1 (% predicted)



Subgroup analysis for recruitment based on exacerbation history



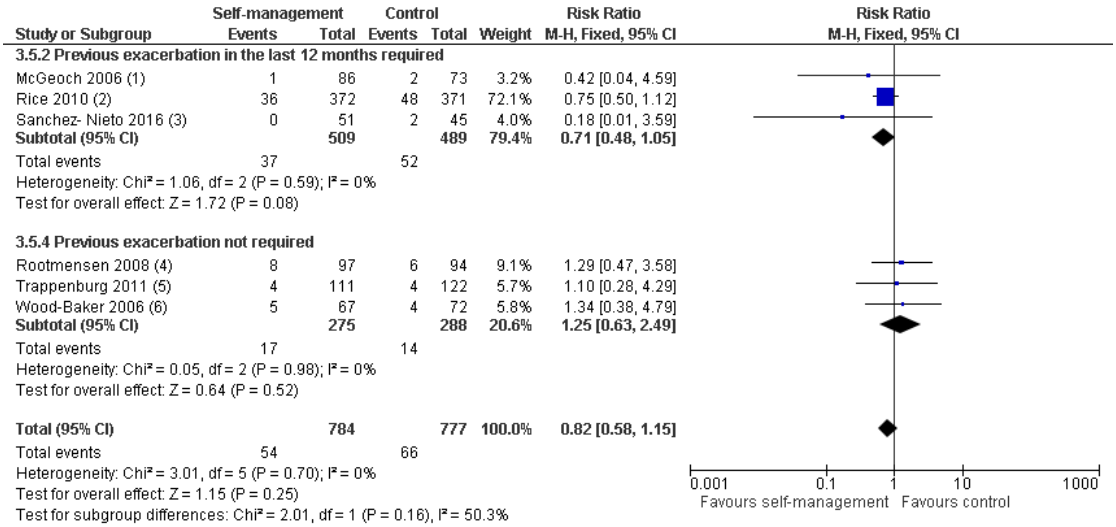
Mortality



Footnotes

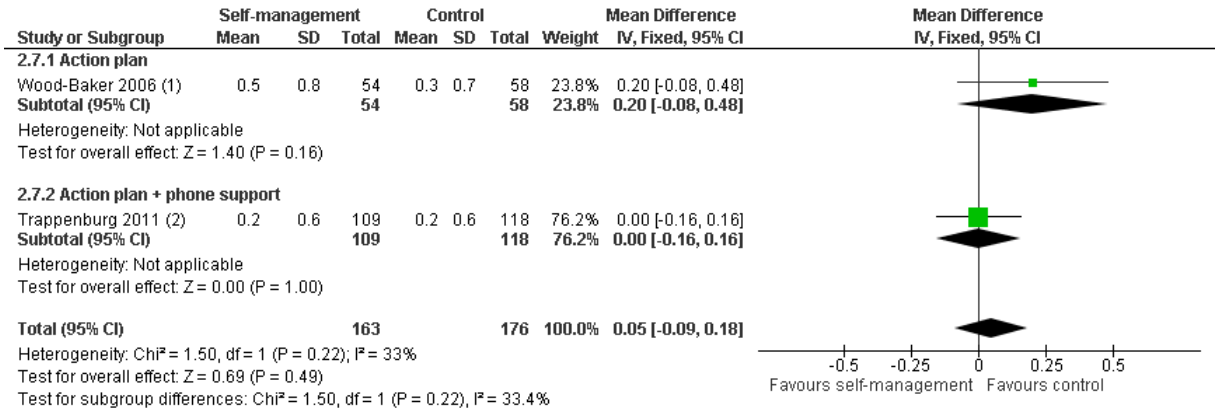
(1) 12 months follow up
(2) 6 months follow up scaled up to 12 months
(3) 12 months follow up
(4) 12 months follow up
(5) 6 months follow up scaled up to 12 months
(6) 12 months follow up

Subgroup analysis for recruitment based on exacerbation history



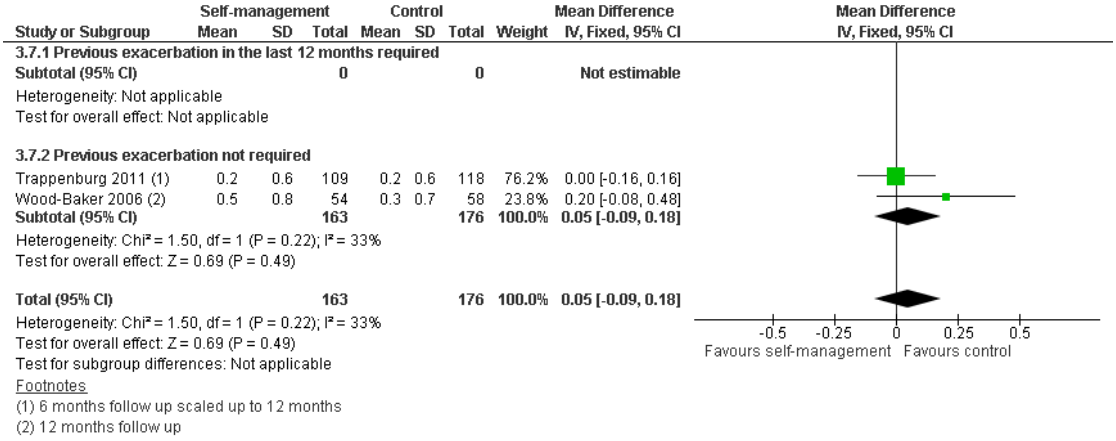
Footnotes
(1) 12 months follow up
(2) 12 months follow up
(3) 12 months follow up
(4) 6 months follow up scaled up to 12 months
(5) 6 months follow up scaled up to 12 months
(6) 12 months follow up

Hospital admissions

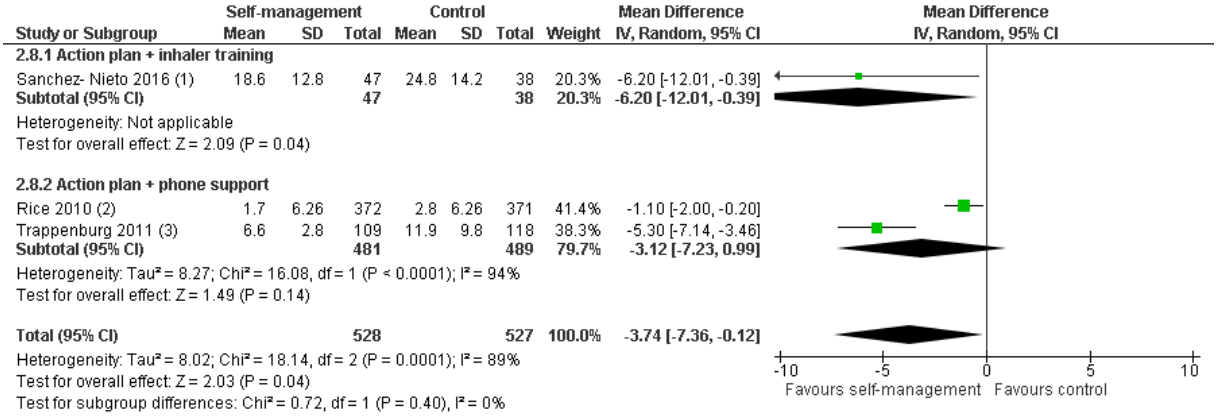


Footnotes
(1) 12 months follow up
(2) 6 months follow up scaled up to 12 months

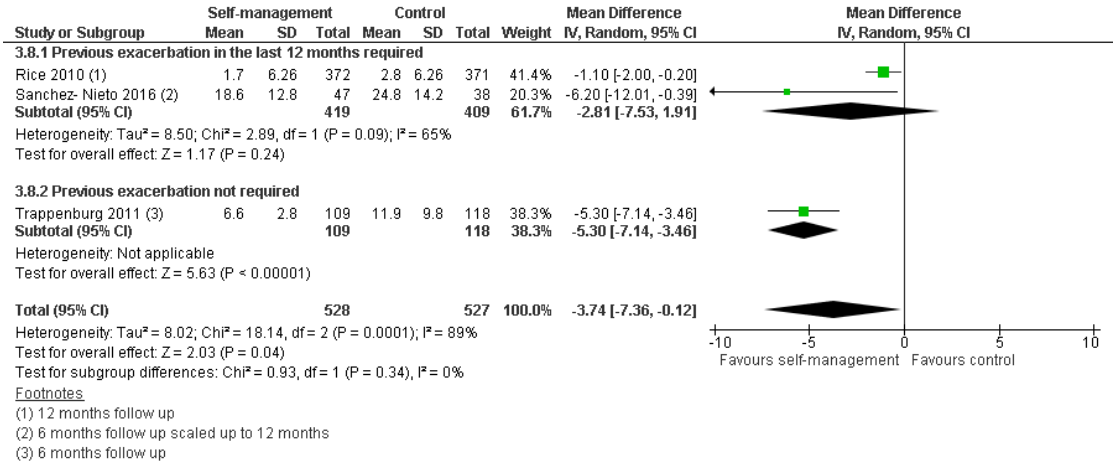
Subgroup analysis for recruitment based on exacerbation history



Length of hospital stay



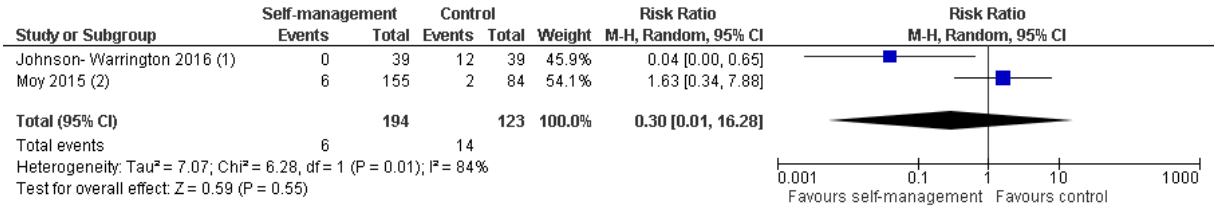
Subgroup analysis for recruitment based on exacerbation history



Footnotes
(1) 12 months follow up
(2) 6 months follow up scaled up to 12 months
(3) 6 months follow up

Self-management (exercise plans)

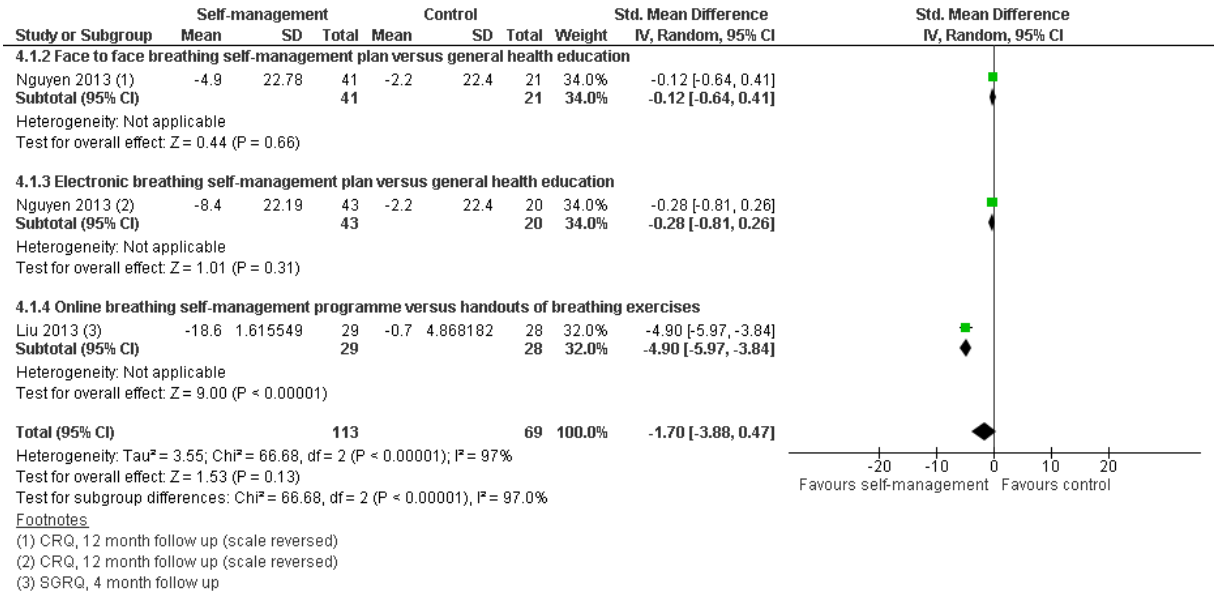
Mortality



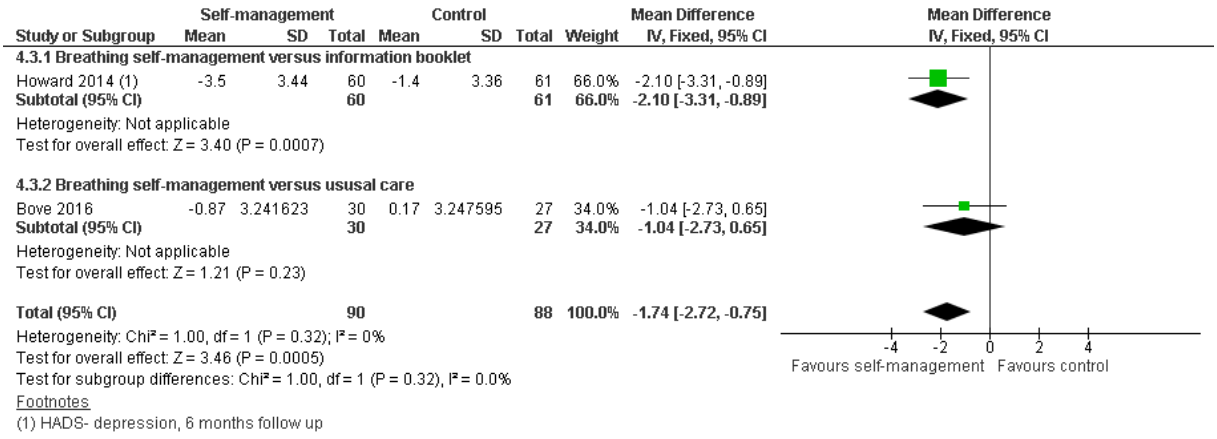
Footnotes
(1) Usual care control, 3 month follow up scaled up to 12 months
(2) Control group wore a pedometer, 12 month follow up

Self-management (breathing plans)

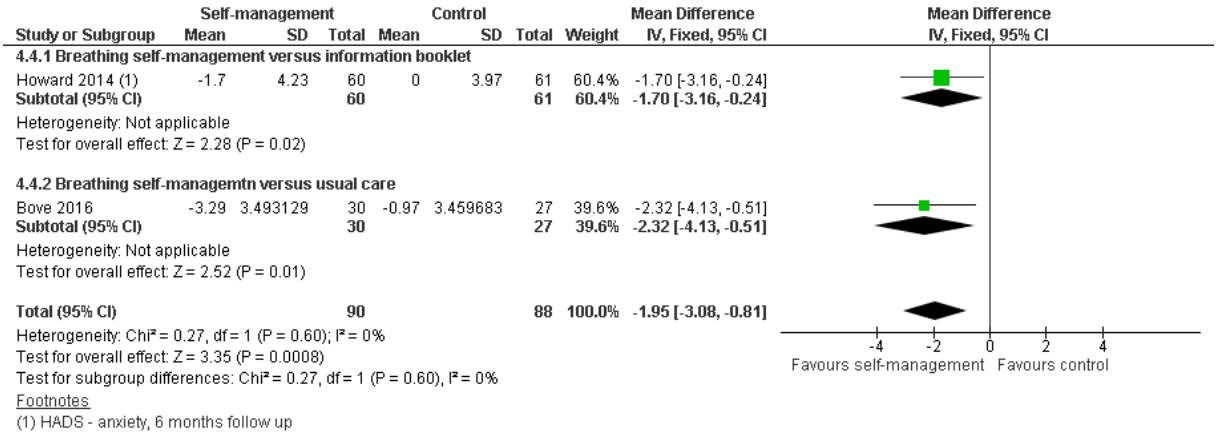
Respiratory-specific quality of life



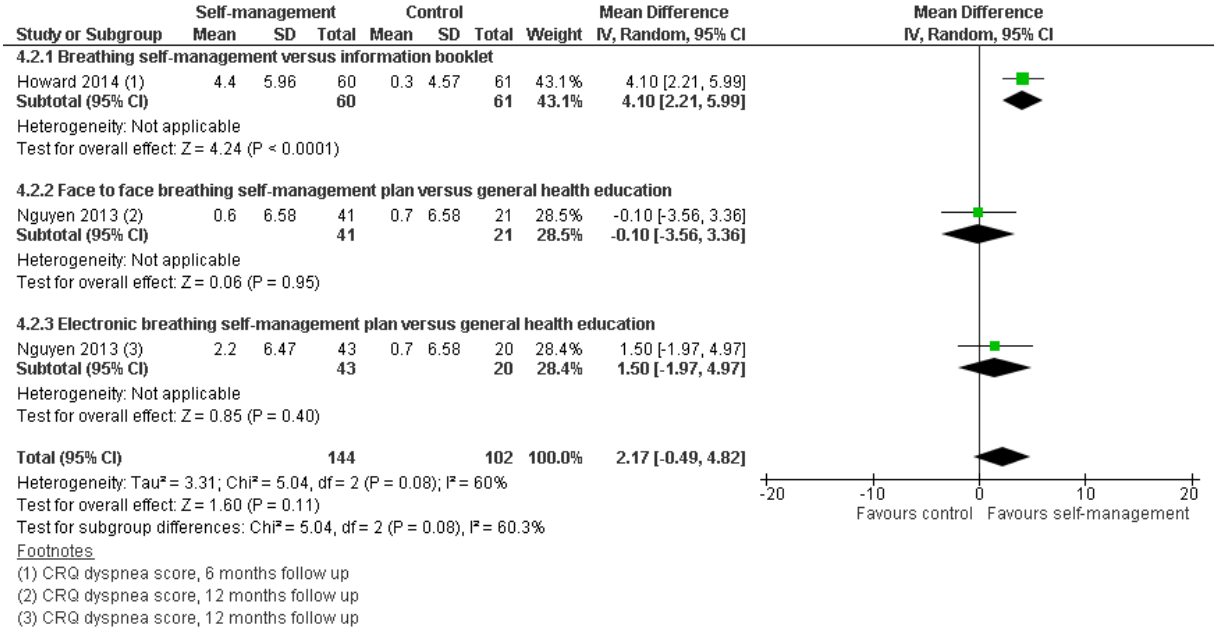
Depression (HADS)



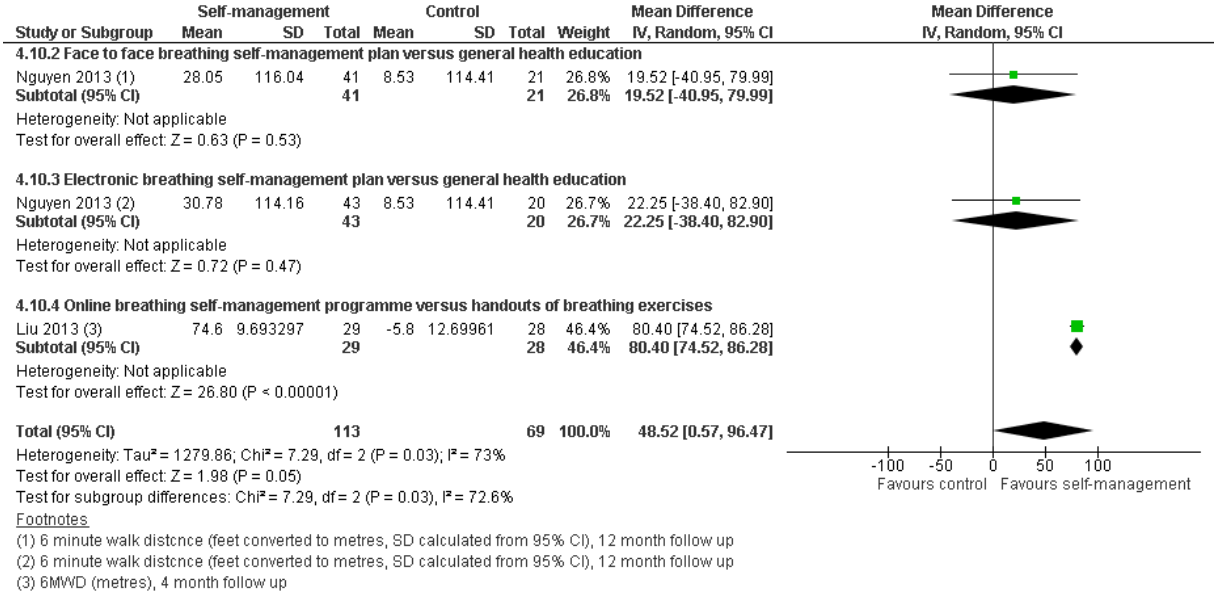
Anxiety (HADS)



Breathlessness (CRQ dyspnoea score)



Six minute walk distance (6MWD)



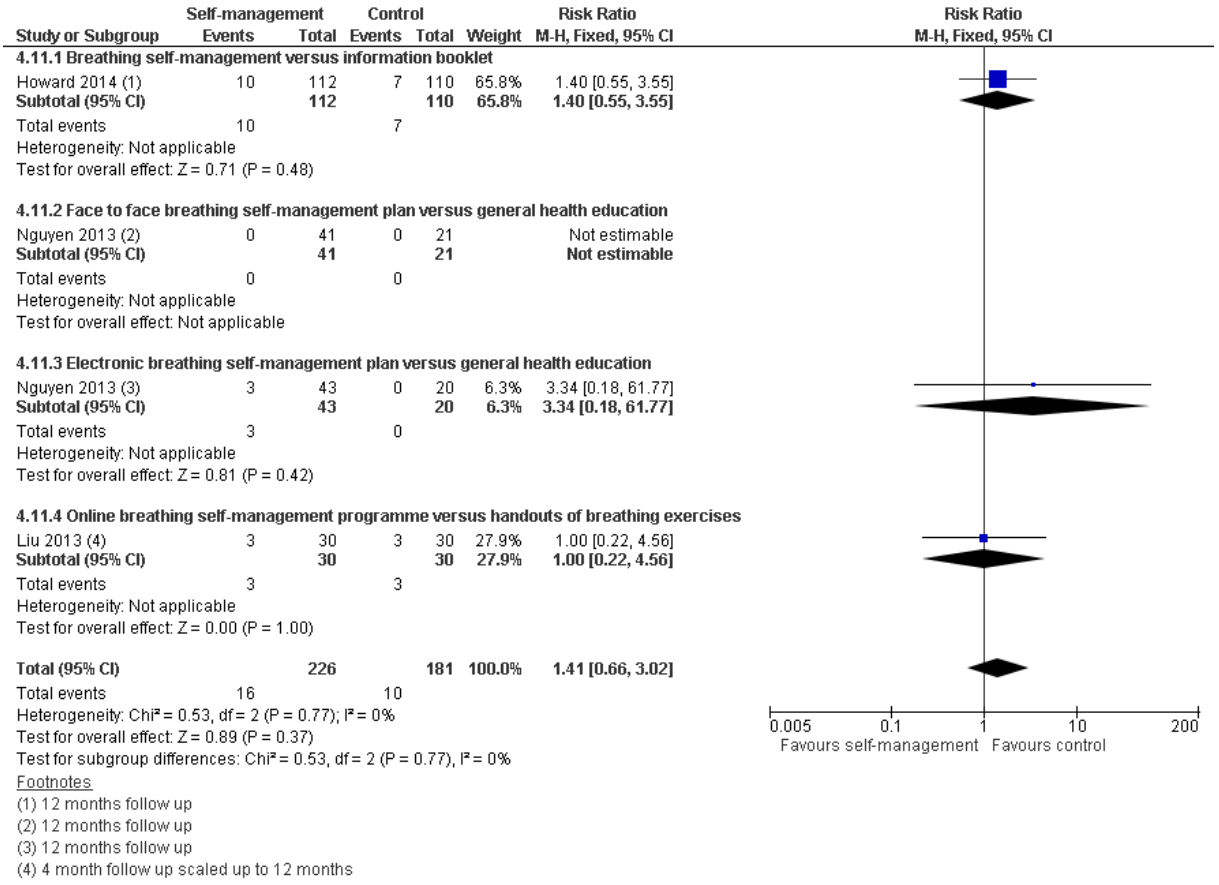
Footnotes

(1) 6 minute walk distance (feet converted to metres, SD calculated from 95% CI), 12 month follow up

(2) 6 minute walk distance (feet converted to metres, SD calculated from 95% CI), 12 month follow up

(3) 6MWD (metres), 4 month follow up

Mortality



Footnotes

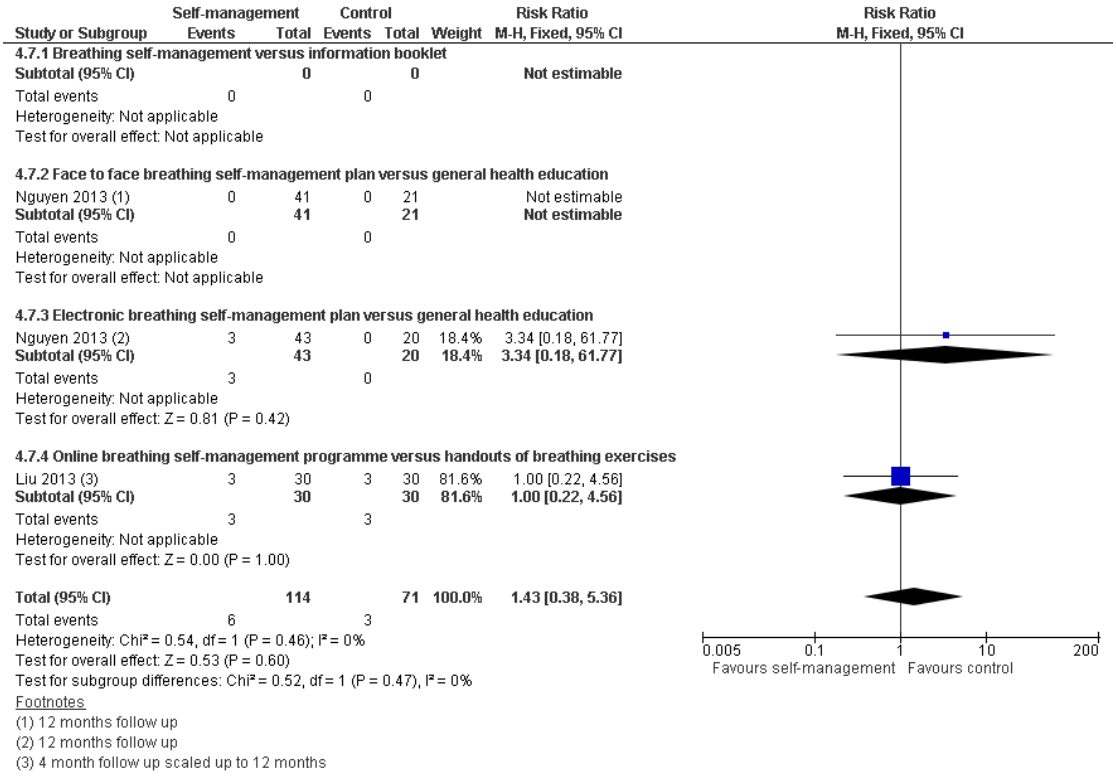
(1) 12 months follow up

(2) 12 months follow up

(3) 12 months follow up

(4) 4 month follow up scaled up to 12 months

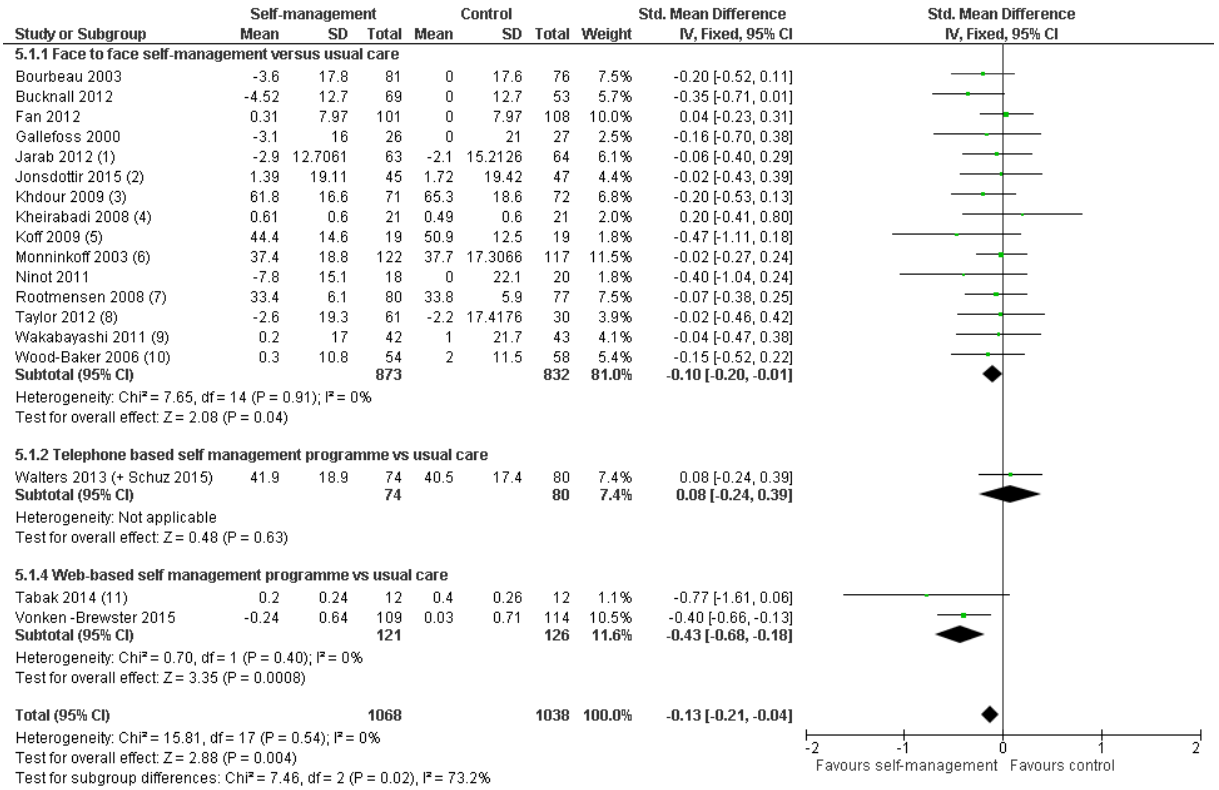
Sensitivity analysis- mortality



Footnotes
(1) 12 months follow up
(2) 12 months follow up
(3) 4 month follow up scaled up to 12 months

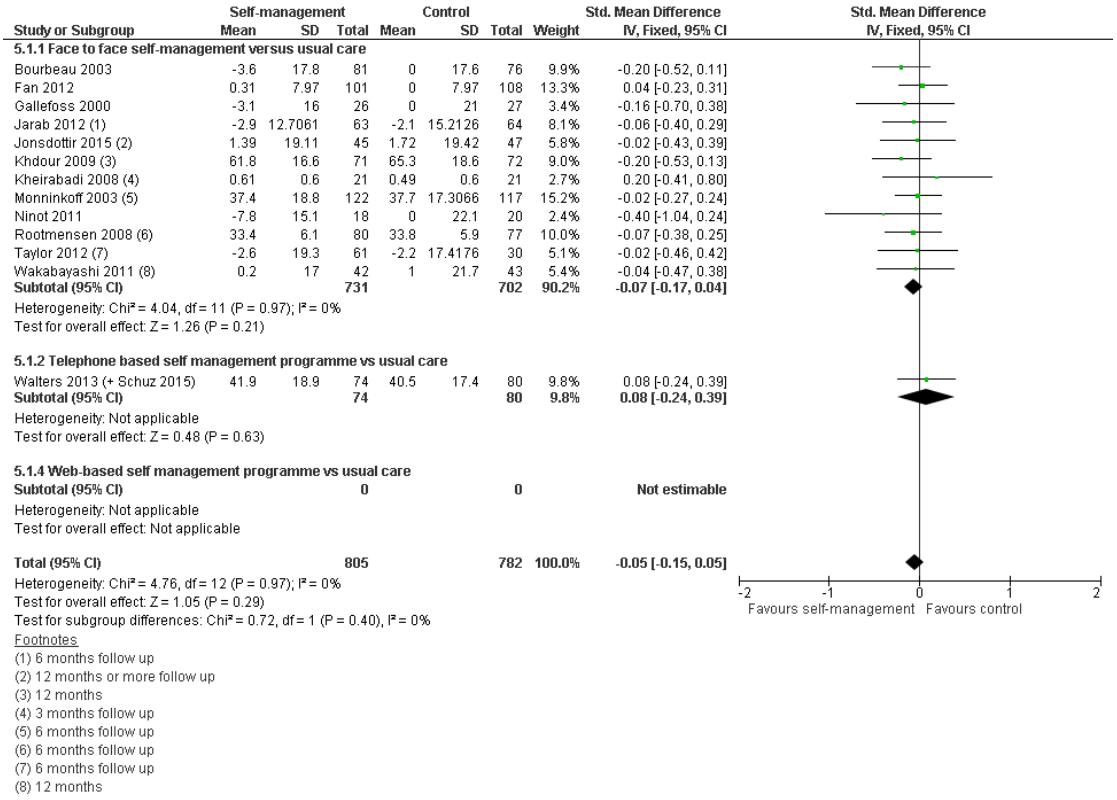
Self-management (general)

Respiratory-specific quality of life



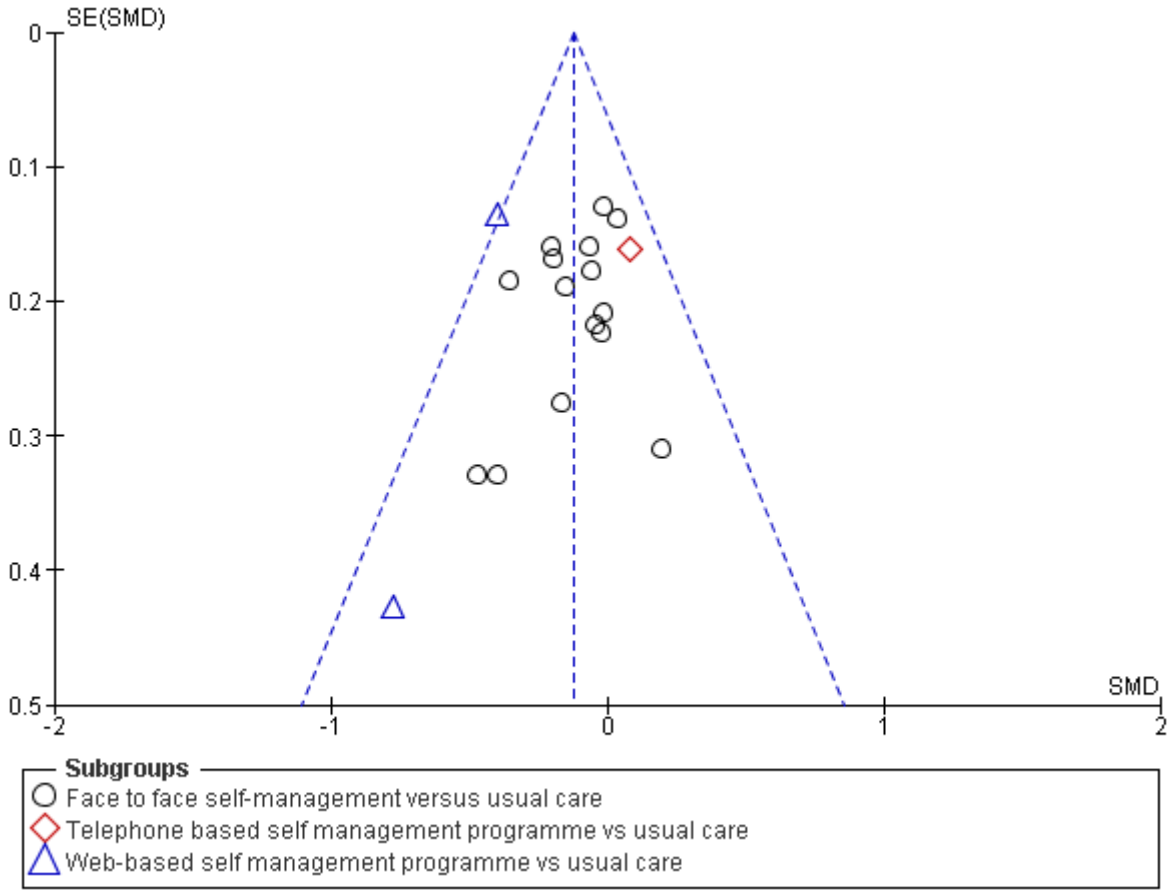
Footnotes
(1) 6 months follow up
(2) 12 months or more follow up
(3) 12 months
(4) 3 months follow up
(5) 3 months follow up
(6) 6 months follow up
(7) 6 months follow up
(8) 6 months follow up
(9) 12 months
(10) 12 months or more follow up
(11) 3 months follow up

Sensitivity analysis- COPD- specific quality of life

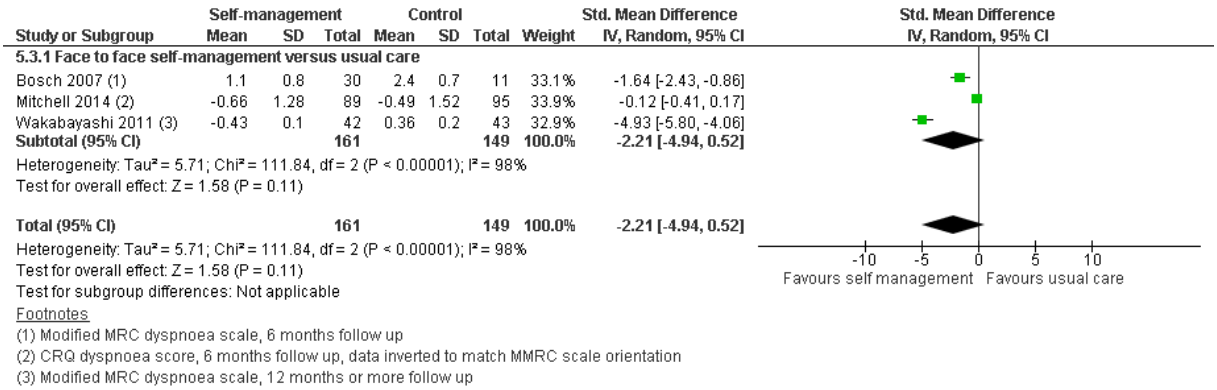


Footnotes
(1) 6 months follow up
(2) 12 months or more follow up
(3) 12 months
(4) 3 months follow up
(5) 6 months follow up
(6) 6 months follow up
(7) 6 months follow up
(8) 12 months

Publication bias assessment



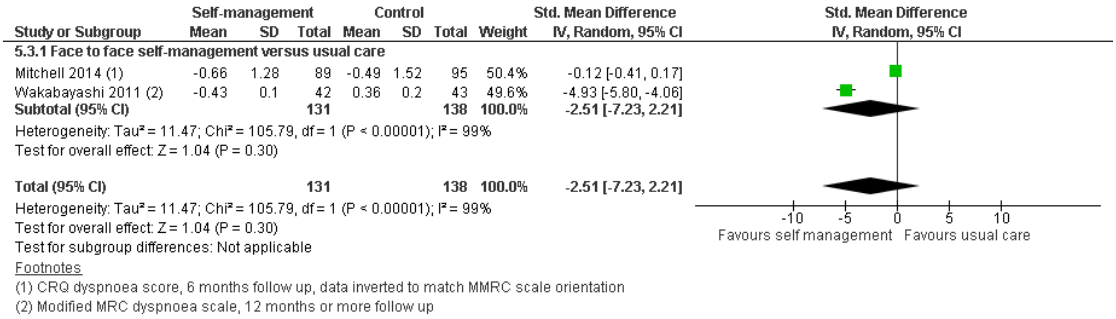
Breathlessness



Study or Subgroup	Self-management Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
5.3.1 Face to face self-management versus usual care								
Bosch 2007 (1)	1.1	0.8	30	2.4	0.7	11	33.1%	-1.64 [-2.43, -0.86]
Mitchell 2014 (2)	-0.66	1.28	89	-0.49	1.52	95	33.9%	-0.12 [-0.41, 0.17]
Wakabayashi 2011 (3)	-0.43	0.1	42	0.36	0.2	43	32.9%	-4.93 [-5.80, -4.06]
Subtotal (95% CI)			**161**			**149**	**100.0%**	**-2.21 [-4.94, 0.52]**
Heterogeneity: Tau² = 5.71; Chi² = 111.84, df = 2 (P < 0.00001); I² = 98%								
Test for overall effect: Z = 1.58 (P = 0.11)								
Total (95% CI)			**161**			**149**	**100.0%**	**-2.21 [-4.94, 0.52]**
Heterogeneity: Tau² = 5.71; Chi² = 111.84, df = 2 (P < 0.00001); I² = 98%								
Test for overall effect: Z = 1.58 (P = 0.11)								
Test for subgroup differences: Not applicable								

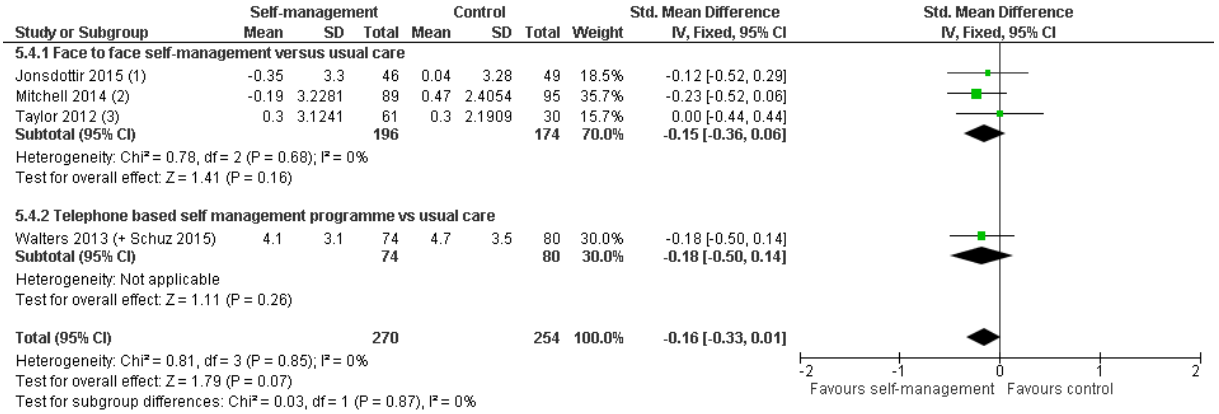
Footnotes
(1) Modified MRC dyspnoea scale, 6 months follow up
(2) CRQ dyspnoea score, 6 months follow up, data inverted to match MMRC scale orientation
(3) Modified MRC dyspnoea scale, 12 months or more follow up

Sensitivity analysis- breathlessness



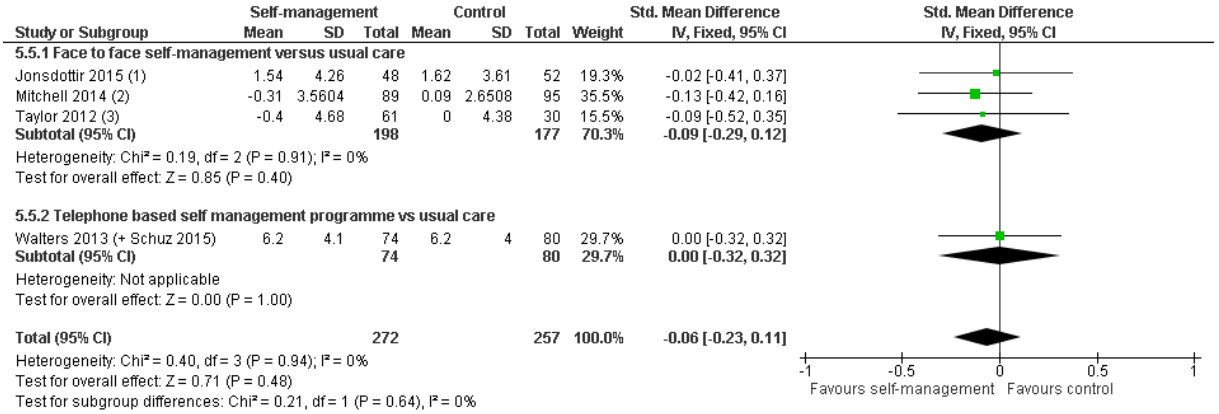
Footnotes
(1) CRQ dyspnoea score, 6 months follow up, data inverted to match MMRC scale orientation
(2) Modified MRC dyspnoea scale, 12 months or more follow up

Depression



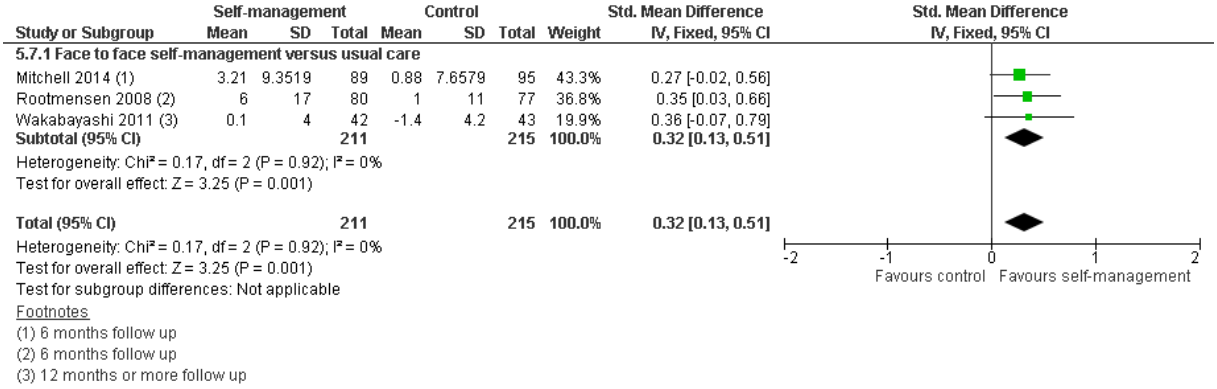
Footnotes
(1) 12 months or more follow up
(2) 6 months follow up
(3) 6 months follow up

Anxiety

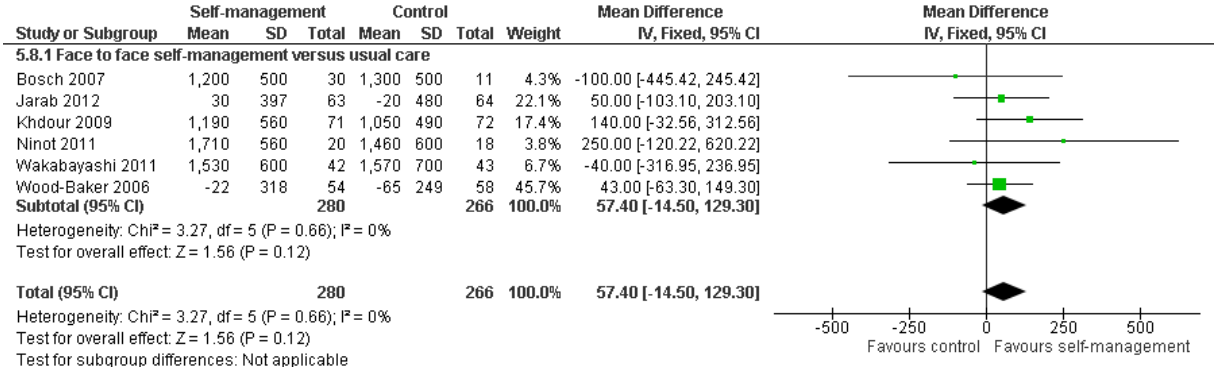


Footnotes
(1) 12 months or more
(2) 6 months follow up
(3) 6 months follow up

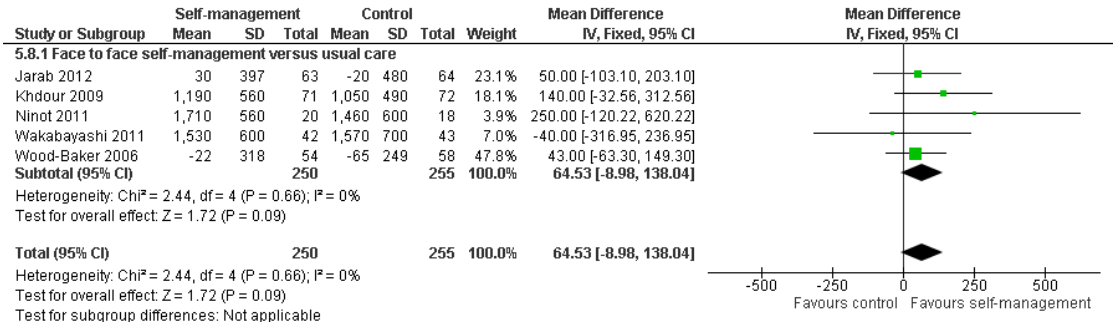
Knowledge



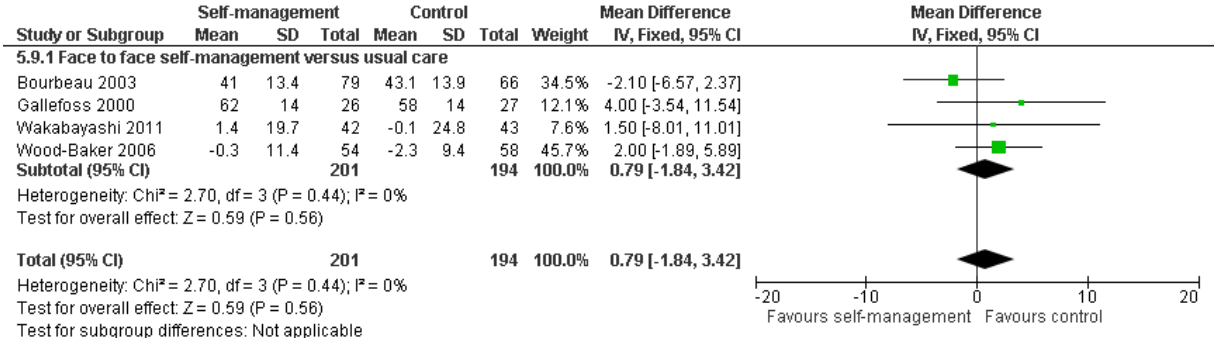
FEV1 (ml)



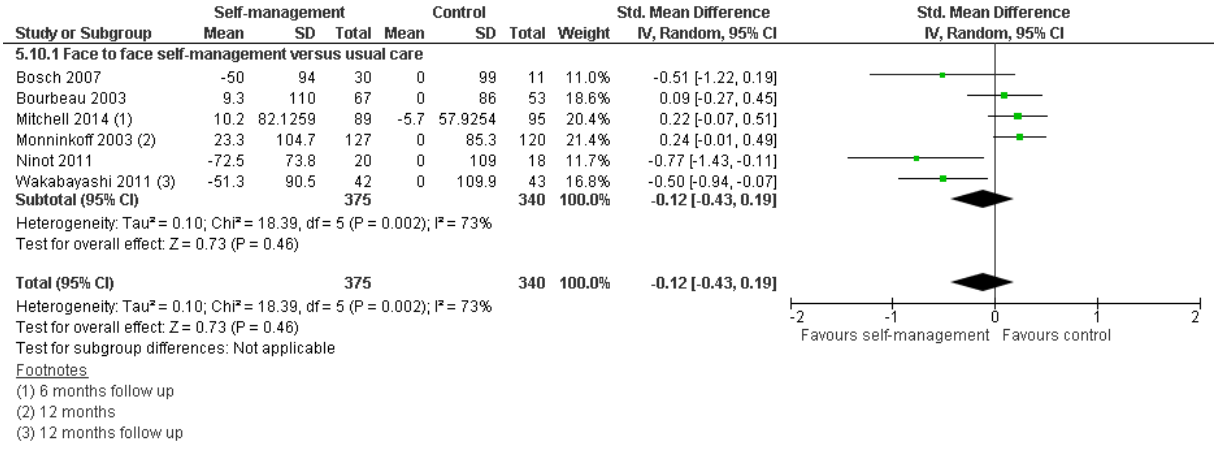
Sensitivity analysis- FEV1 (ml)



FEV1 (% predicted)

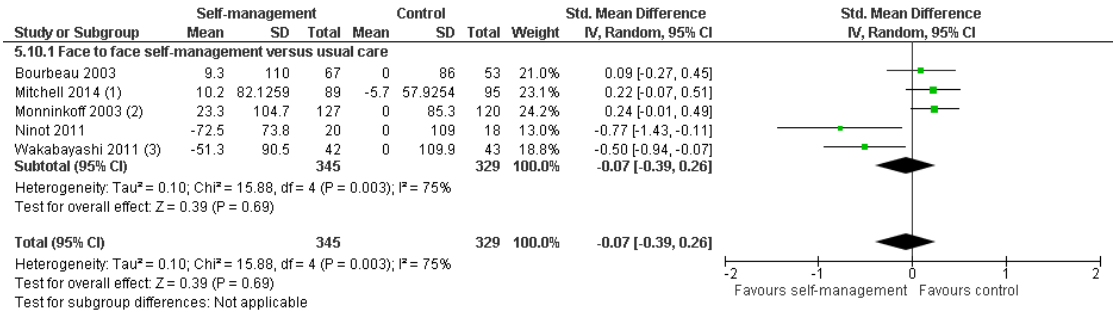


Exercise capacity



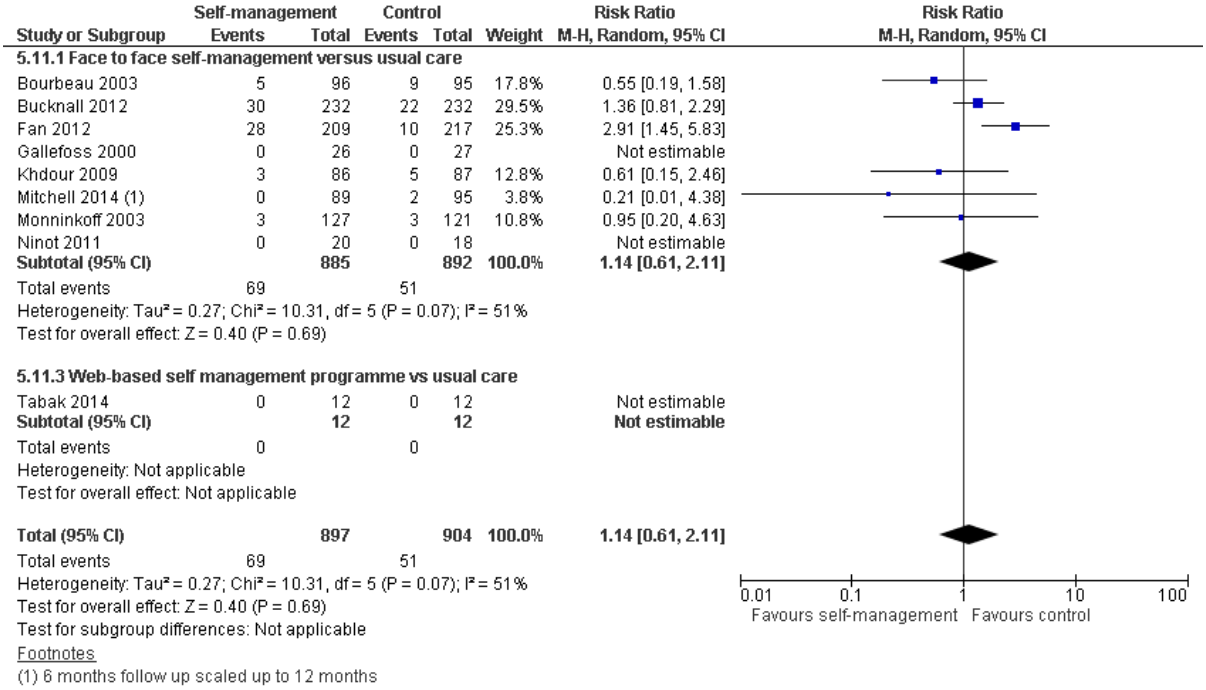
Footnotes
(1) 6 months follow up
(2) 12 months
(3) 12 months follow up

Sensitivity analysis- exercise capacity

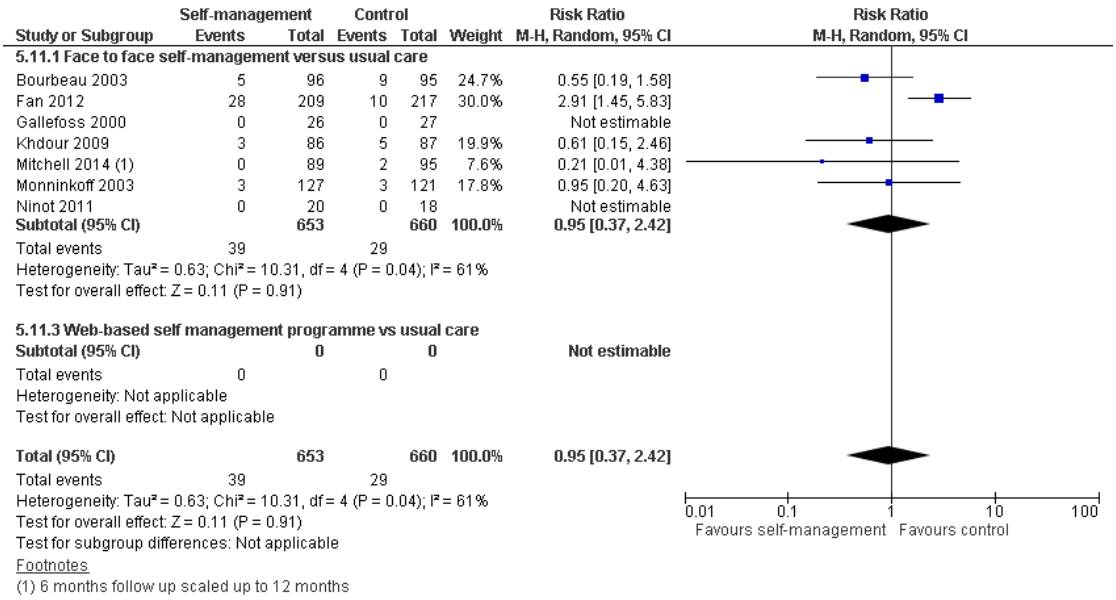


Footnotes
(1) 6 months follow up
(2) 12 months
(3) 12 months follow up

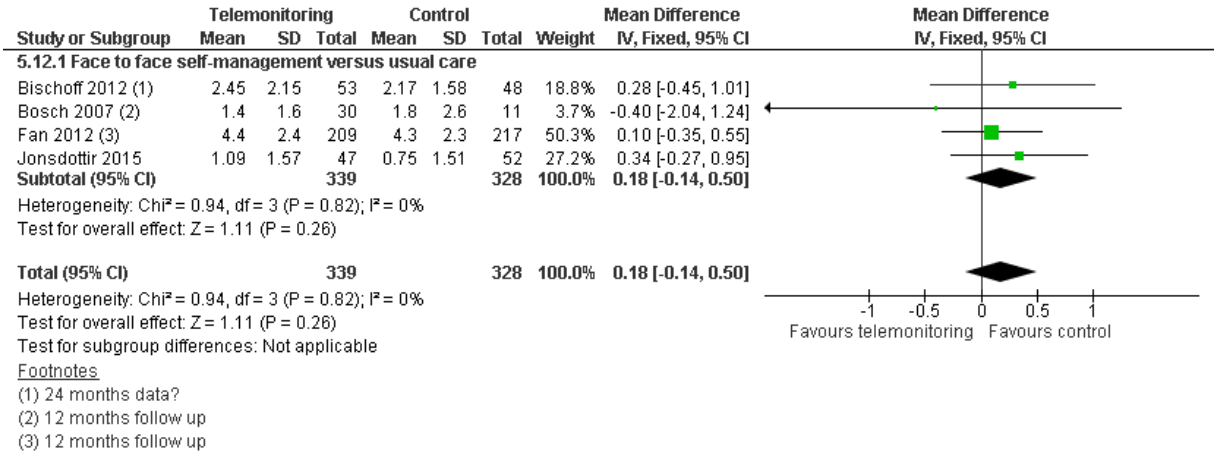
Mortality



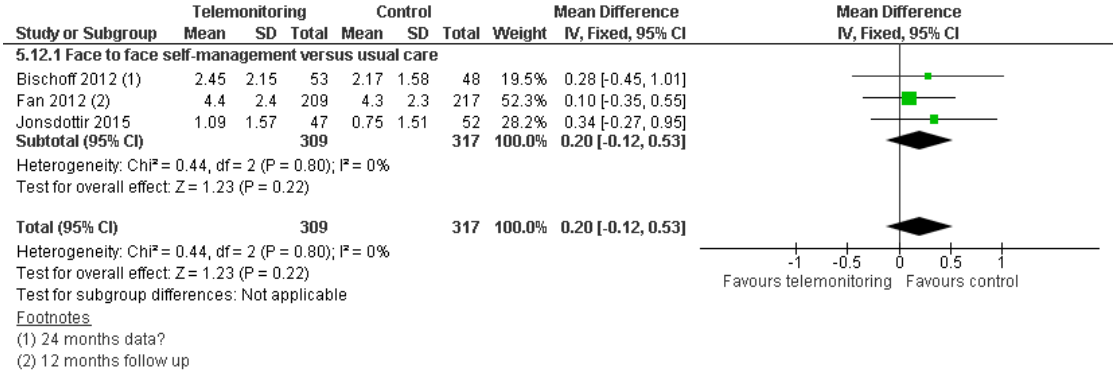
Sensitivity analysis- mortality



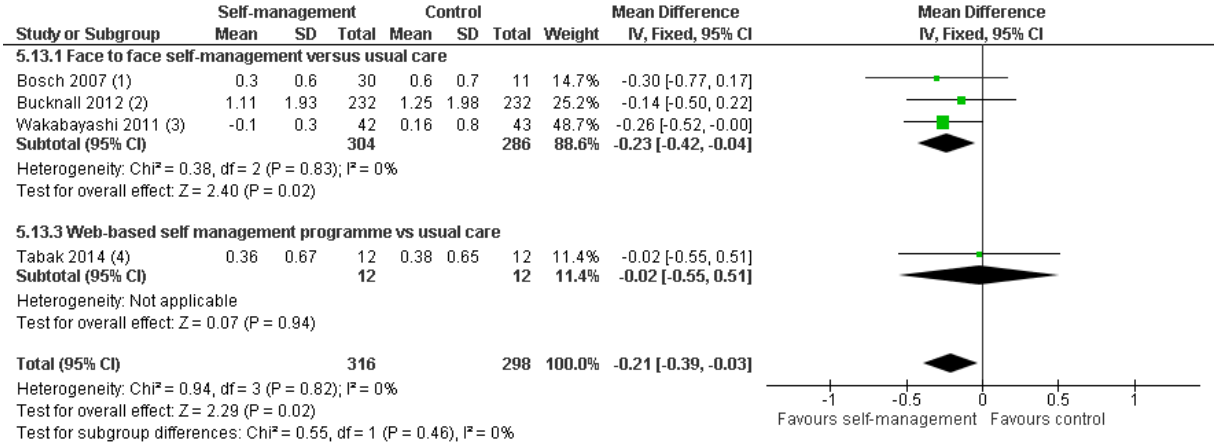
Number of exacerbations



Sensitivity analysis- number of exacerbations



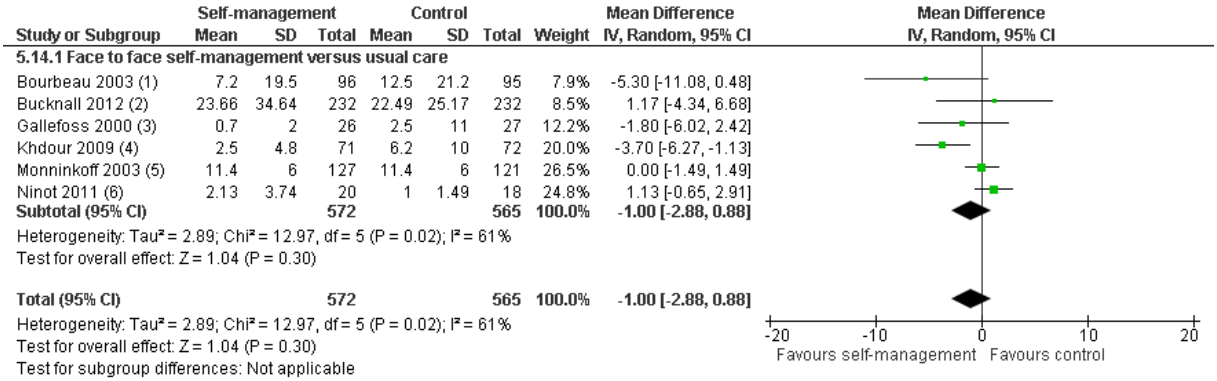
Hospital admissions



Footnotes

(1) 12 months follow up
(2) 12 months follow up
(3) 12 months follow up
(4) 9 months follow up?

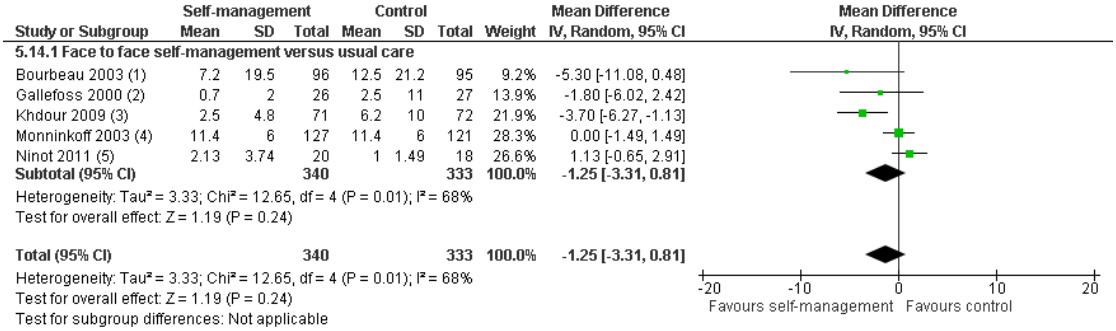
Length of hospital stay



Footnotes

(1) 12 months follow up
(2) 12 and 24 months follow up- check data
(3) 12 months follow up
(4) 12 months follow up
(5) 12 months follow up
(6) 12 months follow up

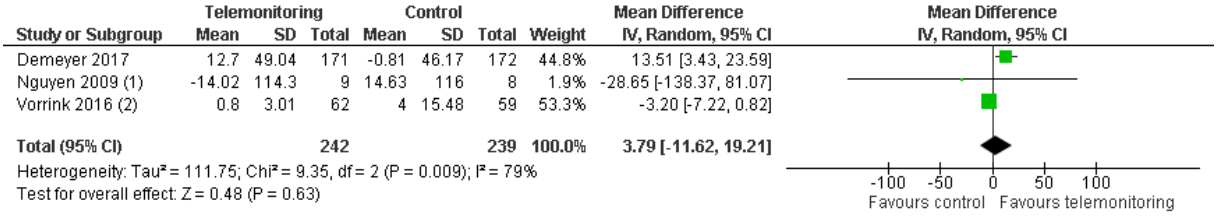
Sensitivity analysis- length of hospital stay



Footnotes
(1) 12 months follow up
(2) 12 months follow up
(3) 12 months follow up
(4) 12 months follow up
(5) 12 months follow up

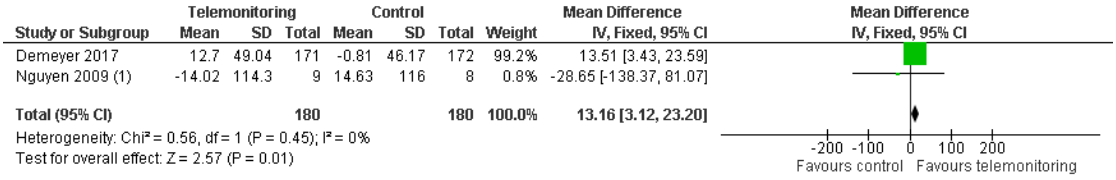
Telehealth monitoring (exercise)

Six minote walk distance (6MWD)



Footnotes
(1) Metres were converted from feet, control is MOBILE- self-monitored group
(2) Usual care control

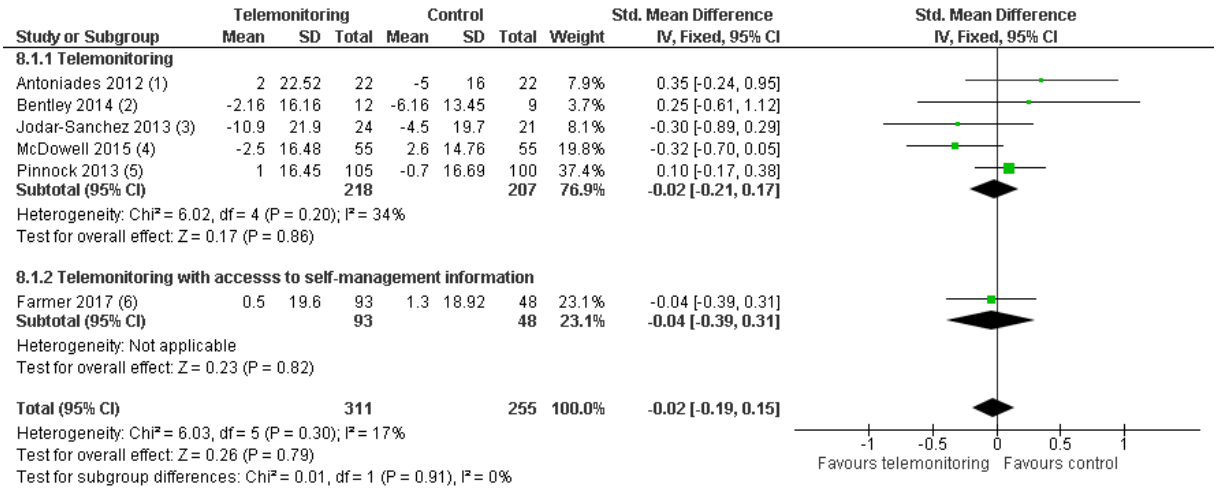
Sensitivity analysis- 6MWD



Footnotes
(1) Metres were converted from feet, control is MOBILE- self-monitored group

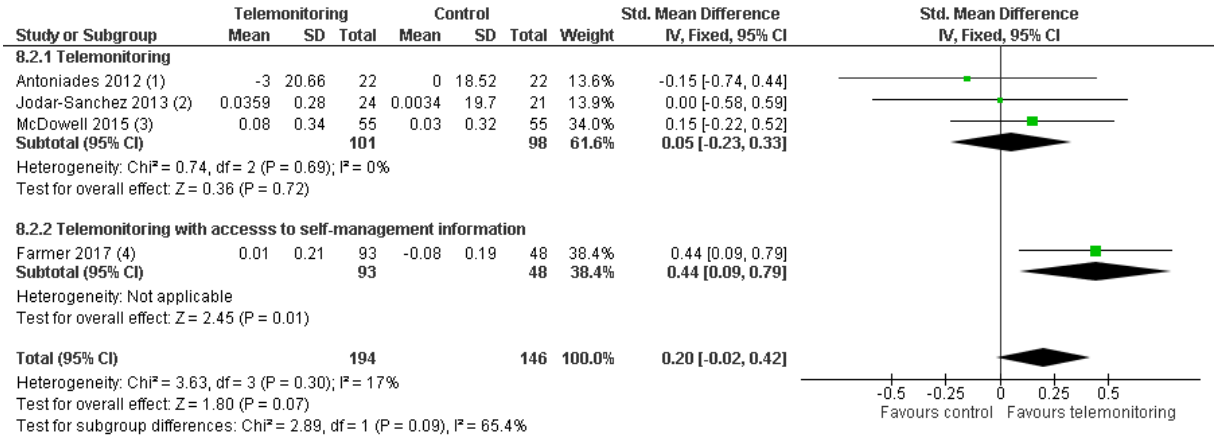
Telehealth monitoring (health)

Respiratory-specific quality of life



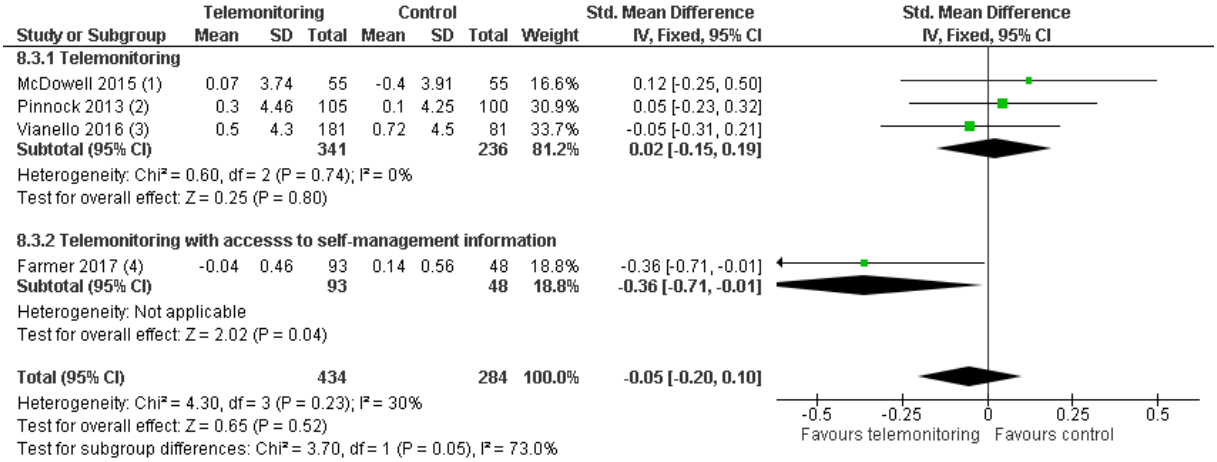
Footnotes
(1) CRDQ- reversed scale, 12 months follow up
(2) SGRQ, 8 months folow up
(3) SGRQ- total score, 4 months follow up
(4) SGRQ-total score, 6 months follow up
(5) SGRQ, 12 months follow up
(6) SGRQ, 12 months follow up

Generic health-related quality of life



Footnotes
(1) SF-36, 12 months follow up
(2) EQ-5D, 4 months follow up
(3) EQ-5D, 6 months follow up
(4) EQ-5D-5L, 12 months follow up

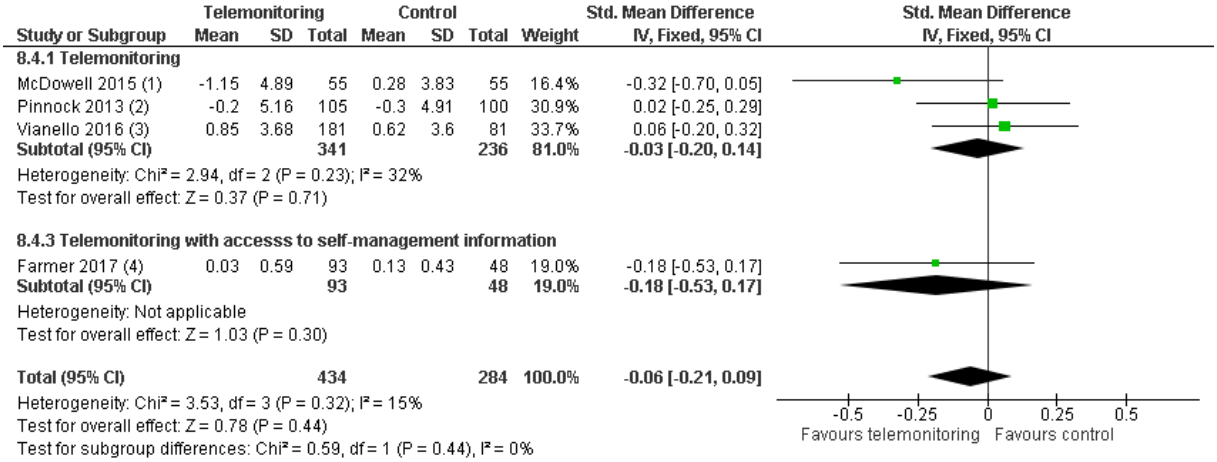
Depression



Footnotes

(1) Hospital Anxiety and Depression Scale, HADS -depression, 6 months follow up
(2) Hospital Anxiety and Depression Scale, HADS- depression, 12 months follow up
(3) Hospital Anxiety and Depression Scale, HADS- depression, 12 months follow up
(4) Standard Checklist 20-item Questionnaire, SCL-20, 12 months follow up

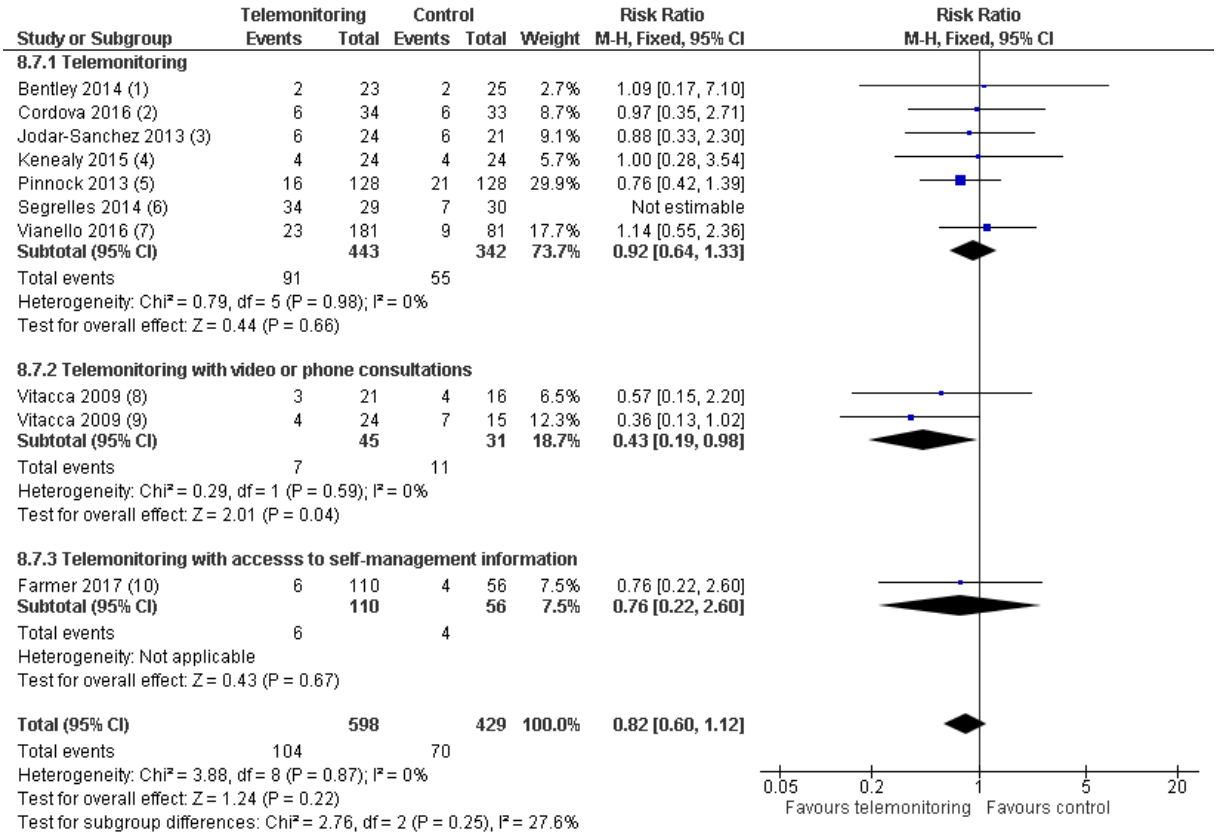
Anxiety



Footnotes

(1) Hospital Anxiety and Depression Scale, HADS- anxiety, 6 months follow up
(2) Hospital Anxiety and Depression Scale, HADS- anxiety, 12 months follow up
(3) Hospital Anxiety and Depression Scale, HADS- anxiety, 12 months follow up
(4) Standard Checklist 10-item Anxiety Measure, SCL-10A, 12 months follow up

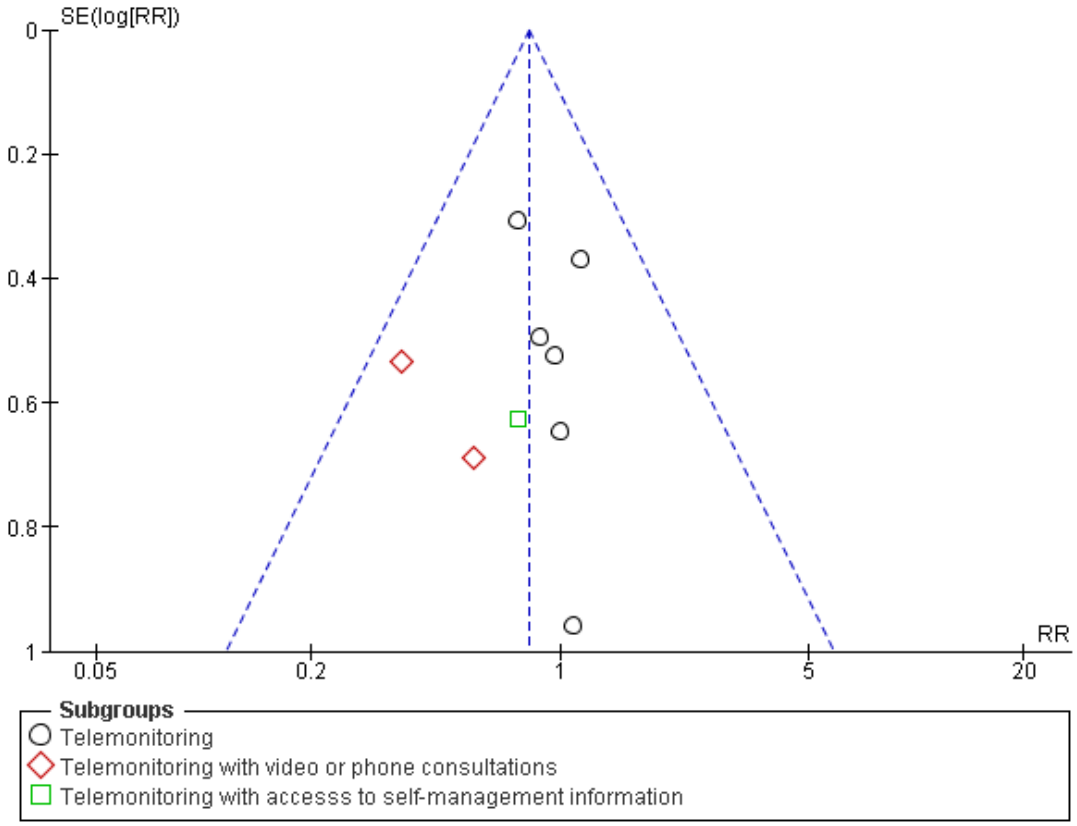
Mortality



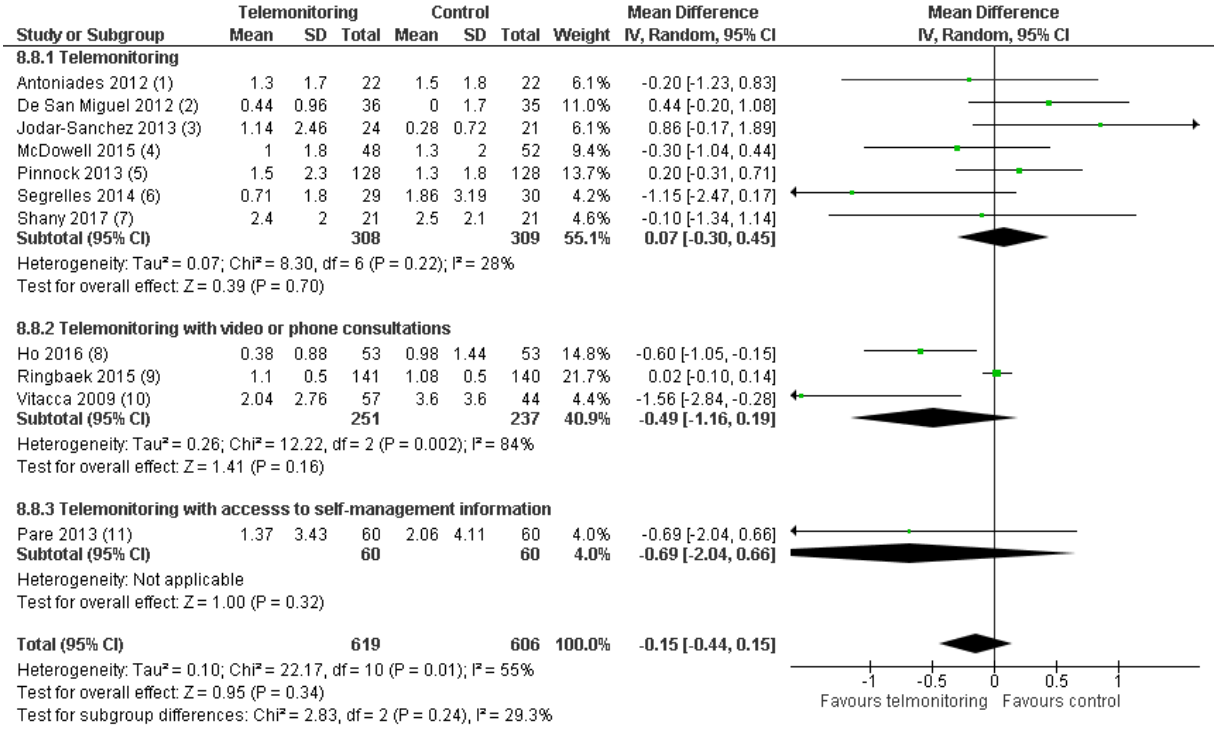
Footnotes

(1) 8 months follow up, scaled to 12 months (rounded up)
(2) Approximately 12 months, study duration given as mean number of days per group.
(3) 4 months follow up, scaled to 12 months
(4) Site B data only- all participants with COPD, 6 months follow up scaled to 12 months
(5) 12 months follow up
(6) 7 months follow up, scaled to 12 months
(7) 12 months follow up
(8) Data for subgroups from Vitacca 2016; 12 months follow up, control LTOT + NIV, Intervention LTOT + NIV+ telemonitoring
(9) Data for subgroups from Vitacca 2016; 12 months follow up, control LTOT, Intervention LTOT + telemonitoring
(10) 12 months follow up

Publication bias assessment- mortality



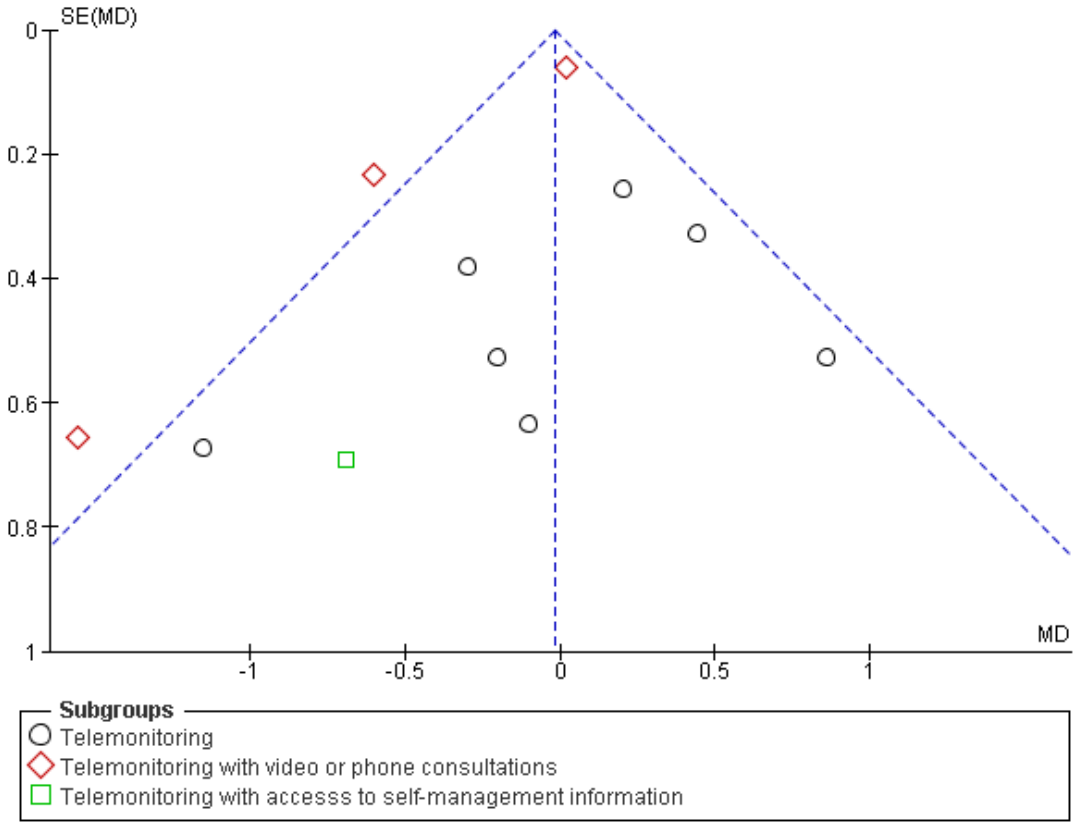
Hospital admissions and readmissions



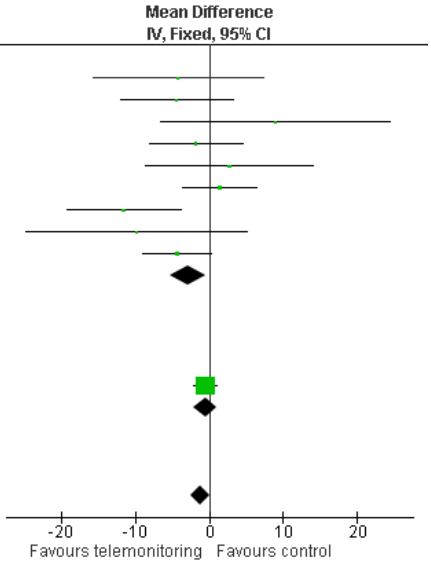
Footnotes

(1) COPD-related admissions, 12 months follow up
(2) COPD-related admissions, 6 months follow up scaled to 12 months
(3) 4 months follow up scaled to 12 months
(4) 6 months follow up scaled up to 12 months
(5) COPD-related admissions, 12 months follow up
(6) 7 months follow up scaled up to 12 months
(7) General hospital admission, ITT data, 12 months follow up
(8) COPD exacerbation related readmissions, 6 months follow up scaled up to 12 months
(9) COPD-related admissions, estimated SD (calculated from p-value), 6 months follow up scaled up to 12 months
(10) Data for participants with COPD only, per month scaled up to 12 months
(11) Data for 3.5 months post-intervention, scaled up to 12 months

Publication bias assessment- hospital admissions and readmissions



Length of hospital stay

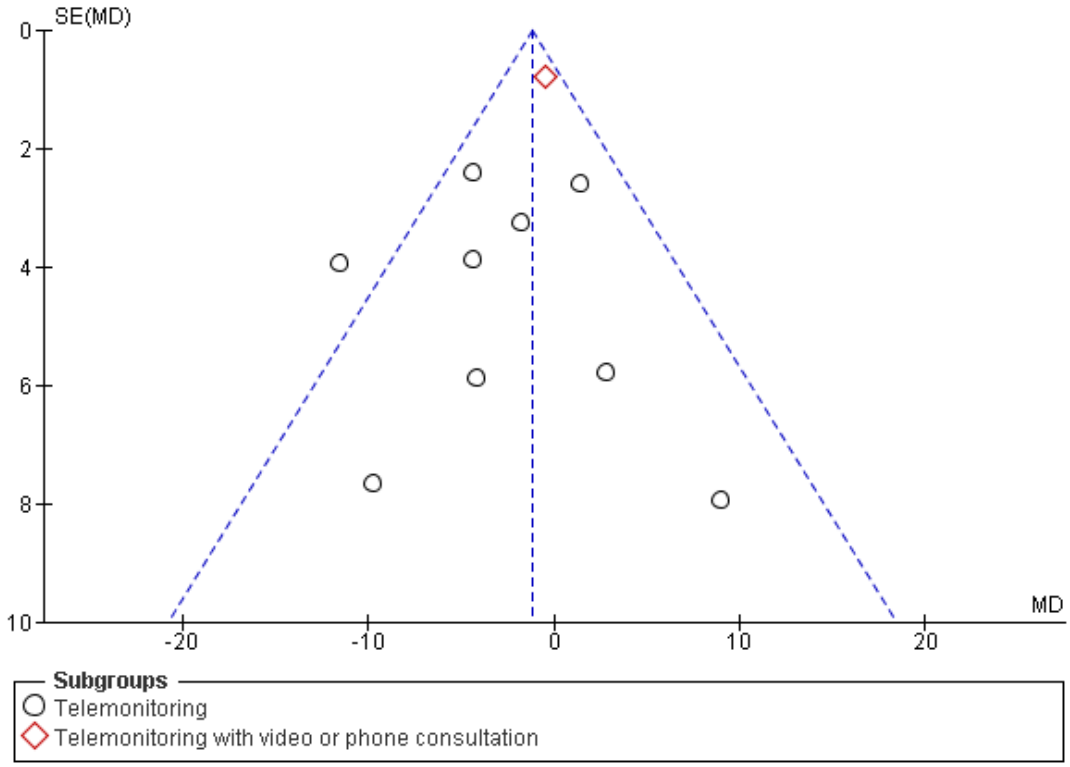


Study or Subgroup	Telemonitoring Mean	SD	Total	Control Mean	SD	Total	Weight	Mean Difference IV, Fixed, 95% CI
8.10.1 Telemonitoring								
Antoniades 2012 (1)	11.4	19.6	22	15.6	19.4	22	1.3%	-4.20 [-15.72, 7.32]
De San Miguel 2012 (2)	4.8	14.2	36	9.2	18.2	35	2.9%	-4.40 [-12.01, 3.21]
Jodar-Sanchez 2013 (3)	13.2	36.6	24	4.2	12	21	0.7%	9.00 [-6.52, 24.52]
McDowell 2015 (4)	6.8	15.4	48	8.6	17	52	4.2%	-1.80 [-8.15, 4.55]
Pare 2013 (5)	14.74	30.51	60	12	32.91	60	1.3%	2.74 [-8.62, 14.10]
Pinnock 2013 (6)	11.9	22.7	128	10.5	18.5	128	6.6%	1.40 [-3.67, 6.47]
Segrelles 2014 (7)	6.21	15.08	29	17.77	15.07	30	2.9%	-11.56 [-19.25, -3.87]
Shany 2017 (8)	20.6	18.5	21	30.4	29.7	21	0.8%	-9.80 [-24.77, 5.17]
Vianello 2016 (9)	18.93	15.33	181	23.29	19.05	81	7.7%	-4.36 [-9.07, 0.35]
Subtotal (95% CI)			**549**			**450**	**28.4%**	**-2.85 [-5.29, -0.40]**
Heterogeneity: Chi² = 12.33, df = 8 (P = 0.14); I² = 35%								
Test for overall effect: Z = 2.28 (P = 0.02)								
8.10.2 Telemonitoring with video or phone consultation								
Ringbaek 2015 (10)	3.52	6.6	141	4.04	6.6	140	71.6%	-0.52 [-2.06, 1.02]
Subtotal (95% CI)			**141**			**140**	**71.6%**	**-0.52 [-2.06, 1.02]**
Heterogeneity: Not applicable								
Test for overall effect: Z = 0.66 (P = 0.51)								
Total (95% CI)			**690**			**590**	**100.0%**	**-1.18 [-2.49, 0.12]**
Heterogeneity: Chi² = 14.81, df = 9 (P = 0.10); I² = 39%								
Test for overall effect: Z = 1.77 (P = 0.08)								
Test for subgroup differences: Chi² = 2.48, df = 1 (P = 0.12), I² = 59.7%								

Footnotes

(1) COPD-related admissions, 12 months follow up
(2) 6 months follow up scaled up to 12 months
(3) 4 months follow up scaled up to 12 months
(4) 6 months follow up scaled up to 12 months
(5) Data for 3.5 post intervention months follow up scaled up to 12 months
(6) COPD-related admissions, 12 months follow up
(7) 7 months follow up scaled up to 12 months
(8) General hospital admissions, ITT data, 12 months follow up
(9) Related to an acute exacerbation of COPD, 12 months follow up
(10) COPD-related admissions, estimated SD (calculated from p-value), 6 months follow up scaled up to 12 months

Publication bias assessment- length of hospital stay



Appendix G – GRADE tables

Education

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Inconsistency	Indirectness	Imprecision	Quality
Bristol COPD knowledge questionnaire (higher values favour education)										
1 (Hill 2010)	RCT	93	MD 9.30 (6.27, 12.33)	-	-	Not serious	N/A	Not serious	Not serious	High
Mortality (lower values favour education)										
1 (Siddique 2012)	RCT	3,425	RR 0.85 (0.68, 1.05)	7.42 per 100	6.31 per 100 (5.05, 7.80)	Not serious	N/A	Not serious	Serious[1]	Moderate

1. Non-significant result

Self-management

Action plans

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Inconsistency	Indirectness	Imprecision	Quality
Respiratory-specific quality of life - SGRQ (lower values favour self-management)										
6	RCT	1,338	MD -2.49 (-4.06, -0.92)	-	-	Very serious[4]	Serious[5]	Not serious	Serious[1]	Very low
Sensitivity analysis -respiratory-specific quality of life - SGRQ (lower values favour self-management) - excluding studies at high risk of bias										
3	RCT	427	MD -1.63 (-3.95, 0.68)	-	-	Not serious	Not serious	Not serious	Not serious	High

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Inconsistency	Indirectness	Imprecision	Quality
Subgroup analysis for recruitment based on exacerbation history -respiratory-specific quality of life - SGRQ (lower values favour self-management)										
Previous exacerbations in the last 12 months										
2	RCT	897	MD -4.12 (-6.30, -1.88)	-	-	Very serious[4]	Serious[5]	Not serious	Serious[1]	Very low
Previous exacerbations not required										
4	RCT	441	MD -0.93 (-3.13, 1.26)	-	-	Very serious[4]	Not serious	Not serious	Not serious	Low
Depression – HADS (lower values favour self-management)										
2	RCT	333	MD -0.25 (-0.34, -0.15)	-	-	Serious[2]	Not serious	Not serious	Not serious	Moderate
Anxiety – HADS (lower values favour self-management)										
2	RCT	333	MD -0.14 (-0.30, 0.02)	-	-	Serious[2]	Not serious	Not serious	Serious[3]	Low
FEV1 - % predicted (higher values favour self-management)										
2	RCT	116	MD 1.02 (-3.33, 5.37)	-	-	Serious[2]	Not serious	Not serious	Serious[3]	Low
Mortality (lower values favour self-management)										
6	RCT	1,561	RR 0.82 (0.58, 1.15)	8.49 per 100	6.97 per 100 (4.93, 9.77)	Not serious	Not serious	Not serious	Serious[3]	Moderate
Number of exacerbations (lower values favour self-management)										
1 (Trappenburg 2011)	RCT	216	MD 0.40 (-1.87, 2.67)	-	-	Not serious	N/A	Not serious	Serious[3]	Moderate
Hospital admissions (lower values favour self-management)										

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Inconsistency	Indirectness	Imprecision	Quality
2	RCT	339	MD 0.05 (-0.09, 0.18)	-	-	Not serious	Not serious	Not serious	Serious[3]	Moderate
Length of hospital stay (lower values favour self-management)										
3	RCT	1,055	MD -3.74 (-7.36, -0.12)	-	-	Not serious	Not serious	Not serious	Not serious	High

1. 95% confidence interval crosses one end of a defined MID interval
2. >33.3% of weighted data from studies at moderate or high risk of bias
3. Non-significant result
4. >33.3% of weighted data from studies at high risk of bias
5. I^2 > 33.3%

Exercise plans

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Inconsistency	Indirectness	Imprecision	Quality
Respiratory-specific quality of life - SGRQ (lower values favour self-management)										
1 (Moy 2015)	RCT	238	MD 1.10 (-2.23, 4.43)	-	-	Serious[1]	N/A	Not serious	Serious[2]	Low
Breathlessness - CRQ dyspnoea score (higher values favour self-management)										
1 (Johnson-Warrington 2016)	RCT	71	MD 0.60 (0.03, 1.17)	-	-	Not serious	N/A	Not serious	Serious[2]	Moderate
Depression – HADS (lower values favour self-management)										
1 (Johnson-Warrington 2016)	RCT	71	MD -0.22 (-2.00, 1.56)	-	-	Not serious	N/A	Not serious	Serious[3]	Moderate

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Inconsistency	Indirectness	Imprecision	Quality
Anxiety – HADS (lower values favour self-management)										
1 (Johnson-Warrington 2016)	RCT	71	MD -0.55 (-2.16, 1.06)	-	-	Not serious	N/A	Not serious	Serious[3]	Moderate
Bristol COPD knowledge questionnaire (higher values favour self-management)										
1 (Johnson-Warrington 2016)	RCT	71	MD 1.82 (-1.55, 5.15)	-	-	Not serious	N/A	Not serious	Serious[3]	Moderate
Daily step count (higher values favour self-management)										
1 (Moy 2015)	RCT	238	MD 107 (-506, 720)	-	-	Serious[1]	N/A	Not serious	Serious[3]	Low
Mortality (lower values favour self-management)										
2	RCT	317	RR 0.30 (0.01, 16.28)	11.38 per 100	3.41 per 100 (0.11,185.30)	Serious[4]	Serious[5]	Not serious	Serious[3]	Very low

1. Study at moderate risk of bias due to lack of blinding
2. 95% confidence interval crosses one end of a defined MID interval
3. Non-significant result
4. >33.3% of weighted data from studies at moderate or high risk of bias
5. I^2 > 33.3%

Breathing plans

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Inconsistency	Indirectness	Imprecision	Quality
Respiratory-specific quality of life (lower values favour self-management)										

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Inconsistency	Indirectness	Imprecision	Quality
2	RCT	182	SMD -1.70 (-3.88, 0.47)	-	-	Not serious	Serious[1]	Not serious	Very serious[2]	Very low
Subgroup analysis by plan type -respiratory-specific quality of life (lower values favour self-management)										
Face to face breathing self-management plan										
1 (Nguyen 2013)	RCT	62	SMD -0.12 (-0.64, 0.41)	-	-	Not serious	N/A	Not serious	Very serious[2]	Low
Electronic breathing self-management plan										
1 (Nguyen 2013)	RCT	63	SMD -0.28 (-0.18, 0.26)	-	-	Not serious	N/A	Not serious	Serious[4]	Moderate
Online breathing self-management plan										
1 (Liu 2013)	RCT	57	SMD -4.90 (-5.97, -3.84)	-	-	Not serious	N/A	Not serious	Not serious	High
Breathlessness- CRQ dyspnoea score (higher values favour self-management)										
2	RCT	246	MD 2.17 (-0.49, 4.82)	-	-	Very serious[3]	Serious[1]	Not serious	Serious[4]	Very low
Sensitivity analysis- breathlessness- CRQ dyspnoea score (higher values favour self-management) –excluding study at high risk of bias										
1 (Nguyen 2013)	RCT	125	MD 0.70 (-1.75, 3.15)	-	-	Not serious	N/A	Not serious	Very serious[2]	Low
Depression – HADS (lower values favour self-management)										
2	RCT	178	MD -1.74 (-2.72, -0.75)	-	-	Very serious[3]	Not serious	Not serious	Not serious	Low
Sensitivity analysis- depression – HADS (lower values favour self-management) –excluding study at high risk of bias										
1 (Bove 2016)	RCT	57	MD -1.04 (-2.73, 0.65)	-	-	Not serious	N/A	Not serious	Serious[5]	Moderate

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Inconsistency	Indirectness	Imprecision	Quality
Anxiety – HADS (lower values favour self-management)										
2	RCT	178	MD -1.95 (-3.08, -0.81)	-	-	Very serious[3]	Not serious	Not serious	Not serious	Low
Sensitivity analysis -anxiety – HADS (lower values favour self-management) –excluding study at high risk of bias										
1 (Bove 2016)	RCT	57	MD -2.32 (-4.13, -0.51)	-	-	Not serious	N/A	Not serious	Not serious	High
FEV1 - % predicted (higher values favour self-management)										
1 (Liu 2013)	RCT	57	MD 5.40 (5.01, 5.79)	-	-	Not serious	N/A	Not serious	Not serious	High
Six minute walk distance (6MWD) (high values favour self-management)										
2	RCT	182	MD 48.52 (0.57, 96.47)	-	-	Not serious	Serious[1]	Not serious	Serious[4]	Low
Subgroup analysis by plan type - 6MWD (higher values favour self-management)										
Face to face breathing self-management plan										
1 (Nguyen 2013)	RCT	62	MD 19.52 (-40.95, 79.99)	-	-	Not serious	N/A	Not serious	Very serious[2]	Low
Electronic breathing self-management plan										
1 (Nguyen 2013)	RCT	63	MD 22.25 (-38.40, 82.90)	-	-	Not serious	N/A	Not serious	Very serious[2]	Low
Online breathing self-management plan										
1 (Liu 2013)	RCT	57	MD 80.40 (74.52, 86.28)	-	-	Not serious	N/A	Not serious	Not serious	High
Mortality (lower values favour self-management)										

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Inconsistency	Indirectness	Imprecision	Quality
3	RCT	407	RR 1.41 (0.66, 3.02)	7.08 per 100	9.98 per 100 (4.67, 21.38)	Very serious[3]	Not serious	Not serious	Serious[5]	Very low
Sensitivity analysis - mortality (lower values favour self-management) –excluding study at high risk of bias										
2	RCT	185	RR 1.43 (0.38, 5.36)	4.17 per 100	5.96 per 100 (1.58, 22.33)	Not serious	Not serious	Not serious	Serious[5]	Moderate
Length of hospital stay (lower values favour self-management)										
1 (Howard 2014)	RCT	222	MD -6.45 (-8.73, -4.17)	-	-	Not serious[6]	N/A	Not serious	Not serious	High

1. $I^2 > 33.3\%$
2. 95% confidence interval crosses both ends of a defined MID interval
3. >33.3% of weighted data from studies at high risk of bias
4. 95% confidence interval crosses one end of a defined MID interval
5. Non-significant result
6. Study at high risk of bias due to high rates of informative dropout, but this outcome was measured through administrative datasets so data were not missing

General self-management interventions

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Inconsistency	Indirectness	Imprecision	Quality
Respiratory-specific quality of life (lower values favour self-management)										
18	RCT	2,106	SMD -0.13 (-0.21, -0.04)	-	-	Serious[7]	Not serious	Not serious	Serious[1]	Low
Sensitivity analysis- respiratory-specific quality of life (lower values favour self-management) –excluding studies at high risk of bias										
12	RCT	1,587	SMD -0.05	-	-	Serious[9]	Not serious	Not serious	Not serious	Moderate

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Inconsistency	Indirectness	Imprecision	Quality
			(-0.15, 0.05)							
Subgroup analysis by mode of delivery- respiratory-specific quality of life (lower values favour self-management)										
Face to face delivery										
15	RCT	1705	SMD -0.10 (-0.20, -0.01)	-	-	Serious[2]	Not serious	Not serious	Very serious[4]	Very low
Telephone delivery										
1 (Walters 2013)	RCT	154	SMD 0.08 (-0.24, 0.39)	-	-	Not serious	N/A	Not serious	Very serious[4]	Low
Web- based delivery										
2	RCT	247	SMD -0.43 (-0.68, -0.18)	-	-	Very serious[6]	Not serious	Not serious	Serious[1]	Very low
Generic health-related quality of life (higher values favour self-management)										
1 (Taylor 2012)	RCT	91	MD 0.14 (0.03, 0.25)	-	-	Serious[2]	N/A	Not serious	Serious[1]	Low
Breathlessness (lower values favour self-management)										
3	RCT	310	SMD -2.21 (-4.94, 0.52)	-	-	Not serious	Very serious[6]	Not serious	Very serious[4]	Very low
Sensitivity analysis- breathlessness (lower values favour self-management) –excluding studies at high risk of bias										
2	RCT	269	SMD -2.51 (-7.23, 2.21)	-	-	Not serious	Very serious[6]	Not serious	Very serious[4]	Very low
Depression (lower values favour self-management)										
4	RCT	524	SMD -0.16 (-0.33, 0.01)	-	-	Serious[7]	Not serious	Not serious	Serious[1]	Moderate
Anxiety (lower values favour self-management)										

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Inconsistency	Indirectness	Imprecision	Quality
4	RCT	529	SMD -0.06 (-0.23, 0.11)	-	-	Not serious	Not serious	Not serious	Serious[1]	Moderate
COPD self-efficacy scale (higher values favour self-management)										
1 (Mitchell 2014)	RCT	184	MD 1.47 (-0.65, 3.59)	-	-	Not serious	N/A	Not serious	Serious[5]	Moderate
Knowledge (higher values favour self-management)										
3	RCT	426	SMD 0.32 (0.13, 0.51)	-	-	Not serious	Not serious	Not serious	Serious[1]	Moderate
FEV1 - ml (higher values favour self-management)										
6	RCT	546	MD 57.4 (-14.5, 129.3)	-	-	Not serious	Not serious	Not serious	Serious[1]	Moderate
Sensitivity analysis- FEV1 (ml) (higher values favour self-management) –excluding studies at high risk of bias										
5	RCT	505	MD 64.53 (-8.98, 138.04)	-	-	Not serious	Not serious	Not serious	Serious[1]	Moderate
FEV1 - % predicted (higher values favour self-management)										
4	RCT	395	MD 0.79 (-1.84, 3.42)	-	-	Not serious	Not serious	Not serious	Serious[5]	Moderate
Exercise capacity (lower values favour self-management)										
6	RCT	715	SMD -0.12 (-0.43, 0.19)	-	-	Not serious	Very serious[6]	Not serious	Serious[1]	Very low
Sensitivity analysis - exercise capacity (higher values favour self-management) –excluding studies at high risk of bias										
5	RCT	674	SMD -0.07 (-0.39, 0.26)	-	-	Not serious	Very serious[6]	Not serious	Very serious[4]	Very low

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Inconsistency	Indirectness	Imprecision	Quality
Mortality (lower values favour self-management)										
9	RCT	1,801	RR 1.14 (0.61, 2.11)	7.80 per 100	8.89 per 100 (4.76, 16.45)	Serious[7]	Serious[3]	Not serious	Serious[5]	Very low
Sensitivity analysis- mortality (lower values favour self-management) –excluding studies at high risk of bias										
7	RCT	1,313	RR 0.95 (0.37, 2.42)	4.39 per 100	4.17 per 100 (1.63, 10.63)	Serious[9]	Serious[3]	Not serious	Serious[5]	Very low
Number of exacerbations (lower values favour self-management)										
4	RCT	667	MD 0.18 (-0.14, 0.50)	-	-	Serious[7]	Not serious	Not serious	Serious[5]	Low
Sensitivity analysis- number of exacerbations (lower values favour self-management) –excluding studies at high risk of bias										
3	RCT	626	MD 0.20 (-0.12, 0.53)	-	-	Serious[9]	Not serious	Not serious	Serious[5]	Low
Hospital admissions (lower values favour self-management)										
4	RCT	614	MD -0.21 (-0.39, -0.03)	-	-	Very serious[8]	Not serious	Not serious	Not serious	High
Sensitivity analysis- hospital admissions (lower values favour self-management) –excluding studies at high risk of bias										
1 (Wakabayashi 2011)	RCT	85	MD -0.26 (-0.52, -0.00)	-	-	Not serious	N/A	Not serious	Serious[5]	Moderate
Length of hospital stay (lower values favour self-management)										
6	RCT	1,137	MD -1.00 (-2.88, 0.88)	-	-	Serious[7]	Serious[3]	Not serious	Serious[5]	Very low
Sensitivity analysis - length of hospital stay (lower values favour self-management) excluding studies at high risk of bias										
5	RCT	677	MD -1.25 (-3.31, 0.81)	-	-	Serious[9]	Very serious[6]	Not serious	Serious[5]	Very low

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Inconsistency	Indirectness	Imprecision	Quality
Adherence to medication (higher values favour self-management)										
1 (Jarab 2012)	RCT	127	RR 1.39 (1.04, 1.84)	71.4 per 100	99.3 per 100 (74.3, 100)	Not serious	N/A	Not serious	Serious[1]	Moderate

1. 95% confidence interval crosses one end of a defined MID interval
2. Study at moderate risk of bias due to high rates of dropout
3. $I^2 > 33.3\%$
4. 95% confidence interval crosses both ends of a defined MID interval
5. Non-significant result
6. $I^2 > 66.7\%$
7. >33.3% of weighted data from studies at moderate or high risk of bias
8. >33.3% of weighted data from studies at high risk of bias
9. >33.3% of weighted data from studies at moderate risk of bias

Face to face self-management versus guidebook

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Inconsistency	Indirectness	Imprecision	Quality
Breathlessness – Borg Scale (lower values favour face to face self-management)										
1 (Kuo 2013)	RCT	64	MD -1.48 (-2.20, -0.76)	-	-	Serious[1]	N/A	Not serious	Serious[2]	Low
COPD self-efficacy scale (higher values favour face to face self-management)										
1 (Kuo 2013)	RCT	64	MD 0.39 (0.03, 0.75)	-	-	Serious[1]	N/A	Not serious	Not serious	Moderate

1. Lack of blinding of personnel and outcome assessors
2. 95% confidence interval crosses one end of a defined MID interval

Telehealth monitoring

Exercise focused

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Inconsistency	Indirectness	Imprecision	Quality
Respiratory-specific quality of life - SGRQ (lower values favour telehealth monitoring)										
1 (Nguyen 2009)	RCT	17	MD 8.90 (-4.81, 22.61)	-	-	Not serious	N/A	Not serious	Very serious[1]	Low
Breathlessness - CRQ dyspnoea score (higher values favour telehealth monitoring)										
1 (Vorrink 2016)	RCT	121	MD -0.09 (-0.28, 0.10)	-	-	Very serious[2]	N/A	Not serious	Not serious	Low
6MWD (higher values favour telehealth monitoring)										
3	RCT	481	MD 3.79 (-11.62, 19.21)	-	-	Very serious[4]	Very serious[5]	Serious[6]	Not serious	Very low
Sensitivity analysis- 6MWD (higher values favour telehealth monitoring)										
2	RCT	360	MD 13.16 (3.12, 23.20)	-	-	Serious[7]	Not serious	Serious[6]	Not serious	Low

1. 95% confidence interval crosses both ends of a defined MID interval
2. Study at high risk of bias due to high rates of informative dropout
3. Non-significant result
4. >33.3% of weighted data from studies at high risk of bias
5. $I^2 > 66.7\%$
6. >33.3% of studies by weight are partially directly applicable
7. >33.3% of weighted data from studies at moderate risk of bias

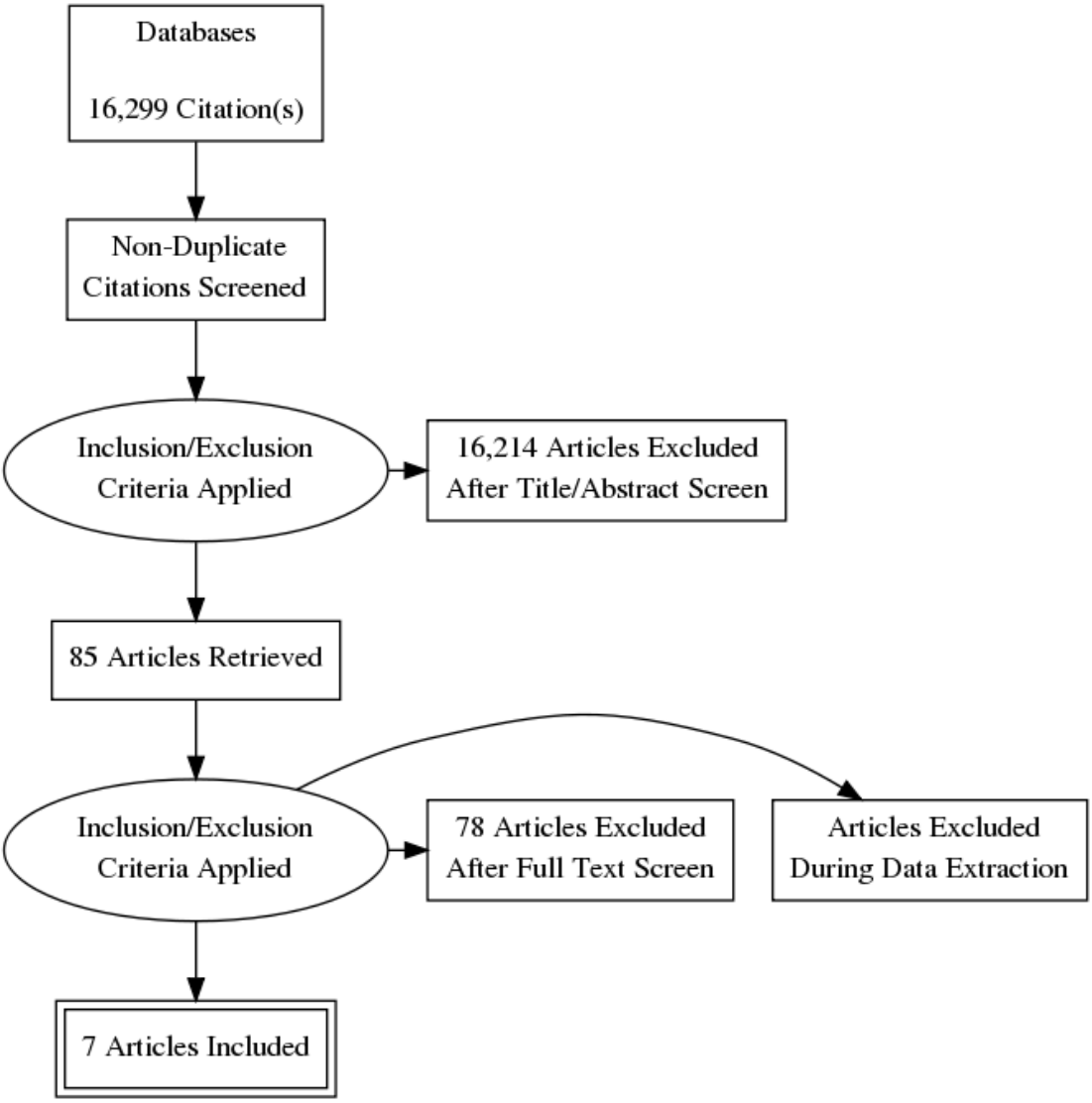
Health focused

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Inconsistency	Indirectness	Imprecision	Quality
Respiratory-specific quality of life (lower values favour telehealth monitoring)										
6	RCT	566	SMD -0.02 (-0.19, 0.15)	-	-	Not serious	Not serious	Not serious	Not serious	High
Generic health-related quality of life (higher values favour telehealth monitoring)										
4	RCT	340	SMD 0.20 (-0.02, 0.42)	-	-	Not serious	Not serious	Not serious	Serious[1]	Moderate
Depression (lower values favour telehealth monitoring)										
4	RCT	718	SMD -0.05 (-0.20, 0.10)	-	-	Serious[2]	Not serious	Not serious	Serious[1]	Low
Depression subgroup analysis based on presence or absence of access to self-management information (lower values favour telehealth monitoring)										
Telemonitoring										
3	RCT	577	SMD 0.02 (-0.15, 0.19)	-	-	Serious[2]	Not serious	Not serious	Not serious	Moderate
Telemonitoring with access to self-management information										
1	RCT	141	SMD -0.36 (-0.71, -0.01)	-	-	Not serious	N/A	Not serious	Serious[1]	Moderate
Anxiety (lower values favour telehealth monitoring)										
4	RCT	718	SMD -0.06 (-0.21 , 0.09)	-	-	Serious[2]	Not serious	Not serious	Serious[1]	Low
6MWD (higher values favour telehealth monitoring)										
1 (Antoniades 2012)	RCT	44	MD -44.0 (-113.0, 25.0)	-	-	Not serious	N/A	Not serious	Serious[1]	Moderate

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Inconsistency	Indirectness	Imprecision	Quality
Number of exacerbations (lower values favour telehealth monitoring)										
1 (Vitacca 2016)	RCT	76	MD -6.84 (-10.26, -3.42)	-	-	Serious[3]	N/A	Not serious	Not serious	Moderate
Mortality (lower values favour telehealth monitoring)										
10	RCT	1,027	RR 0.82 (0.60, 1.12)	17.4 per 100	13.9 per 100 (10.1, 19.5)	Not serious	Not serious	Not serious	Serious[4]	Moderate
Hospital admissions and readmissions (lower values favour telehealth monitoring)										
11	RCT	1, 225	MD -0.15 (-0.44, 0.15)	-	-	Not serious	Serious[5]	Not serious	Serious[4]	Low
Length of hospital stay (lower values favour telehealth monitoring)										
10	RCT	1,280	MD -1.18 (-2.49, 0.12)	-	-	Not serious	Not serious	Not serious	Serious[4]	Moderate
Adherence to treatment plans (higher values favour telehealth monitoring)										
1 (Pinnock 2013)	RCT	205	MD -0.10 (-0.62, 0.42)	-	-	Not serious	N/A	Not serious	Serious[4]	Moderate

1. 95% confidence interval crosses one end of a defined MID interval
2. >33.3% of weighted data from studies at moderate or high risk of bias
3. Selective reporting of outcome data in study
4. Non-significant result
5. I^2 > 33.3%, but < 66.7%

Appendix H – Economic evidence study selection



Appendix I – Health economic evidence profiles

Self-management

Study	1. Applicability 2. Limitations	Comparison(s)	Setting	Duration Discount rate(s)	Results / conclusion	Uncertainty
Dritsaki (2016)	1. Directly applicable 2. Very serious limitations[a]	Self-management programme of activity, coping and education (SPACE) versus usual care	UK	6 months N/A (time horizon less than one year)	ICER for self-management versus usual care: £280.39 per QALY	Probabilistic sensitivity analysis was conducted using 1,000 bootstrapped samples of trial data. Results showed that self-management is associated with a 97% probability of being cost-effective at a threshold of £20,000 per QALY.

(a) *The authors appear to have made an error in calculating QALYs – there seems to be no correction for utility at baseline, and QALYs have been calculated over one year, rather than the 6 month time horizon of the model.*

Study	1. Applicability 2. Limitations	Comparison(s)	Setting	Duration Discount rate(s)	Results / conclusion	Uncertainty
Jordan (2015)	1. Directly applicable 2. Minor limitations[a]	Self-management versus usual care	UK	Lifetime time horizon (30 years) Discount rate not specified – assumed 3.5%	ICER for self-management versus usual care: £8,218 per QALY	Probabilistic sensitivity analysis showed that self-management is associated with a 68% probability of being cost-effective at a threshold of £20,000 per QALY. This uncertainty was largely due to a wide confidence interval for the reduction in admissions

						associated with self-management. Deterministic sensitivity analyses were conducted in which the time horizon of the model, effectiveness of self-management and duration of intervention effect were varied. Scenarios using a 6 month time horizon and a low estimate of self-management effectiveness resulted in an ICER of over £20,000. In all scenarios the cost-effectiveness of self-management was relatively uncertain. Subgroup analyses showed that the ICER remained below £20,000 in patients stratified by GOLD stage, age, gender, and smoking status, but the uncertainty surrounding this result remained relatively high.

(a) The analysis was limited by the relatively high level of uncertainty regarding the effectiveness of self-management. However, this was a flaw in the quality and heterogeneity of the data used to inform the model, rather than an issue with the modelling approach itself.

Study	1. Applicability 2. Limitations	Comparison(s)	Setting	Duration Discount rate(s)	Results / conclusion	Uncertainty
Khdour (2011)	1. Directly applicable	Pharmacy-led self-management versus usual care	UK	1 year	Self-management dominates usual care: 0.065 incremental QALYs and cost saving of £671.59	Probabilistic sensitivity analysis was implemented via 1,000 bootstrapped samples of trial

	2. Minor limitations[a]	N/A (time horizon only 1 year)	data, and showed that self-management is associated with a 95% probability of being cost-effective

(a) Classified as having only having minor limitations as, although the analysis uses a short time horizon of 6 months, the intervention is cost-effective at this endpoint, and is likely to produce further QALY gains in the future

Study	1. Applicability 2. Limitations	Comparison(s)	Setting	Duration Discount rate(s)	Results / conclusion	Uncertainty
Taylor (2012)	1. Directly applicable 2. Minor limitations [a]	Self-management (Better Living with Long Term Airways Disease)	UK	6 months N/A – time horizon less than 1 year	ICER for self-management versus usual care: £11,710/QALY	Probabilistic sensitivity analysis was conducted using 1,000 bootstrapped samples of trial data, and showed that self-management is associated with a 75% probability of being cost-effective

(a) Classified as having only having minor limitations as, although the analysis uses a short time horizon of 6 months, the intervention is cost-effective at this endpoint, and is likely to produce further QALY gains in the future

Telehealth monitoring

Study	1. Applicability 2. Limitations	Comparison(s)	Setting	Duration Discount rate(s)	Results / conclusion	Uncertainty
Bentley (2014)	1. Directly applicable 2. Potentially serious limitations [a]	Telehealth as part of discharge service versus discharge service alone	UK	6 months N/A (Time horizon less than 1 year)	ICER for discharge service with telehealth versus standard discharge service: £68,811/QALY	No sensitivity analyses conducted

(a) Classified as having potentially serious limitations due to a lack of sensitivity analysis, short time horizon, and lack of clarity on whether adjustment for differences in baseline utility have been corrected for

Study	1. Applicability 2. Limitations	Comparison(s)	Setting	Duration Discount rate(s)	Results / conclusion	Uncertainty
McDowell (2015)	1. Directly applicable 2. Very serious limitations [a]	Telehealth monitoring compared with usual care in patients with moderate to severe COPD	UK	6 months N/A (time horizon is less than 1 year)	ICER for telehealth versus usual care: £203,900/QALY	No sensitivity analyses conducted

(a) *Classified as having very serious limitations as the analysis does not appear to include healthcare costs other than those directly associated with telemonitoring, does not include sensitivity analysis, uses a short time horizon, and lacks clarity on whether differences in baseline utility have been corrected for*

Study	1. Applicability 2. Limitations	Comparison(s)	Setting	Duration Discount rate(s)	Results / conclusion	Uncertainty
Stoddart (2015)	1. Directly applicable 2. Minor limitations[a]	Telehealth monitoring compared with usual care in patients who had been admitted to hospital for a COPD exacerbation in the previous year	UK	1 year N/A (time horizon not longer than 1 year)	ICER for telehealth versus usual care: £137,277/QALY.	Probabilistic sensitivity analysis was conducted using 1,000 non-parametric bootstrap samples, and showed that telehealth is associated with a 10.1% probability of being cost-effective compared to usual care at a threshold of £20,000/QALY.

(a) *Classified as having only minor limitations as, despite the relatively short time horizon, the high ICER and lack of certainty that telehealth monitoring produces a QALY benefit indicate that the intervention is unlikely to become cost-effective over a lifetime time horizon*

Appendix J – Excluded studies

Clinical studies

Short Title	Title	Reason for exclusion
Alwashmi (2016)	The Effect of Smartphone Interventions on Patients With Chronic Obstructive Pulmonary Disease Exacerbations: A Systematic Review and Meta-Analysis	Systematic review was excluded as data was extracted directly from relevant primary studies
Apps (2009)	Randomised controlled trial of a self-management programme of activity, coping and education (SPACE) for COPD	Abstract only (conference or other)
Apps (2013)	The development and pilot testing of the Self-management Programme of Activity, Coping and Education for Chronic Obstructive Pulmonary Disease (SPACE for COPD)	Study duration < 12 weeks
Ashmore (2013)	Chronic obstructive pulmonary disease self-management activation research trial (COPD-SMART): design and methods	Study protocol
Baker (2017)	Clinical and cost effectiveness of nurse-led self-management interventions for patients with copd in primary care: A systematic review	Systematic review was excluded as data was extracted directly from relevant primary studies
Barberan-Garcia (2014)	Effects and barriers to deployment of telehealth wellness programs for chronic patients across 3 European countries	Study does not allow separation of data for people with COPD from a mixed population Not a relevant study design (not an RCT or SR of RCTs) *Of the 3 study centres, participants at 2 were not randomised.*
Barnestein-Fonseca (2014)	Tecepoc II study . How to improve the inhalation techniques in patient with COPD. The influence of preferences	Abstract only (conference or other)
Bartoli (2009)	Systematic review of telemedicine services for patients affected by chronic obstructive pulmonary disease (COPD)	Systematic review was excluded as data was extracted directly from relevant primary studies
Bender (2015)	Enhancing physical activity in patients with chronic obstructive pulmonary	Abstract only (conference or other)

Short Title	Title	Reason for exclusion
	disease (COPD) through a program of patient selected goals	
Bentsen (2012)	Evaluation of self-management interventions for chronic obstructive pulmonary disease	More recent systematic review that covers the same topic
Benzo (2013)	Development and feasibility of a self-management intervention for chronic obstructive pulmonary disease delivered with motivational interviewing strategies	Study does not contain any of the outcomes of interest
Berkhof (2014)	Telemedicine, the effect of nurse-initiated telephone follow up, on health status and health-care utilization in COPD patients: A randomized trial	Study does not contain any relevant interventions *Intervention involves teleconsultations without telehealth monitoring*
Bernocchi (2018)	Home-based telerehabilitation in older patients with chronic obstructive pulmonary disease and heart failure: a randomised controlled trial	Study does not contain any relevant interventions. Intervention does not match our definition of telehealth monitoring.
Bertolini (2016)	Effects of a home-based exercise program after supervised resistance training in patients with chronic obstructive pulmonary disease	Physical activity intervention
Billington (2015)	Evaluation of a Nurse-Led Educational Telephone Intervention to Support Self-Management of Patients With Chronic Obstructive Pulmonary Disease: A Randomized Feasibility Study	Study does not contain any relevant interventions *Intervention consisted of phone call support on top of a self-management plan.*
Bischoff (2013)	Comprehensive self management and routine monitoring in chronic obstructive pulmonary disease patients in general practice: Randomised controlled trial	Abstract only (conference or other)
Blackstock (2007)	Disease-specific health education for COPD: a systematic review of changes in health outcomes	Systematic review was excluded as data was extracted directly from relevant primary studies
Blackstock (2014)	Comparable improvements achieved in chronic obstructive pulmonary disease through pulmonary rehabilitation with and without a	Study does not contain any relevant interventions *Intervention consists of education with pulmonary rehabilitation - pulmonary rehabilitation is out of the*

Short Title	Title	Reason for exclusion
	structured educational intervention: a randomized controlled trial	*scope of the review.*
Bolton (2011)	Insufficient evidence of benefit: A systematic review of home telemonitoring for COPD	Systematic review was excluded as data was extracted directly from relevant primary studies
Borycki (2012)	M-health: can chronic obstructive pulmonary disease patients use mobile phones and associated software to self-manage their disease?	Review article but not a systematic review
Botsis (2008)	Current status and future perspectives in telecare for elderly people suffering from chronic diseases	Systematic review was excluded as data was extracted directly from relevant primary studies
Bourbeau (2003)	Disease-specific self-management programs in patients with advanced chronic obstructive pulmonary disease: A comprehensive and critical evaluation	More recent systematic review that covers the same topic
Bourbeau (2016)	An international randomized study of a home-based self-management program for severe COPD: the COMET	Study protocol
Bryant (2013)	Improving medication adherence in chronic obstructive pulmonary disease: a systematic review	Systematic review was excluded as data was extracted directly from relevant primary studies
Cabedo (2010)	Effectiveness of the correct use of inhalation devices in patients with COPD: randomized clinical trial	Study not reported in English
Calvo (2014)	A home telehealth program for patients with severe COPD: The PROMETE study	Duplicate reference *Same as Segrelles 2014*
Cannon (2016)	The effects of chronic obstructive pulmonary disease self-management interventions on improvement of quality of life in COPD patients: A meta-analysis	Systematic review was excluded as data was extracted directly from relevant primary studies
Carre (2008)	The effect of an information leaflet upon knowledge and awareness of COPD in potential sufferers. A randomized controlled study	Study does not allow separation of data for people with COPD from a mixed population

Short Title	Title	Reason for exclusion
Cartwright (2013)	Effect of telehealth on quality of life and psychological outcomes over 12 months (Whole Systems Demonstrator telehealth questionnaire study): nested study of patient reported outcomes in a pragmatic, cluster randomised controlled trial	Study does not allow separation of data for people with COPD from a mixed population
Chan (2016)	Evaluation of a tablet-based instruction of breathing technique in patients with COPD	Study does not contain any relevant interventions *Both groups are taught pursed -lip breathing-the intervention group was taught using a tablet computer, the control group was taught face to face.*
Chatwin (2014)	Randomised crossover trial of telemonitoring in chronic respiratory patients (TeleCRAFT trial*): No impact on hospital admissions and quality of life (QOL)	Abstract only (conference or other)
Chatwin (2016)	Randomised crossover trial of telemonitoring in chronic respiratory patients (TeleCRAFT trial)	Study does not allow separation of data for people with COPD from a mixed population
Chau (2012)	A feasibility study to investigate the acceptability and potential effectiveness of a telecare service for older people with chronic obstructive pulmonary disease	Study duration < 12 weeks
Chuang (2011)	Enhancing cost-effective care with a patient-centric coronary obstructive pulmonary disease program	Not a relevant study design (not an RCT or SR of RCTs)
Cockcroft (1987)	Controlled trial of respiratory health worker visiting patients with chronic respiratory disability.	Study does not allow separation of data for people with COPD from a mixed population
Collins (2012)	Nutritional support in chronic obstructive pulmonary disease: a systematic review and meta-analysis	Systematic review was excluded as data was extracted directly from relevant primary studies
Coultas (2016)	A Lifestyle Physical Activity Intervention for Patients with Chronic	Physical activity intervention

Short Title	Title	Reason for exclusion
	Obstructive Pulmonary Disease. A Randomized Controlled Trial	
Cruz (2014)	Home telemonitoring effectiveness in COPD: a systematic review	Systematic review was excluded as data was extracted directly from relevant primary studies
Dal (2009)	Survival in severe COPD patients on home LTOT with vs. without telemonitoring: a 10-year experience	Study not reported in English
Davis (2006)	Effects of treatment on two types of self-efficacy in people with chronic obstructive pulmonary disease	Physical activity intervention *Breathlessness self-management programme used in all groups with the addition of different amounts of exercise in the two intervention groups.*
de Toledo (2006)	Telemedicine experience for chronic care in COPD	Study does not contain any relevant interventions *Telehealthcare intervention does not include telemonitoring as defined by our study protocol (no data collection by the patients, with automated transmission and feedback from healthcare professionals).*
Dickens (2014)	Complex interventions that reduce urgent care use in COPD: A systematic review with meta-regression	Systematic review was excluded as data was extracted directly from relevant primary studies
Dinesen (2012)	Using preventive home monitoring to reduce hospital admission rates and reduce costs: A case study of telehealth among chronic obstructive pulmonary disease patients	Study does not contain any relevant interventions *Tele-rehabilitation intervention*
Donesky (2014)	The affective dimension of dyspnea improves in a dyspnea self-management program with exercise training	Study does not contain any relevant interventions *Interventions are varying amounts of exercise on top of a baseline self-management plan.*
Efraimsson (2008)	Effects of COPD self-care management education at a nurse-led primary health care clinic	Data not reported in an extractable format

Short Title	Title	Reason for exclusion
Efraimsson (2012)	COPD care and management at nurseled COPDclinics in Swedish primary health care: A literature review	Abstract only (conference or other)
Entesari-Tatafi (2017)	Telemedicine to deliver personalised health care in chronic obstructive pulmonary disease may reduce hospital admissions	Abstract only (conference or other)
Facchiano (2011)	A literature review on breathing retraining as a self-management strategy operationalized through Rosswurm and Larrabee's evidence-based practice model	Review article but not a systematic review
Farmer (2016)	Self-management support using an Internet-linked tablet computer based intervention in chronic obstructive pulmonary disease (EDGE): randomised controlled trial	Abstract only (conference or other)
Ferreira (2016)	Can patients with COPD assimilate disease specific information at a time of being acutely unwell due to an exacerbation of their disease?	Abstract only (conference or other)
Franek (2012)	Home telehealth for patients with chronic obstructive pulmonary disease (COPD): an evidence-based analysis	Systematic review was excluded as data was extracted directly from relevant primary studies
Franke (2015)	Telemonitoring of cycle home exercise in patients with COPD	Abstract only (conference or other)
Franke (2016)	Telemonitoring of home exercise cycle training in patients with COPD	Data not reported in an extractable format
Gellis (2012)	Outcomes of a telehealth intervention for homebound older adults with heart or chronic respiratory failure: a randomized controlled trial	Study does not allow separation of data for people with COPD from a mixed population
Gellis (2014)	Integrated telehealth care for chronic illness and depression in geriatric home care patients: The integrated telehealth education and activation of mood (I-TEAM) study	Study does not allow separation of data for people with COPD from a mixed population
Gilmore (2010)	Educational strategies to improve health-related quality of life in patients with COPD	Full text paper not available *Record does not match a paper in this journal*

Short Title	Title	Reason for exclusion
Goransson (2003)	Evaluation of a nurse-led group-based education programme for in-patients with chronic obstructive pulmonary disease	Not a relevant study design (not an RCT or SR of RCTs)
Göri (2013)	The effects of training on inhaler technique and quality of life in patients with COPD	Not a relevant study design (not an RCT or SR of RCTs) *Quasi-randomised trial*
Gourley (1998)	Humanistic outcomes in the hypertension and COPD arms of a multicenter outcomes study.	Study does not contain any relevant interventions
Gregersen (2016)	Do telemedical interventions improve quality of life in patients with COPD? A systematic review	Systematic review was excluded as data was extracted directly from relevant primary studies
Halpin (2009)	Effect of an innovative automated interactive health forecast alert system on rate of exacerbations of COPD	Abstract only (conference or other)
Halpin (2011)	A randomised controlled trial of the effect of automated interactive calling combined with a health risk forecast on frequency and severity of exacerbations of COPD assessed clinically and using EXACT PRO	Study does not contain any relevant interventions *The baseline telehealth monitoring lacks a feedback component and the intervention is the addition of a weather forecast alert for conditions that could increase the risk of an exacerbation.*
Hamir (2010)	A novel patient support system to further improve health-related quality of life through self-management after pulmonary rehabilitation	Abstract only (conference or other)
Hanlon (2017)	Telehealth Interventions to Support Self-Management of Long-Term Conditions: A Systematic Metareview of Diabetes, Heart Failure, Asthma, Chronic Obstructive Pulmonary Disease, and Cancer	Systematic review was excluded as data was extracted directly from relevant primary studies
Harrison (2015)	Self-management following an acute exacerbation of COPD: a systematic review	Systematic review was excluded as data was extracted directly from relevant primary studies
Heidari (2014)	Effect of a self-management program based on 5a model on dyspnea and	Study not reported in English

Short Title	Title	Reason for exclusion
	fatigue severity among patients with chronic obstructive pulmonary disease: a randomized clinical trial	
Hernandez (2013)	Walking guide for COPD patients: Can be used as a promoter of physical activity?	Abstract only (conference or other)
Hesselink (2004)	Effectiveness of an education programme by a general practice assistant for asthma and COPD patients: results from a randomised controlled trial	Study does not allow separation of data for people with COPD from a mixed population
Hill (2005)	A randomised clinical trial examining the enhanced benefits in health outcomes with the addition of self-management education to exercise training in patients with chronic obstructive pulmonary disease (COPD)	Clinical trial registry record
Holland (2013)	Telehealth reduces hospital admission rates in patients with COPD	Review article but not a systematic review
Howland (1986)	Chronic obstructive airway disease. Impact of health education.	Not a relevant study design (not an RCT or SR of RCTs) *Quasi-experimental study design*
Imanalieva (2016)	Patient education with telephone follow-up for chronic obstructive pulmonary disease and essential hypertension	Abstract only (conference or other)
Is There Any Additional... (2016)	Is There Any Additional Effect of Tele-Assistance on Long-Term Care Programmes in Hypercapnic COPD Patients? A Retrospective Study	Duplicate reference
Jansen-Kosterink (2011)	Evaluation of a web based home training program for COPD patients: A controlled trial	Abstract only (conference or other)
Jehn (2013)	Impact of climate change in patients with COPD: Results of telemedical patient monitoring	Abstract only (conference or other)
Jehn (2013)	Tele-monitoring reduces exacerbation of COPD in the context of climate change--a randomized controlled trial	Study does not contain any relevant interventions *Telehealth monitoring intervention does not include feedback from a*

Short Title	Title	Reason for exclusion
		health professional
Johnson-Warrington (2015)	A supported self-management programme for chronic obstructive pulmonary disease (COPD) upon hospital discharge: A randomised controlled trial	Abstract only (conference or other)
Johnston (2013)	Detection of COPD exacerbations and compliance with patient-reported daily symptom diaries	Not a relevant study design (not an RCT or SR of RCTs)
Jolly (2016)	Self-management of health care behaviors for COPD: a systematic review and meta-analysis	Systematic review was excluded as data was extracted directly from relevant primary studies
Jonkman (2015)	Who benefits most from COPD self-management interventions? An individual patient data meta-analysis	Abstract only (conference or other)
Jonkman (2015)	Identifying components of self-management interventions associated with change in health-related quality of life in COPD patients: Systematic review and a meta-regression analysis	Abstract only (conference or other)
Jonkman (2016)	Characteristics of effective self-management interventions in patients with COPD: individual patient data meta-analysis	Systematic review was excluded as data was extracted directly from relevant primary studies
Jonkman (2016)	Do self-management interventions in COPD patients work and which patients benefit most? An individual patient data meta-analysis	Systematic review was excluded as data was extracted directly from relevant primary studies
Jonkman (2016)	Identifying components of self-management interventions that improve health-related quality of life in chronically ill patients: Systematic review and meta-regression analysis	Systematic review was excluded as data was extracted directly from relevant primary studies
Jonsdottir (2013)	Self-management programmes for people living with chronic obstructive pulmonary disease: a call for a reconceptualisation	Systematic review was excluded as data was extracted directly from relevant primary studies
Jordan (2013)	Supported self-management for patients with moderate to severe COPD at or shortly after discharge	Abstract only (conference or other)

Short Title	Title	Reason for exclusion
	from hospital: A systematic review of the evidence	
Jordan (2015)	Supported self-management for patients with moderate to severe chronic obstructive pulmonary disease (COPD): an evidence synthesis and economic analysis	Systematic review was excluded as data was extracted directly from relevant primary studies
Kamei (2013)	Systematic review and meta-analysis of studies involving telehome monitoring-based telenursing for patients with chronic obstructive pulmonary disease	Systematic review was excluded as data was extracted directly from relevant primary studies
Kara (2004)	Effect of education on self-efficacy of Turkish patients with chronic obstructive pulmonary disease	Study duration < 12 weeks
Kennedy (2013)	Implementation of self management support for long term conditions in routine primary care settings: Cluster randomised controlled trial	Study does not allow separation of data for people with COPD from a mixed population
Kerenidi (2015)	Short-term telemonitoring program after hospital discharge for COPD exacerbation: Greek pilot of the renewing health multicenter randomized trial	Abstract only (conference or other)
Kessler (2016)	A home-centered disease management program in severe chronic obstructive pulmonary disease (Results of the COPD patient Management European Trial-COMET)	Abstract only (conference or other)
Kheirabadi (2009)	Effect of add-on "Self management and behavior modification" education on severity of chronic pulmonary obstructive disease	Abstract only (conference or other)
Kim (2012)	Effects of consumer-centered u-health service for the knowledge, skill, and attitude of the patients with chronic obstructive pulmonary disease	Not a relevant study design (not an RCT or SR of RCTs)
Kiser (2012)	A randomized controlled trial of a literacy-sensitive self-management intervention for chronic obstructive pulmonary disease patients	Study does not contain any of the outcomes of interest Study duration < 12 weeks

Short Title	Title	Reason for exclusion
Kitsiou (2013)	Systematic reviews and meta-analyses of home telemonitoring interventions for patients with chronic diseases: a critical assessment of their methodological quality	Systematic review was excluded as data was extracted directly from relevant primary studies
Klijn (2016)	Educational inhaler technique interventions in asthma & COPD patients: A systematic review	Abstract only (conference or other)
Korsbakke (2016)	Interaction between functional health literacy and telehomecare: Short-term effects from a randomized trial	Study does not contain any of the outcomes of interest
Kruis (2014)	Cochrane corner: is integrated disease management for patients with COPD effective?	Systematic review was excluded as data was extracted directly from relevant primary studies
Lavery (2011)	Expert patient self-management program versus usual care in bronchiectasis: a randomized controlled trial	Does not contain a population of people with stable COPD *Participants have bronchiectasis rather than COPD with bronchiectasis.*
Lenferink (2016)	Self-management interventions that include COPD exacerbation action plans improve healthrelated quality of life-a cochrane review	Abstract only (conference or other)
Lewis (2010)	Does home telemonitoring after pulmonary rehabilitation reduce healthcare use in optimized COPD? A pilot randomized trial	Data not reported in an extractable format *Data presented as medians with interquartile range*
Lewis (2010)	Home telemonitoring and quality of life in stable, optimised chronic obstructive pulmonary disease	Data not reported in an extractable format
Lilholt (2017)	Telehealthcare for patients suffering from chronic obstructive pulmonary disease: effects on health-related quality of life: results from the Danish 'TeleCare North' cluster-randomised trial	Data not reported in an extractable format *Health-related quality of life only assessed using component scores for SF-36.*
Liu (2008)	Efficacy of a cell phone-based exercise programme for COPD	Physical activity intervention

Short Title	Title	Reason for exclusion
Lundell (2015)	Telehealthcare in COPD: a systematic review and meta-analysis on physical outcomes and dyspnea	Systematic review was excluded as data was extracted directly from relevant primary studies
Majothi (2015)	Supported self-management for patients with COPD who have recently been discharged from hospital: a systematic review and meta-analysis	Systematic review was excluded as data was extracted directly from relevant primary studies
Martin-Lesende (2013)	Impact of telemonitoring home care patients with heart failure or chronic lung disease from primary care on healthcare resource use (the TELBIL study randomised controlled trial)	Study does not allow separation of data for people with COPD from a mixed population
McBain (2015)	The impact of self-monitoring in chronic illness on healthcare utilisation: a systematic review of reviews	Systematic review was excluded as data was extracted directly from relevant primary studies
McCurdy (2012)	Chronic obstructive pulmonary disease (COPD) evidentiary framework	Systematic review was excluded as data was extracted directly from relevant primary studies
McLean (2011)	Telehealthcare for chronic obstructive pulmonary disease	Systematic review was excluded as data was extracted directly from relevant primary studies
McLean (2012)	Telehealthcare for chronic obstructive pulmonary disease: Cochrane Review and meta-analysis	Systematic review was excluded as data was extracted directly from relevant primary studies
Minguez (2014)	Early assisted discharge with generic telemedicine for chronic obstructive pulmonary disease exacerbations: Results of a randomized controlled trial	Abstract only (conference or other)
Monninkhof (2003)	Self-management education for patients with chronic obstructive pulmonary disease: a systematic review	More recent systematic review that covers the same topic
Moullec (2012)	Does a self-management education program have the same impact on emotional and functional dimensions of HRQoL?	Not a relevant study design (not an RCT or SR of RCTs) *Trial is quasi-randomised.*

Short Title	Title	Reason for exclusion
Moy (2014)	An internet-mediated, pedometer-based walking program improves HRQL in veterans with COPD	Abstract only (conference or other)
Moy (2015)	Long-term effects of an internet-mediated pedometer-based walking program in COPD: A randomized controlled trial	Abstract only (conference or other)
Namil (2016)	Unlocking smartphone potential in health care by providing smartphones to patients: A systematic review	Abstract only (conference or other)
Newham (2017)	Features of self-management interventions for people with COPD associated with improved health-related quality of life and reduced emergency department visits: a systematic review and meta-analysis	Systematic review was excluded as data was extracted directly from relevant primary studies
Ng (2017)	Effects of a self-management education program on self-efficacy in patients with COPD: a mixed-methods sequential explanatory designed study	Data not reported in an extractable format. Data on self-efficacy was reported as medians with ranges.
Nguyen (2005)	Dyspnea self-management in patients with chronic obstructive pulmonary disease: moderating effects of depressed mood	Study does not contain any relevant interventions *All participants have a self-management for breathlessness programme at baseline with supervised physical education as the intervention.*
Nguyen (2008)	Randomized controlled trial of an internet-based versus face-to-face dyspnea self-management program for patients with chronic obstructive pulmonary disease: pilot study	Study does not contain any relevant interventions *Study examines different methods of imparting the same self-management intervention (face to face versus via the internet) rather than comparing an intervention to a different intervention.*
Nield (2012)	Real-time telehealth for COPD self-management using Skype?	Study does not contain any relevant interventions *Telehealth coaching intervention*

Short Title	Title	Reason for exclusion
Norweg (2013)	Evidence for cognitive-behavioral strategies improving dyspnea and related distress in COPD	Review article but not a systematic review
Oancea (2015)	Impact of medical education program on COPD patients: a cohort prospective study	Not a relevant study design (not an RCT or SR of RCTs)
Paquin (2014)	Telehome care for patients with chronic pulmonary disease: the experience of a Canadian second line respiratory specialty care service	Abstract only (conference or other)
Pedone (2013)	Efficacy of multiparametric telemonitoring on respiratory outcomes in elderly people with COPD: a randomized controlled trial	Data not reported in an extractable format *Lack of SD or SE data to go with outcome of interest.*
Pedone (2015)	Systematic review of telemonitoring in COPD: an update	Systematic review was excluded as data was extracted directly from relevant primary studies
Petty (2006)	Impact of customized videotape education on quality of life in patients with chronic obstructive pulmonary disease	Study does not allow separation of data for people with COPD from a mixed population
Pinnock (2009)	The impact of a telemetric chronic obstructive pulmonary disease monitoring service: Randomised controlled trial with economic evaluation and nested qualitative study	Study protocol
Polisena (2009)	Home telehealth for chronic disease management: A systematic review and an analysis of economic evaluations	More recent systematic review that covers the same topic
Polisena (2010)	Home telehealth for chronic obstructive pulmonary disease: a systematic review and meta-analysis	Systematic review was excluded as data was extracted directly from relevant primary studies
Pomidori (2012)	A simple method for home exercise training in patients with chronic obstructive pulmonary disease: one-year study.	Physical activity intervention
Poureslami (2016)	Assessing the effect of culturally specific audiovisual educational interventions on attaining self-	Study does not contain any of the outcomes of interest *Study primary outcome is change in*

Short Title	Title	Reason for exclusion
	management skills for chronic obstructive pulmonary disease in Mandarin- and Cantonese-speaking patients: a randomized controlled trial	*inhaler technique and there is no measure of the effect of this educational intervention on quality of life or exacerbations.*
Quinones (2014)	Educational group visits for the management of chronic health conditions: a systematic review	Systematic review was excluded as data was extracted directly from relevant primary studies
Rabinovich (2017)	Physical activity is increased by a 12-week semiautomated telecoaching programme in patients with COPD: a multicentre randomised controlled trial	Full text paper not available. Reference incomplete and paper cannot be located. Identical title and shared authors with Demeyer 2017, which is included.
Rixon (2017)	A RCT of telehealth for COPD patient's quality of life: the whole system demonstrator evaluation	Data not reported in an extractable format *No baseline data for outcomes of interest.*
Sano (2016)	Self-management education using interactive application software for tablet computer to improve health status in patients with COPD: A randomized controlled trial	Abstract only (conference or other)
Schou (2013)	A randomised trial of telemedicine-based treatment versus conventional hospitalisation in patients with severe COPD and exacerbation - effect on self-reported outcome	Study does not include people with stable COPD at baseline *Participants are enrolled during an exacerbation and the intervention involves telemedicine for management of the exacerbation at home versus hospital treatment.*
Self (2014)	Action plans to reduce hospitalizations for chronic obstructive pulmonary disease exacerbations: focus on oral corticosteroids	Review article but not a systematic review
Solomon (1998)	Clinical and economic outcomes in the hypertension and COPD arms of a multicenter outcomes study.	Study does not contain any relevant interventions *Intervention is case-management involving a pharmacist*
Song (2014)	Effectiveness of a brief self-care support intervention for pulmonary rehabilitation among the elderly	Study duration < 12 weeks

Short Title	Title	Reason for exclusion
	patients with chronic obstructive pulmonary disease in Korea	
Stoilkova (2013)	Educational programmes in COPD management interventions: a systematic review	More recent systematic review that covers the same topic
Supported self-management... (2015)	Supported self-management for patients with moderate to severe chronic obstructive pulmonary disease (COPD): An evidence synthesis and economic analysis	Duplicate reference
Tan (2012)	A meta-analysis on the impact of disease-specific education programs on health outcomes for patients with chronic obstructive pulmonary disease	Systematic review was excluded as data was extracted directly from relevant primary studies
Taylor (2009)	Pilot randomised controlled trial of a 7-week disease-specific self-management programme for patients with COPD: BELLA (better living with long term airways disease study)	Abstract only (conference or other)
Theander (2015)	Effects of a self-management program for patients with COPD or chronic heart failure (CHF) on self-efficacy related to exercise and fatigue - The SAFS study	Abstract only (conference or other)
Tong (2012)	Application of self-management systems evaluation trial (asset) for COPD patients in counties manukau (funded by the primary health care innovations fund)	Abstract only (conference or other)
Trappenburg (2009)	Action Plan to enhance self-management and early detection of exacerbations in COPD patients; a multicenter RCT	Study protocol
Uijen (2012)	Continuity in different care modes and its relationship to quality of life: a randomised controlled trial in patients with COPD.	Data not reported in an extractable format
van der Weegen (2015)	It's LiFe! Mobile and Web-Based Monitoring and Feedback Tool Embedded in Primary Care Increases Physical Activity: A Cluster Randomized Controlled Trial	Physical activity intervention

Short Title	Title	Reason for exclusion
Van Wijk (2005)	Effectiveness of interventions by community pharmacists to improve patient adherence to chronic medication: A systematic review	Systematic review was excluded as data was extracted directly from relevant primary studies
Velardo (2017)	Digital health system for personalised COPD long-term management	Not a relevant study design (not an RCT or SR of RCTs)
Venter (2012)	Results of a telehealth-enabled chronic care management service to support people with long-term conditions at home	Study does not allow separation of data for people with COPD from a mixed population
Walters (2016)	Action plans with brief patient education only for exacerbations in COPD: A systematic review	Abstract only (conference or other)
Wang (2014)	Mobile-phone-based home exercise training program decreases systemic inflammation in COPD: A pilot study	Physical activity intervention
Wang (2017)	Effectiveness of disease-specific self-management education on health outcomes in patients with chronic obstructive pulmonary disease: An updated systematic review and meta-analysis	Systematic review was excluded as data was extracted directly from relevant primary studies
Warlies (2006)	Evaluation of a standardized specific education program "Lebensrhythmus Atmen": a prospective, randomized, controlled study for COPD patients - A pilot study	Study not reported in English
Whitten (2007)	Home telecare for COPD/CHF patients: outcomes and perceptions	Study does not contain any relevant interventions *Intervention consists of real-time video consultations (tele-consultations) rather than telemonitoring*
Wittmann (2007)	Patient education in COPD during inpatient rehabilitation improves quality of life and morbidity	Study not reported in English
Wong (2012)	Peer educator Vs. Respiratory therapist: Which form of support provides better health and functional outcomes 6 months after pulmonary rehabilitation?	Abstract only (conference or other)

Short Title	Title	Reason for exclusion
Wong (2012)	Tele-monitoring of home oxygen user (THOU): A program to ensure maximal therapeutic benefit in patients commencing on long-term oxygen therapy (LTOT)	Abstract only (conference or other)
Wood-Baker (2012)	Clinical trial of community nurse mentoring to improve self-management in patients with chronic obstructive pulmonary disease	Not a relevant study design (not an RCT or SR of RCTs) *Quasi-RCT as participants were enrolled and allocated to an intervention group or a control group according to domicile.*
Wootton (2012)	Twenty years of telemedicine in chronic disease management--an evidence synthesis	Systematic review was excluded as data was extracted directly from relevant primary studies
Wootton (2017)	The effect on HRQoL of ongoing feedback during a maintenance walking program : an RCT	Abstract only (conference or other)
Yu (2014)	Effects of self-management education on quality of life of patients with chronic obstructive pulmonary disease	Not a relevant study design (not an RCT or SR of RCTs)
Zhang (2016)	Qigong Yi Jinjing Promotes Pulmonary Function, Physical Activity, Quality of Life and Emotion Regulation Self-Efficacy in Patients with Chronic Obstructive Pulmonary Disease: A Pilot Study	Physical activity intervention
Zwerink (2014)	A community-based exercise programme in COPD self-management: two years follow-up of the COPE-II study	Physical activity intervention *Intervention adds an exercise programme to a self-management plan. Control group uses the self-management plan alone.*
Zwerink (2014)	Effectiveness of self-treatment of exacerbations in COPD patients: Two-year follow-up of the COPE-II study	Abstract only (conference or other)
Zwerink (2015)	The (cost-)effectiveness of self-treatment of exacerbations in COPD patients: Two-year follow-up	Abstract only (conference or other)

Economic studies

Short title	Title	Reason for exclusion
Achelrod (2016a)	Health-economic evaluation of home telemonitoring for COPD in Germany: evidence from a large population-based cohort	Does not use QALYs to measure health benefits
Achelrod (2016b)	Costs and outcomes of the German disease management programme (DMP) for chronic obstructive pulmonary disease (COPD)-A large population-based cohort study	Does not use QALYs to measure health benefits
Adams (2012)	Feasibility of a respiratory outreach service, facilitating early discharge from acute care for patients with pneumonia or exacerbation of COPD	Does not include economic outcomes
Akpinar (2011)	The impact of home exercise program on pulmonary functions and quality of life in chronic obstructive pulmonary disease	Conference abstract
COPD working group (2012)	Pulmonary rehabilitation for patients with chronic pulmonary disease (COPD): An evidence-based analysis	Economic analyses reported in a separate publication
Antoniu (2006)	Self-management programs in chronic obstructive pulmonary disease: do they have a sustained effect on health resource utilization?	Does not use QALYs to measure health benefits
Atsuo (2016)	Simulation-Based Estimates of the Effectiveness and Cost-Effectiveness of Pulmonary Rehabilitation in Patients with Chronic Obstructive Pulmonary Disease in France	Incorrect intervention (smoking cessation)
Au (2013)	Impact of integrated telehealth and care management program on resource utilization in medicare beneficiaries with chronic obstructive pulmonary disease	Conference abstract
Avery (2016)	The Impact of a Telephone-Based Chronic Disease Management Program on Medical Expenditures	Does not use QALYs to measure health benefits
Bakerly (2009)	Cost analysis of an integrated care model in the management of acute exacerbations of chronic obstructive pulmonary disease	Does not use QALYs to measure health benefits
Bakerly (2012)	The evaluation of a tele-monitoring model (Teleheath) as an aid in the case management of patients with COPD	Conference abstract
Bandurska (2015)	Economic effectiveness of integrated care model (ICM) for patients with severe chronic obstructive pulmonary disease (COPD)	Conference abstract
Bausewein (2012)	Development, effectiveness and cost-effectiveness of a new out-patient Breathlessness Support Service: study protocol of a phase III fast-track randomised controlled trial	Study protocol
Bermingham (2015)	Pulmonary rehabilitation setting for adults with chronic obstructive pulmonary disease (COPD): an economic rapid review (Structured abstract)	Incorrect intervention (pulmonary rehabilitation)

Short title	Title	Reason for exclusion
Blissett (2014)	An economic evaluation of self-management programs delivered at discharge after acute exacerbation, in COPD patients in the UK	Conference abstract
Boland (2012a)	Are disease management programs for COPD cost-saving?	Conference abstract
Boland (2012b)	Are disease management programs for COPD cost-effective?	Conference abstract
Boland (2013)	The health economic impact of disease management programs for COPD: a systematic literature review and meta-analysis	Systematic review of economic evaluations
Boland (2014a)	Cost-Effectiveness of a COPD Disease Management Program in Primary Care: The Recode Cluster Randomized Trial	Conference abstract
Boland (2014b)	Cost-effectiveness of an integrated care program for COPD: The RECODE cluster randomized trial	Conference abstract
Boland (2015)	Cost-effectiveness of integrated COPD care: the RECODE cluster randomised trial	Not conducted in a UK setting
Boland (2016)	Is integrated COPD care cost-effective?	Study not reported in English
Boven (2014)	Improving inhaler adherence in patients with Chronic Obstructive Pulmonary Disease: a cost-effectiveness analysis (Provisional abstract)	Not conducted in a UK setting
Burke (2013)	Interventions to decrease hospital readmissions keys for cost-effectiveness	Not specific to COPD
Burns (2016)	The Cost Effectiveness of Maintenance Schedules Following Pulmonary Rehabilitation in Patients with Chronic Obstructive Pulmonary Disease: An Economic Evaluation Alongside a Randomised Controlled Trial	Incorrect intervention (pulmonary rehabilitation)
Canadian Agency for Drugs and Technologies in Health (2010)	Pulmonary rehabilitation for chronic obstructive pulmonary disease: clinical, economic, and budget impact analysis	Incorrect intervention (pulmonary rehabilitation)
Chandra (2012a)	Cost-effectiveness of interventions for chronic obstructive pulmonary disease (COPD) using an Ontario policy model	Analysis does not consider self-management or telehealth
Chandra (2012b)	Cost-effectiveness of interventions for chronic obstructive pulmonary disease (COPD) using an Ontario policy model (Structured abstract)	Conference abstract
Chang (2016)	A comparison of care management delivery models on the trajectories of medical costs among patients with chronic diseases: 4-year follow-up results	Does not use QALYs to measure health benefits

Short title	Title	Reason for exclusion
Chuang (2011)	Enhancing cost-effective care with a patient-centric chronic obstructive pulmonary disease program	Does not use QALYs to measure health benefits
Cross (2010)	A randomised controlled equivalence trial to determine the effectiveness and cost-utility of manual chest physiotherapy techniques in the management of exacerbations of chronic obstructive pulmonary disease (MATREX) (Structured abstract)	Incorrect intervention (manual physiotherapy)
Dal Negro (2016)	The economic impact of educational training assessed by the Handling Questionnaire with three inhalation devices in asthma and Chronic Obstructive Pulmonary Disease patients	Does not use QALYs to measure health benefits
Darba (2017)	Estimating the economic consequences of an increased medication adherence due to a potential improvement in the inhaler technique with Spiromax compared with Turbuhaler in patients with moderate-to-severe chronic obstructive pulmonary disease in Spain	Incorrect intervention - does not include self-help/telehealth/education
Chirag (2014)	Protocol for a systematic review and economic evaluation of the clinical and cost-effectiveness of non-hospital-based non-invasive ventilation (NIV) in patients with stable end-stage COPD with hypercapnic respiratory failure	Incorrect intervention (non-invasive ventilation)
Dewan (2010)	Cost effective analysis of disease management in COPD: Results of va visn 23 multicenter randomized controlled trial	Conference abstract
Dewan (2011)	Economic evaluation of a disease management program for chronic obstructive pulmonary disease	Conference abstract
Dritsaki (2015)	An economic evaluation of a self-management programme for patients with COPD	Conference abstract
Fairhurst (2012)	Enhanced care review for people with COPD in primary care addressing quality, Cost-effectiveness and productivity	Conference abstract
Farias (2014)	Costs and benefits of pulmonary rehabilitation in chronic obstructive pulmonary disease: a randomized controlled trial	Incorrect intervention (pulmonary rehabilitation)
Farquhar (2016)	The clinical and cost effectiveness of a Breathlessness Intervention Service for patients with advanced non-malignant disease and their informal carers: mixed findings of a mixed method randomised controlled trial	Does not use QALYs to measure health benefits
Franek (2012a)	Home telehealth for patients with chronic obstructive pulmonary disease (COPD): An evidence-based analysis	Economic analyses reported in a separate publication
Franek (2012b)	Home telehealth for patients with chronic obstructive pulmonary disease (COPD): an evidence-based analysis (Structured abstract)	Conference abstract
Gama (2015)	Economic evaluation of the practical approach to lung health and informal provider interventions for improving the detection of tuberculosis and chronic airways disease at	Incorrect intervention (diagnosis of COPD)

Short title	Title	Reason for exclusion
	primary care level in Malawi: study protocol for cost-effectiveness analysis	
Gillespie (2013)	The cost-effectiveness of a structured education pulmonary rehabilitation programme for chronic obstructive pulmonary disease in primary care: The PRINCE cluster randomised trial	Incorrect intervention (includes pulmonary rehabilitation)
Giraldo (2011)	Cost-effectiveness of an ambulatory program of pulmonary rehabilitation following acute exacerbations of COPD in Colombia	Conference abstract
Haesum (2012)	Cost-utility analysis of a telerehabilitation program: a case study of COPD patients	Not conducted in a UK setting
Hailey (2013)	Cost-effectiveness of telehealth in the management of chronic conditions	Does not use QALYs to measure health benefits
Hajizadeh (2012)	Using decision modeling to inform advance care planning in patients with severe copd	Conference abstract
Hall (2016)	Modelling cost effectiveness of a COPD pathway using the Star approach; could cognitive behavioural therapy (CBT) be cost effective in preventing panicassociated admissions?	Conference abstract
Henderson (2013)	Cost effectiveness of telehealth for patients with long term conditions (Whole Systems Demonstrator telehealth questionnaire study): Nested economic evaluation in a pragmatic, cluster randomised controlled trial	Included patients with other chronic conditions
Hofer (2016)	Cost-Utility Analysis of Telemonitoring Interventions for Patients with Chronic Obstructive Pulmonary Disease (COPD) in Germany	Not conducted in a UK setting
Hofmann (2015)	First outline and baseline data of a randomized, controlled multicenter trial to evaluate the health economic impact of home telemonitoring in chronic heart failure - CardioBBEAT	Incorrect disease area
Hoogendoorn (2016)	Is INTERdisciplinary COMmunity-based COPD management (INTERCOM) cost-effective?	Incorrect intervention - includes smoking cessation and twice-weekly exercise training sessions
Hoogendoorn (2011)	Comparing the cost-effectiveness of a wide range of COPD interventions using a stochastic population model for COPD	Conference abstract
Jodar-Sanchez (2014)	Cost-utility analysis of a telehealth programme for patients with severe chronic obstructive pulmonary disease treated with long-term oxygen therapy	Not conducted in a UK setting
Khdour (2011b)	Erratum: Cost-utility analysis of a pharmacy-led self-management programme for patients with COPD	Erratum
Liu (2013)	Economic assessment of home-based COPD management programs	Incorrect intervention (home treatment)

Short title	Title	Reason for exclusion
Marina (2012)	Economic impact analysis of a tele-medicine program to improve the quality of apirometry in primary care	Conference abstract
Marriner (2012)	A COPD admission avoidance service reduces unplanned admissions and is cost effective	Conference abstract
McGarry (2011)	Cost-effectiveness of a lung health intervention in US smokers	Conference abstract
Ninot (2011)	Cost-saving effect of supervised exercise associated to COPD self-management education program	Does not use QALYs to measure health benefits
Oberje (2013)	Cost effectiveness of medication adherence-enhancing interventions: A systematic review of trial-based economic evaluations	Incorrect intervention (medication adherence)
Pena-Longobardo (2015)	Economic valuation and determinants of informal care to disabled people with Chronic Obstructive Pulmonary Disease (COPD)	Incorrect intervention (informal care)
Pinnock (2009)	The impact of a telemetric chronic obstructive pulmonary disease monitoring service: Randomised controlled trial with economic evaluation and nested qualitative study	Study protocol
Polisena (2009)	Home telehealth for chronic disease management: A systematic review and an analysis of economic evaluations	Systematic review of economic evaluations
Porcu (2012)	Costs and effectiveness of a disease management program for chronic obstructive pulmonary disease	Conference abstract
Roine (2009)	Cost-effectiveness of interventions based on physical exercise in the treatment of various diseases: A systematic literature review	Systematic review of economic evaluations
Sorensen (2016)	Economic Evaluation of Community-Based Case Management of Patients Suffering From Chronic Obstructive Pulmonary Disease	Not conducted in a UK setting
Tsiachristas (2015)	Cost-Effectiveness of Disease Management Programs for Cardiovascular Risk and COPD in The Netherlands	Not conducted in a UK setting
van Boven (2014a)	Improving inhaler adherence in patients with chronic obstructive pulmonary disease: a cost-effectiveness analysis	Does not use QALYs to measure health benefits
van Boven (2014b)	Cost-effectiveness analysis of a pharmacist-led intervention on improving inhaler adherence in patients with chronic obstructive pulmonary disease	Conference abstract
van Boven (2014c)	Medication monitoring and optimization: a targeted pharmacist program for effective and cost-effective improvement of chronic therapy adherence	Does not report economic outcomes for COPD
van Boven (2014d)	Improving inhaler adherence in patients with Chronic Obstructive Pulmonary Disease: A cost-effectiveness analysis	

Short title	Title	Reason for exclusion
Wong (2016)	Cost-effectiveness of 'Program We Care' for patients with chronic obstructive pulmonary disease: A case-control study	Does not use QALYs to measure health benefits
Wright (2015)	Chronic obstructive pulmonary disease case finding by community pharmacists: a potential cost-effective public health intervention	Incorrect intervention (casefinding)
Zwerink (2015)	The (cost-)effectiveness of self-treatment of exacerbations in COPD patients: Two-year follow-up	Conference abstract
Zwerink (2016a)	(Cost-)effectiveness of self-treatment of exacerbations in patients with COPD: 2 years follow-up of a RCT	Does not use QALYs to measure health benefits
Zwerink (2016b)	Cost-Effectiveness of a Community-Based Exercise Programme in COPD Self-Management	Incorrect intervention (physiotherapist-led exercise sessions)

Appendix K – References

Included clinical studies

Randomised controlled trials

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