Bruyère Reports

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Integrated Disease Management for Chronic Obstructive Pulmonary Disease (COPD) in Long-Term Care.

A Bruyère Rapid Review

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Contents

Key messages

- Cigarette smoke is the most common risk factor for COPD. Other risk factors are occupational irritants (dust and chemicals), and air pollution.
- Common comorbidities include cardiovascular diseases, osteoporosis, anxiety and depression, lung cancer, infections, and metabolic syndrome and diabetes.
- Most individuals with COPD are not diagnosed until the disease is well advanced. This can be improved through targeted testing of symptomatic individuals and those with risk factors for the development of COPD.
- Diagnosis of COPD is based on a combination of symptom screening, dyspnea severity, and spirometry. Post-bronchodilator spirometry is required to make a confident diagnosis of COPD, based on the severity of the airflow limitation detected.
- The management approach is based on an individualized care plan – matching the patient's therapy more closely to his or her needs. Smoking cessation is a key step in the prevention and control of COPD.

Executive summary

This rapid review examined the evidence of the effectiveness of integrated disease management of COPD in people with chronic obstructive pulmonary disease (COPD) in long-term care. We found one systematic review and five guidelines of moderate to high quality that met our inclusion criteria.

COPD is a chronic, progressive disease associated with airflow limitation due to an enhanced chronic inflammatory response to noxious particles or gases in the airways and lungs. It can be accompanied by periods of acute exacerbations usually triggered by infection or air pollution that may require hospitalization.

Cigarette smoke is the most common risk factor for COPD. Other risk factors are occupational irritants (dust and chemicals), and air pollution.

A diagnosis of COPD is based on a combination of symptom screening, dyspnea severity, and post-bronchodilator spirometry. There are four levels of classification of COPD, based on the symptoms and disability (mild, moderate, and severe), and four levels of classification of airflow obstruction based on spirometry results (mild, moderate, severe, and very severe). Exacerbations and comorbidities contribute to the overall severity in individual patients.

Smoking cessation is a key step in the prevention and control of COPD. The management of COPD includes both: pharmacological interventions (inhaled therapy, oral therapy, and combined oral and inhaled therapy); and non-pharmacological interventions such as pulmonary rehabilitation, patient education/self-management programs, nutrition, and vaccination. Adjunct therapies include supplemental oxygen, treatment of comorbidities according to usual treatment guidelines, palliative care, and surgery, as appropriate.

Prevention or early diagnosis and treatment of an acute exacerbation are imperative, as hospitalization for acute exacerbations greatly contributes to the high economic burden of COPD. Preventive measures include smoking cessation, pneumococcal and influenza vaccinations, education and case management, as well as pharmacotherapy.

There is limited evidence to support specific COPD interventions in the long-term care population. Most guideline recommendations for this context and population are based on expert opinion.

Background

The issue

Chronic obstructive pulmonary disease (COPD) is the fourth leading cause of death in Canada(1, 2) and among chronic diseases it is the only cause of death that is increasing (2). Almost 80% of deaths from COPD are due to smoking(3). Inpatient hospitalization is the most significant contributor to the economic burden of the disease(4-6) and hospitalization costs increase with severity of the disease(7). The economic burden associated with moderate and severe COPD exacerbations in Canada was estimated at $646 million to $736 million annually(6, 8).

COPD is usually underdiagnosed because of a lack of symptom recognition in patients(2, 6, 7, 9) and the lack of the use of an objective diagnostic test, such as spirometry(4, 7). With the growing clinical, economic and social burden of COPD due to aging and the long-term effects/continued exposure to risk factors, early diagnosis and the development of optimal COPD management programs in the long-term care setting and the community are necessary.

Context

Saint-Vincent Hospital (SVH) is a 336-bed Complex Continuing Care (CCC) hospital in Ottawa, affiliated with Bruyère Con-tinuing Care. It is the sole provider of complex continuing care in the Ottawa region and SVH patients usually transition to the community or long-term care facilities.

The prevalence of respiratory disease including COPD among inpatients at SVH is estimated to be 32%, based on hospital pharmacy data, though the number of patients coded as having COPD in the Resident Assessment Instrument Minimum Data Set (RAI-MDS) are significantly lower. Two analyses of inhaled medication use at SVH, however, have strongly suggested that the number of patients prescribed inhaled medications indicative of COPD far exceeds the number of patients coded as having the disease. An analysis of Ontario provincial health administrative data also found that 35% of residents in long-term care facilities have COPD(10). There is a need for transitional care of COPD patients as they move to long-term care facilities. Also, early diagnosis and optimal management of COPD in long-term care will reduce hospitalizations and resource use as well as the economic burden of the disease(5).

The optimal management of COPD is complex and involves multiple components. An integrated disease management approach that aims to reduce symptoms and avoid the fragmentation of care while containing costs has been suggested for the management of COPD(5, 11). This approach includes both pharmacologic and non-pharmacologic interventions, provided in a coordinated manner, generally by an inter-professional care team. The choice of therapy is guided by the assessment of the disease severity, its impact on the patient's health status and the risk of future events such as exacerbations(7).

Existing guidelines for the management of COPD are designed for any clinical setting(6, 7) but it is unclear if these recommendations could be easily adapted to the long-term care setting with multi-morbid elderly patients. Current guidelines for the assessment of COPD include assessing the patient's symptoms, severity of their spirometric abnormality, exacerbation risk and presence of comorbidities (7).

Objective

The aim of this rapid review is to identify evidence about the effectiveness of integrated disease management of COPD in long-term care.

Methods

Eligibility criteria

We used the PICO (population, intervention, comparison, and outcome) framework to develop the eligibility criteria.

Population: people with COPD in long term care

Intervention: integrated disease management of COPD involving at least two interventions listed below for a minimum duration of three months; and active involvement of at least two different categories of healthcare providers.

1. Education/self-management: i.e. education, self-management, personal goals and/or action plan, exacerbation management
2. Exercise: i.e. (home) exercise training and/or strength and/or endurance training
3. Psychosocial: cognitive behavioral therapy, stress management, other psychological assessment and/or treatment
4. Smoking cessation
5. Medication: optimal medication/prescription of medication adherence
6. Nutrition: dietary intervention
7. Follow-up and/or communication: structural follow-up and/or communication, case management by healthcare providers, ensuring optimal diagnosis
8. Multidisciplinary team: active participation and formation of teams of professional caregivers from different disciplines, revision of professional roles, integration of services, local team meetings
9. Financial intervention: fees/payment/grants for providing IDM.

Comparison: usual care

Outcomes: health-related quality of life, functional capacity (e.g. walking distance), number of exacerbations, acute-care episodes (hospital admissions) and resource use.

Literature search

We updated the search of the Cochrane review on integrated disease management interventions for patients with chronic obstructive pulmonary disease(5) from 2008 to May 25 2015 using the Cochrane Airways Group Register of trials, the Cochrane Central Register of Controlled Trials (CENTRAL) in The Cochrane Library, MEDLINE, EMBASE and CINAHL (See Appendix 1). We identified 1622 articles after deduplication.

We also ran a search in the Trip Database and found 861 records including 54 systematic reviews and 499 guidelines.

Relevance assessment (selection of articles)

We reviewed the search results in duplicate for relevance. We found only one guideline specific to the management of COPD in long-term care(12) and four others that were not specific to any setting – the 2015 Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines(7), the 2010 UK National Institute for Health and Care Excellence (NICE) guidelines(4), the 2007 Canadian Thoracic Society (CTS) guidelines (9) for the management of COPD, as well as the 2014 American College of Chest Physicians' and CTS guidelines for the management of COPD acute exacerbations(6). We found no new studies or systematic reviews on integrated disease management interventions for patients with COPD in long-term care besides the existing Cochrane review(5) which examined COPD patients in the primary, secondary and tertiary care settings but not the long-term care setting.

Critical appraisal

We assessed the quality of the guidelines and the Cochrane systematic review using AGREE II(13) and AMSTAR(14) respectively. The systematic review was high quality scoring 10/11 on AMSTAR. The quality of the guidelines ranged from 99 to 122/168. See Appendix 2 for details.

We graded the quality of the evidence as platinum, gold, silver or bronze level as described in Appendix 3 (15). The quality of the evidence ranged from bronze to gold.

Evidence review

The overarching goals of COPD management are to reduce patients' symptoms and to reduce future risks (7). IDM interventions are aimed at reducing symptoms and avoiding fragmentation of care, while containing costs(5, 11, 16). At least two interventions for a minimum duration of three months, and active involvement of at least two different categories of healthcare providers must be considered for the optimal management of COPD(5, 16-19).

Evidence from systematic reviews

The 2013 Cochrane systematic review on integrated disease management interventions for patients with chronic obstructive pulmonary included 26 trials and 2997 participants(5). The mean age of the study population was 68 years and 68% were male. The patients were treated in primary, secondary, tertiary or a combination of primary and secondary health care settings. However, no included studies considered patients in the long-term care setting. The mean number of healthcare providers involved in the IDM program was three (range two to seven) and the mean number of components per program was four (range two to eight).

The following six categories of IDM components were identified:

1. IDM dominant component exercise
2. . IDM dominant component self-management with an exacerbation action plan
3. IDM structured follow-up with nurses/GP
4. IDM exercise and self-management action plan
5. IDM self-management action plan and structured follow-up
6. IDM program of educational sessions, followed by a phase of individually tailored education according to scores on the Lung Information Needs Questionnaire score.

IDM was found to improve health-related quality of life and exercise capacity of the patients and reduced hospital admissions and hospital days per person. The patients were elderly and the assessed interventions have been recommended for use in long term care (12). Resource use was not assessed. Details are in Table 1.

Table 1: Summary of findings table for IDM in patients with COPD

Outcomes	Illustrative comparison risks (95% CI)		Relative effect (95% CI)	No. of participants (studies)	Quality of the evidence (GRADE)	What it means
	Control group	IDM group				
Quality of life measured on the SGRQ total score Scale: 0 to 100; lower score means improvement. Follow-up: 3 to 12 months	The mean change in the SGRQ total score was -0.24	The mean SGRQ total score in the intervention group was 3.71 lower (5.83 to 1.59 lower)	MD -3.71 (-5.83 to -1.59)	1425 (13 studies)	High	IDM improves quality of life by 4 more points on the SGRQ scale of 0 to 100 than control
Functional exercise capacity (6 minute walking distance) Follow-up: 3 to 12 months	The mean change in the 6 minute walking distance was 2.72	The mean functional exercise capacity in the intervention group was 43.86 higher (21.83 to 65.89 higher)	MD 43.86 (21.83 to 65.89)	871 (14 studies)	Moderate[1]	IDM may improve the six-minute walking distance by 43.86 meters more than control

Outcomes	Illustrative comparison risks (95% CI)		Relative effect (95% CI)	No. of participants (studies)	Quality of the evidence (GRADE)	What it means
	Control group	IDM group				
Respiratory-related hospital admissions Follow-up: 3 to 12 months	27 per 100	20 per 100 (15 to 27)	OR 0.68 (0.47 to 0.99)	1470 (7 studies)	High	IDM probably reduced hospital admissions by 7 less days per 100 than control
Hospital days per patient (all causes) Follow-up: 3 to 12 months	The mean change in hospital days per patient was 8.96	The mean number of hospital days per patient in the intervention group was 3.78 lower (5.9 to 1.67 lower)	MD -3.78 (-5.9 to -1.67)	741 (6 studies)	High	IDM probably reduced hospital days per patient by 4 less days than control
Number of patients experiencing at least one exacerbation Follow-up: 3 to 12 months	31 per 100	35 per 100 (25 to 46)	OR 1.21 (0.77 to 1.91)	407 (2 studies)	High	4 more patients per 100 on IDM experienced at least one exacerbation but this may be a result of chance
Resource use	Not assessed	Not assessed	Not estimable	-	Not assessed	Resource use was not assessed in any of the studies

IDM=integrated disease management; COPD=chronic obstructive pulmonary disease; SGRQ= St George's Respiratory Questionnaire; CI=confidence interval; MD=mean difference

Footnotes:

[1]We downgraded as all included studies were of moderate to low quality. If we removed studies which had high or unclear risk of bias on allocation concealment, the effect decreased to 15 meters.

Evidence from clinical practice guidelines

The optimal management of COPD involves four phases: recognition (or diagnosis), assessment, treatment and monitoring. Four of the five included guidelines(4, 7, 9, 12) dealt with all four phases of the management of COPD and risk factors. The other guideline(6) focused on the prevention of acute exacerbations of COPD.

Risk factors

The most common risk factor for COPD is a history of smoking. Other risk factors include occupational exposures to respiratory irritants (dust and chemicals), air pollution, family history of pulmonary disease (COPD), genetic factors (alpha-1 antitrypsin deficiency), age, gender, lung growth and development, childhood respiratory infections, recurrent or chronic respiratory symptoms, nutrition and socioeconomic status.

Diagnosis and assessment

The clinical diagnosis of COPD is based on the presence of dyspnoea, chronic cough, chronic sputum production and a history of exposure to risk factors in an individual at least 35 to 45 years old(4, 7, 9, 11). The severity of breathlessness during daily activities can be assessed using the modified Medical Research Council (mMRC) Dyspnoea scale and ranges from grade 0 (breathless with strenuous exercise) to grade 4 (too breathless to leave the house) (see Appendix 4 for details). In the Canadian COPD guidelines the severity of COPD can be classified as mild, moderate or severe based on symptoms and disability(9) as shown in Table 2.

Spirometry is required to confirm the diagnosis and assessment of the severity of COPD using the fixed ratio, post-bronchodilator FEV1/FVC < 0.70 to define airflow limitation (see Table 3). The classification of the severity of lung function impairment is based on the results of post-bronchodilator spirometry, and is divided into four grades: Mild, Moderate, Severe, and Very Severe)(4, 7, 9, 12).

In addition, the assessment of comorbidities in patients with COPD better reflects the complexity of the disease as they may contribute to its severity(7, 11).

Recommended interventions and practices related to diagnosis and assessment are summarised in Table 4.

Table 2: Classification of COPD severity by symptoms and disability

COPD stage	Symptoms
Mild	Shortness of breath from COPD when hurrying on the level or walking up a slight hill (mMRC grade 1)
Moderate	Shortness of breath from COPD causing the patient to stop after walking approximately 100m (or after a few minutes) on the level (mMRC grade 2 to 3)
Severe	Shortness of breath from COPD resulting in the patient being too breathless to leave the house, breathless when dressing or undressing (mMRC grade 4), or the presence of chronic respiratory failure or clinical signs of right heart failure

Table 3: Classification of COPD severity by impairment of lung function

COPD stage	Spirometry (postbronchodilator) in patients with $FEV_1/FVC < 0.70$
Mild	$FEV_1 \geq 80\%$ predicted
Moderate	$50\% \leq FEV_1 < 80\%$ predicted
Severe	$30\% \leq FEV_1 < 50\%$ predicted
Very severe	$FEV_1 < 30\%$ predicted

Table 4: Recommendations for diagnosis and assessment

Recommendations	AMDA guidelines	GOLD guidelines	NICE guidelines	CTS guidelines	AECOPD* guidelines
Screen and assess all newly admitted residents for COPD and risk factors	P	P	P	P	NA
Develop a differential diagnosis†	P	P	P	P	NA
Assessment of COPD severity, stability, exacerbations	P	P	P	P	NA
Assessment of patient's functional status	P	P	P	P	NA
Assessment of comorbidities	P	P	P	P	NA
Obtain input from all members of the multidisciplinary team	P	NA	P	NA	NA

AMDA= American Medical Directors' Association; GOLD= Global Initiative for Chronic Obstructive Lung Disease
NICE=National Institute for Health and Care Excellence; CTS=Canadian Thoracic Society
AECOPD=Acute Exacerbation of Chronic Obstructive Pulmonary Disease
*These guidelines are for the prevention of AECOPD
P= recommended
NA=Not addressed

= silver level of evidence

= bronze level of evidence

† It may be difficult to differentiate COPD from other conditions such as asthma, bronchiectasis, congestive heart failure, tuberculosis, carcinoma of the bronchus, obliterative bronchiolitis, bronchopulmonary dysplasia, diffuse pan-bronchiolitis, pulmonary emboli, severe deconditioning, obesity, anemia, interstitial lung disease, neuromuscular disease.

Treatment and monitoring

Management and treatment should be based on individualized patient assessment and should be provided by a multidisciplinary team. Specific recommendations are summarized in Table 5.

Table 5: Recommendations for treatment and monitoring

Recommendations	AMDA guidelines	GOLD guidelines	NICE guidelines	CTS guidelines	AECOPD* guidelines
Develop an individualized care plan and define the treatment goals	P	P	P	P	NA
Implement facility-wide programs and policies to encourage smoking cessation	P	P	P	P	P
Implement non-pharmacologic interventions e.g. rehabilitation, self-management program, education	P	P	P	P	P
Prescribe supplemental oxygen therapy if appropriate	P	P	P	P	NA
Ensure residents are protected against respiratory tract infections e.g. pneumococcal and influenza vaccinations	P	P	P	P	P
Implement pharmacologic interventions as appropriate	P	P	P	P	P
Treat acute exacerbations of COPD promptly	P	P	P	P	NA
Manage comorbidities associated with COPD	P	P	P	P	NA
Consider specialty referral	P	P	P	P	NA
Determine when the resident's condition should be considered end-stage	P	P	P	P	NA
Monitor the patient's symptoms and functional ability	P	P	P	P	NA
Monitor the use of medications to treat COPD	P	P	P	P	NA

Recommendations	AMDA guidelines	GOLD guidelines	NICE guidelines	CTS guidelines	AECOPD* guidelines
Monitor the facility's management of COPD	P 	NA	NA	NA	NA
Monitor exacerbation history	NA	P 	P 	P 	NA
Monitor comorbidities	NA	P 	P 	P 	NA
Monitor surgery (post-operative pulmonary complications) in the COPD patient	NA	P 	P 	NA	NA

AMDA= American Medical Directors' Association; GOLD= Global Initiative for Chronic Obstructive Lung Disease
NICE=National Institute for Health and Care Excellence; CTS=Canadian Thoracic Society
AECOPD=Acute Exacerbation of Chronic Obstructive Pulmonary Disease
*These guidelines are for the prevention of AECOPD
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† It may be difficult to differentiate COPD from other conditions such as asthma, bronchiectasis, congestive heart failure, tuberculosis, carcinoma of the bronchus, obliterative bronchiolitis, bronchopulmonary dysplasia, diffuse pan-bronchiolitis, pulmonary emboli, severe deconditioning, obesity, anemia, interstitial lung disease, neuromuscular disease.

Synthesis of findings

A variety of residents live in long-term care facilities: those with a primary diagnosis of COPD; those with a secondary diagnosis of COPD; those who have unrecognized COPD or who develop symptoms of COPD while in residence; and those with end-stage COPD.

The only included systematic review showed that integrated disease management of COPD involving at least two interventions for a minimum duration of three months and active involvement of at least two different categories of healthcare providers improves the quality of life and exercise capacity of COPD patients, and reduces hospital admissions and hospital days per person.

According to the guidelines, tobacco smoke is the most common risk factor. Others include occupational exposures to respiratory irritants (dust and chemicals), air pollution, family history of pulmonary disease (COPD), genetic factors (alpha-1 antitrypsin deficiency), age, gender, lung growth and development, childhood respiratory infections, recurrent or chronic respiratory symptoms, nutrition and socioeconomic status.

Most COPD patients are not diagnosed until the disease has progressed and symptoms become fairly severe, because they develop COPD symptoms insidiously. Canadian guidelines recommend against mass screening of asymptomatic individuals, but recommend targeted screening for patients with known risk factors. Specifically, patients who are older than 40 years of age and who are current or ex-smokers should undergo spirometry if they report coughing or coughing up phlegm regularly, shortness of breath with simple chores, wheezing when they exert themselves or at night, or frequent colds that persist longer than those of other people they know(9). All residents in long-term care facilities should be assessed for the presence of known or suspected COPD or risk factors for developing COPD upon admission; targeted screening for patients with known COPD or risk factors for the disease should be implemented using screening questionnaires and spirometry, as indicated.

Since COPD is a progressive, heterogeneous disease affecting different patients in different ways, COPD management and treatment should be based on an individualized patient assessment taking into account comorbidities, prognosis, life expectancy, and preferences. A combined COPD assessment involving symptomatic assessment, spirometric classification, the risk of exacerbations, plus assessment of comorbidities, would give a better picture of the complexity of COPD. Common comorbidities are cardiovascular diseases (ischemic heart disease, congestive heart failure, hypertension, atrial fibrillation), and lung cancer which share smoking as a risk factor. Others include osteoporosis, normocytic anemia, diabetes, metabolic syndromes, and depression.

A multidisciplinary team and a combination of interventions are recommended for optimal management. Smoking cessation is the most important single intervention for preventing and treating COPD. Other evidence-based interventions include: pharmacological interventions (inhaled therapy, oral therapy, and combined oral and inhaled therapy); non-pharmacological interventions such as pulmonary rehabilitation, patient education/self-management programs, advanced care planning, nutrition counseling, and influenza and pneumococcal vaccination; as well as adjunct therapy if appropriate such as supplemental oxygen therapy, mechanical ventilation, treatment of comorbidities according to appropriate treatment guidelines, palliative care consultation and intervention, and surgery.

Prevention or early diagnosis and treatment of an acute exacerbation are imperative as hospitalization for acute exacerbations greatly contributes to the high economic burden of COPD. Preventive measures include smoking cessation, pneumococcal and influenza vaccinations, education and case management, as well as pharmacotherapy.

The treatment setting for COPD depends on the severity. Most patients with an exacerbation (80%) could be treated out of the hospital(7). Factors to consider when deciding where to manage a patient are summarized in Appendix 5.

Discussion

Applicability of the evidence/ implementation

Spirometry is the most objective measurement of airflow limitation available. It should be used to confirm the diagnosis of COPD in any patient at least 35 years old presenting with dyspnea, chronic cough, chronic sputum production and a history of exposure to risk factors such as smoking. These symptoms are not only characteristic of COPD; they may be present in other cardiovascular and respiratory conditions that are common in elderly patients. Therefore, differential diagnoses and comorbidities should be considered when assessing patients for COPD.

Since COPD affects different people in different ways, all of the guidelines recommend an individualized patient care plan guided by the assessment of severity, the impact on the patient's health status, the risk of exacerbations, assessment of comorbidities and the patient's preferences. Although smoking cessation is the most important single intervention for preventing and treating COPD it should not be used alone. The use of other stand-alone interventions such as education, and case management, in isolation, has been shown to be ineffective in preventing COPD exacerbations and are discouraged. Therefore, a combination of at least two interventions should be used to manage COPD depending on the specific patient's assessment and preferences. There are limited indications for surgery in the long-term care setting because of the life expectancy and comorbidities of most patients in this setting.

Strengths and limitations of the evidence review

The objective of this review was to identify evidence about the effectiveness of integrated management of COPD in long-term care.

The only included systematic review on integrated disease management in COPD patients did not consider the long-term care setting as patients in long-term care or nursing homes were usually excluded from the trials. However, the patients were elderly patients (mean age 68 years) and different combinations of interventions were assessed which were in agreement with those recommended in the guidelines.

Only one guideline was specific for the long-term care setting but we found similar recommendations across all the included guidelines. Many recommendations in the long-term care guideline were based on expert opinion due to limited evidence in the long-term care population.

Recommendations

- All health professionals managing patients with COPD should have access to spirometry and they must be competent in the interpretation of the results. Spirometry is the most accepted means of reliably and objectively diagnosing COPD, in combination with assessments of disease severity and routine symptom screening.
- The effective management of patients with COPD, or risk factors for developing COPD, should include an integrated disease management approach that includes both pharmacologic and non-pharmacologic interventions. This should include education, advanced care planning, access to services such as pulmonary rehabilitation, and access to specialist consultations (such as palliative care specialists and respirologists).
- Prevention and prompt treatment of acute exacerbations is important in slowing disease progression and improving the quality of life of COPD patients. Staff should be trained to recognize and implement treatment promptly as well as determine if patients should be hospitalized or treated in the long-term care facilities.
- Many patients with COPD will require long-term care or admission to a nursing home. More research on COPD management that includes patients in the long-term care setting is necessary.

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Appendices

Appendix 1: Search strategies

MEDLINE search strategy

1. Pulmonary Disease, Chronic Obstructive/

2. COPD.mp.

3. Chronic Obstructive Pulmonary Disease.mp.

4. Chronic Obstructive Airway Disease.mp.

5. Chronic Obstructive Lung Disease.mp.

6. pulmonary emphysema.mp.

7. chronic bronchitis.mp.

8. COAD.mp.

9. Chronic Airflow Obstruction.mp.

10. or/1-9

11. disease management/

12. Disease management.mp.

13. exp Managed Care Programs/

14. managed care.mp.

15. (insurance and "case management").mp.

16. exp Patient Care Planning/

17. "patient care plan$".mp.

18. "nursing care plan$".mp.

19. "goals of care".mp.

20. "care goal".mp.

21. exp "Delivery of Health Care, Integrated"/

22. (integrated and (health$ or care$ or delivery or system$)).mp.

23. disease state management.mp.

24. Comprehensive Health Care/

25. "comprehensive health care".mp.

26. ((interdisciplin$ or multidisciplin$) and (care or health$ or delivery or system$)).mp.

27. Primary Nursing/

28. "primary nursing".mp.

29. "community based".mp.

30. Patient-Centered Care/

31. Patient Care Management/

32. (patient adj3 (care or management)).mp.

33. practice guideline/

34. education, medical, continuing/ or education, nursing, continuing/

35. exp community health services/

36. Primary Health Care/

37. "patient care team".mp.

38. "critical pathways".mp.

39. "case management".mp.

40. Self Care/

41. (continuity adj3 "patient care").mp.

42. guideline$.mp.

43. "clinical protocol".mp.

44. "patient education".mp.

45. (self-care or "self care").mp.

46. reminder systems.mp. or Reminder Systems/

47. Health Education/

48. Health Promotion/

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49. (health adj3 (education or promotion)).mp.

50. Community Health Planning/

51. ambulatory care.mp.

52. feedback.mp.

53. or/11-52

54. 10 and 53

55. (clinical trial or controlled clinical trial or randomised controlled trial).pt.

56. (randomised or randomised).ab,ti.

57. placebo.ab,ti.

58. dt.fs.

59. randomly.ab,ti.

60. trial.ab,ti.

61. groups.ab,ti.

62. or/55-61

63. Animals/

64. Humans/

65. 63 not (63 and 64)

66. 62 not 65

67. 54 and 66

[Limited to pub. Date > = 1990]

EMBASE search strategy

1. chronic obstructive lung disease/

2. COPD.mp. [mp=title, abstract, subject headings, heading word, drug trade name, original title, device manufacturer, drug manufacturer]

3. Chronic Obstructive Pulmonary Disease.mp.

4. Chronic Obstructive Airway Disease.mp.

5. Chronic Obstructive Lung Disease.mp.

6. pulmonary emphysema.mp.

7. chronic bronchitis.mp.

8. COAD.mp. [mp=title, abstract, subject headings, heading word, drug trade name, original title, device manufacturer, drug manufacturer]

9. Chronic Airflow Obstruction.mp.

10. or/1-9

11. disease management/

12. Disease management.mp.

13. managed care/

14. managed care.mp.

15. (insurance and “case management”).mp.

16. patient care planning/

17. “patient care plan$”.mp.

18. “nursing care plan$”.mp.

19. “goals of care”.mp.

20. “care goal”.mp.

21. integrated health care system/

22. (integrated adj5 (health$ or care$ or delivery or system$)).mp.

23. disease state management.mp.

24. health care/

25. “comprehensive health care”.mp.

26. ((interdisciplin$ or multidisciplin$) adj5 (care or health$ or delivery or system$)).mp.

27. primary nursing/

28. “primary nursing”.mp.

29. “community based”.mp.

30. patient care/

31. (patient adj3 (care or management)).mp.

32. practice guideline/

33. medical education/

34. exp community care/

35. primary health care/

36. “patient care team”.mp.

37. “critical pathways”.mp.

38. “case management”.mp.

39. self care/

40. (continuity adj3 “patient care”).mp.

41. guideline$.mp.

42. “clinical protocol”.mp.

43. “patient education”.mp.

44. (self-care or “self care”).mp.

45. reminder system/

46. reminder systems.mp.

47. health education/

48. health promotion/

49. (health adj3 (education or promotion)).mp.

50. health care planning/

51. ambulatory care.mp.

52. feedback.mp.

53. or/11-52

54. 10 and 53

55. Randomized Controlled Trial/

56. randomisation/

57. Controlled Study/

58. Clinical Trial/

59. controlled clinical trial/

60. Double Blind Procedure/

61. Single Blind Procedure/

62. Crossover Procedure/

63. or/55-62

64. (clinica$ adj3 trial$).mp.

65. ((singl$ or doubl$ or trebl$ or tripl$) adj3 (mask$ or blind$ or method$)).mp.

66. exp Placebo/

67. placebo$.mp.

68. random$.mp.

69. ((control$ or prospectiv$) adj3 (trial$ or method$ or stud$)).mp.

70. (crossover$ or cross-over$).mp.

71. or/64-70

72. 63 or 71

73. exp ANIMAL/

74. Nonhuman/

75. Human/

76. 73 or 74

77. 76 not 75

78. 72 not 77

79. 54 and 78

[Limited to pub. Date >=1990]

CINAHL search strategy

S1 (MH “Pulmonary Disease, Chronic Obstructive+”)

S2 COPD

S3 “chronic Obstructive Pulmonary Disease”

S4 “Chronic Obstructive Airway Disease”

S5 “Chronic Obstructive Lung Disease”

S6 “pulmonary emphysema”

S7 “chronic bronchitis”

S8 COAD

S9 “Chronic Airflow Obstruction”

S10 S1 or S2 or S3 or S4 or S5 or S6 or S7 or S8 or S9

S11 (MH “Disease Management”)

S12 “Disease management”

S13 (MH “Managed Care Programs+”)

S14 “managed care”

S15 insurance and “case management”

S16 (MH “Patient Care Plans+”)

S17 “patient care plan*”

S18 “nursing care plan*”

S19 “goals of care”

S20 “care goal”

S21 (MH “Health Care Delivery, Integrated”)

S22 (integrated and (health* or care* or delivery or system*))

S23 “disease state management”

S24 “Comprehensive Health Care”

S25 ((interdisciplin* or multidisciplin*) and (care or health* or delivery or system*))

S26 (MH “Primary Nursing”)

S27 “primary nursing”

S28 “community based”

S29 (MH “Patient Centered Care”)

S30 “patient care”

S31 “patient management”

S32 (MH “Education, Medical, Continuing”)

S33 Education, Nursing, Continuing

S34 (MH “Community Health Services+”)

S35 (MH “Primary Health Care”)

S36 “patient care team”

S37 (MH “Critical Path”)

S38 “case management”

S39 (MH “Self Care”)

S40 (MH “Continuity of Patient Care”)

S41 guideline*

S42 “clinical protocol”

S43 “patient education”

S44 self-care or “self care”

S45 (MH “Reminder Systems”)

S46 “reminder system*”

S47 (MH “Health Education”)

S48 (MH “Health Promotion+”)

S49 (health N3 educat*) or (health N3 promot*)

S50 “Community Health Planning”

S51 “ambulatory care”

S52 feedback

S53 S11 or S12 or S13 or S14 or S15 or S16 or S17 or S18 or S19 or S20 or S21 or S22 or S23 or S24 or S25 or S26 or S27 or

S28 or S29 or S30 or S31 or S32 or S33 or S34 or S35 or S36 or S37 or S38 or S39 or S40 or S41 or S42 or S43 or S44 or S45 or S46

or S47 or S48 or S49 or S50 or S51 or S52

S54 S10 and S53

S55 (DE “RANDOMIZED CONTROLLED TRIALS”)

S56 (MH “Double-Blind Studies”)

S57 (MH “Random Assignment”)

S58 (MH “Placebos”)

S59 placebo*

S60 random*

S61 crossover* or cross-over*

S62 clinical* and (trial* or study or studies)

S63 (single* or double* or triple*) and blind*

S64 S55 or S56 or S57 or S58 or S59 or S60 or S61 or S62 or S63

S65 S54 and S64 [Limiters - Exclude MEDLINE records; Published Date from: 19900101-20111231]

CENTRAL search strategy

#1 MeSH descriptor Pulmonary Disease, Chronic Obstructive explode all trees

#2 COPD

#3 “chronic Obstructive Pulmonary Disease”

#4 “Chronic Obstructive Airway Disease”

#5 “Chronic Obstructive Lung Disease”

#6 “pulmonary emphysema”

#7 “chronic bronchitis”

#8 COAD

#9 “Chronic Airflow Obstruction”

#10 (#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9)

#11 MeSH descriptor Disease Management, this term only

#12 “Disease management”

#13 MeSH descriptor Managed Care Programs explode all trees

#14 “managed care”

#15 insurance and “case management”

#16 MeSH descriptor Patient Care Planning explode all trees

#17 “patient care plan*”

#18 “nursing care plan*”

#19 “goals of care”

#20 “care goal”

#21 MeSH descriptor Delivery of Health Care, Integrated explode all trees

#22 (integrated and (health* or care* or delivery or system*))

#23 “disease state management”

#24 MeSH descriptor Comprehensive Health Care, this term only

#25 “comprehensive health care”

#26 ((interdisciplin* or multidisciplin*) and (care or health* or delivery or system*))

#27 MeSH descriptor Primary Nursing, this term only

#28 “primary nursing”

#29 “community based”

#30 MeSH descriptor Patient-Centered Care explode all trees

#31 MeSH descriptor Patient Care Management, this term only

#32 “patient care”

#33 “patient management”

#34 MeSH descriptor Education, Medical, Continuing, this term only

#35 MeSH descriptor Education, Nursing, Continuing, this term only

#36 MeSH descriptor Community Health Services explode all trees

#37 MeSH descriptor Primary Health Care, this term only

#38 “patient care team”

#39 “critical pathways”

#40 “case management”

#41 MeSH descriptor Self Care, this term only

#42 continuity NEAR/3 “patient care”

#43 guideline*

#44 “clinical protocol”

#45 “patient education”

#46 self-care or “self care”

#47 MeSH descriptor Reminder Systems explode all trees

#48 “reminder system*”

#49 MeSH descriptor Health Education, this term only

#50 MeSH descriptor Health Promotion explode all trees

#51 health NEAR/3 (educat* or promot*)

#52 MeSH descriptor Community Health Planning, this term only

#53 “ambulatory care”

#54 feedback

#55 (#11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR

#25 OR #26 OR #27 OR #28 OR #29 OR #30 OR #31 OR #32 OR #33 OR #34 OR #35 OR #36 OR #37 OR #38 OR #39 OR

#40 OR #41 OR #42 OR #43 OR #44 OR #45 OR #46 OR #47 OR #48 OR #49 OR #50 OR #51 OR #52 OR #53 OR #54)

#56 (#55 AND #10)

#57 (#56), from 1990 to 2013

Cochrane Airways Group Register search strategy

#45=COPD

AND

(“disease management” or “managed care” or insurance* or “case management” or “care plan” or (goal* and care) or (integrat* and

(system* or delivery or care or health*)) or (comprehensive and “health care”) or ((interdisciplin* or multidisciplin*) and (care or

health* or delivery or system*)) or “primary nursing” or patient-cent* or “patient care” or “patient manag*” or “practice guideline*” or

“community health” or “primary health care” or “critical pathway*” or self-care or “self care” or “clinical protocol*” or “patient educat*”

or reminder* or (health and (educat* or promot*)) or ((community or health) and plan*) or “ambulatory care” or feedback)

[Limited to pub. date>=1990]

Appendix 2: Quality assessment

We assessed quality using AMSTAR score for systematic reviews and AGREE score for guidelines.

Quality assessment of the systematic review

The AMSTAR instrument uses the following assessment criteria:

1. Was an a priori design provided?

2. Was there duplicate study selection and data extraction?

3. Was a comprehensive literature search performed?

4. Was the status of publication (i.e. grey literature) used as an inclusion criterion?

5. Was a list of studies (included and excluded) provided?

6. Were the characteristics of the included studies provided?

7. Was the scientific quality of the included studies assessed and documented?

8. Was the scientific quality of the included studies used appropriately in formulating conclusions?

9. Were the methods used to combine the findings of studies appropriate?

10. Was the likelihood of publication bias assessed?

11. Was the conflict of interest stated?

The quality assessment of the review is summarized in the table below.

AMSTAR criteria	AMSTAR score
Was an a priori design provided?	yes
Was there duplicate study selection and data extraction?	yes
Was a comprehensive literature search performed?	yes
Was the status of publication (i.e. grey literature) used as an inclusion criterion?	yes
Was a list of studies (included and excluded) provided?	yes
Were the characteristics of the included studies provided?	yes
Was the scientific quality of the included studies assessed and documented?	yes
Was the scientific quality of the included studies used appropriately in formulating conclusions?	yes
Were the methods used to combine the findings of studies appropriate?	yes
Was the likelihood of publication bias assessed?	yes
Was the conflict of interest stated?	Can't answer (Not stated in the included studies, though stated for systematic review in general)
Score	**10/11**

Quality assessment of the guidelines

The AGREE II consists of 23 key items organized within 6 domains followed by 2 global rating items. Each domain captures a unique dimension of guideline quality. Each item (items 1-24) is rated a maximum of 7 and the last item is rated yes/no.

Domain 1. Scope and Purpose is concerned with the overall aim of the guideline, the specific health questions, and the target population (items 1-3).

Domain 2. Stakeholder Involvement focuses on the extent to which the guideline was developed by the appropriate stakeholders and represents the views of its intended users (items 4-6).

Domain 3. Rigour of Development relates to the process used to gather and synthesize the evidence, the methods to formulate the recommendations, and to update them (items 7-14).

Domain 4. Clarity of Presentation deals with the language, structure, and format of the guideline (items 15-17).

Domain 5. Applicability pertains to the likely barriers and facilitators to implementation, strategies to improve uptake, and resource implications of applying the guideline (items 18-21).

Domain 6. Editorial Independence is concerned with the formulation of recommendations not being unduly biased with competing interests (items 22-23).

Overall assessment includes the rating of the overall quality of the guideline (item 24) and whether the guideline would be recommended for use in practice (item 25).

The quality assessments for the guidelines are summarized in the table below.

AGREE domain	AMDA guidelines	GOLD guidelines	NICE guidelines	CTS guidelines	AECOPD guidelines
Domain 1 – scope and purpose (items 1-3)	14	16	14	13	17
Domain 2 – stakeholder involvement (items 4-6)	14	13	16	13	13
Domain 3 – Rigour of Development (items 7-14)	33	41	34	27	43
Domain 4 – Clarity of Presentation (items 15-17)	14	16	13	15	17
Domain 5 – Applicability (items 18-21)	18	17	17	17	17
Domain 6 – Editorial Independence (items 22-23)	10	4	7	10	10
Overall assessment (items 24-25)	4/yes	5/yes	4/yes	4/yes	5/yes
Score	**107/168**	**112/168**	**105/168**	**99/168**	**122/168**

Appendix 3: Grading of the quality of the evidence

We used the grading system described below(15).

Grading for Evidence-based Rheumatology

Platinum level

The Platinum ranking is given to evidence that meets the following criteria, as reported: is a published systematic review that has at least two individual randomized controlled trials each satisfying the following:

• Sample sizes of at least 50 per group. If they do not find a statistically significant difference, they are adequately powered for a 20% relative difference in the relevant outcome.
• Blinding of patients and assessors for outcomes.
• Handling of withdrawals >80% follow up (imputations based on methods such as Last Observation Carried Forward (LOCF) acceptable).
• Concealment of treatment allocation.

Gold level

The Gold ranking is given to evidence if at least one randomized controlled trial meets all of the following criteria for the major outcome(s), as reported:

• Sample sizes of at least 50 per group. If they do not find a statistically significant difference, they are adequately powered for a 20% relative difference in the relevant outcome.
• Blinding of patients and assessors for outcomes.
• Handling of withdrawals > 80% follow up (imputations based on methods such as Last Observation Carried Forward (LOCF) acceptable).
• Concealment of treatment allocation.

Silver level

The Silver ranking is given to evidence if a systematic review or randomized trial that does not meet the above criteria. Silver ranking would also include evidence from at least one study of nonrandomized cohorts who did and did not receive the therapy or evidence from at least one case control study. A randomized trial with a "head-to-head" comparison of agents is considered Silver level ranking unless a reference is provided to a comparison of one of the agents to placebo showing at least a 20% relative difference.

Bronze level

The bronze ranking is given to evidence if at least one case series without controls (including simple before/after studies in which the patient acts as their own control) or is derived from expert opinion based on clinical experience without reference to any of the foregoing (for example, argument from physiology, bench research or first principles).

Appendix 4: Modified Medical Research Council (mMRC) Dyspnoea Scale for grading the severity of breathlessness during daily activities(7)

mMRC Grade 0: I only get breathless with strenuous exercise

mMRC Grade 1: I get short of breath when hurrying on the level or walking up a slight hill

mMRC Grade 2: I walk slowly than people of the same age on the level because of breathlessness, or I have to stop for breath when walking on my own pace on the level

mMRC Grade 3: I stop for breath after walking about 100 metres or after a few minutes on level ground

mMRC Grade 4: I am too breathless to leave the house or I am breathless when dressing or undressing

Appendix 5: Factors to consider when deciding where to manage patient(4, 7)

Factors	Favors treatment at home	Favors treatment in hospital
Able to cope at home	Yes	No
Breathlessness	Mild	Severe
General condition	Good	Poor - deteriorating
Level of activity	Good	Poor/confined to bed
Cyanosis	No	Yes

Factors	Favors treatment at home	Favors treatment in hospital
Worsening peripheral edema	No	Yes
Level of consciousness	Normal	Impaired
Already receiving LTOT	No	Yes
Social circumstances	Good	Living alone/not coping
Acute confusion	No	Yes
Rapid rate of onset	No	Yes
Significant comorbidity (particularly cardiac and insulin dependent diabetes)	No	Yes
SaO_2 < 90%	No	Yes
Changes on the chest radiograph	No	Present
Arterial pH level	≥ 7.35	< 7.35
Arterial PaO_2	≥ 7kPa	< 7kPa
Frequent exacerbations	No	Yes
Older age	No	Yes

LTOT=long-term oxygen therapy
SaO2=oxygen saturation of arterial blood
PaO2=partial pressure of oxygen in arterial blood
kPa=kilo Pascals

Acknowledgement

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