

Effectiveness of innovations in nurse led chronic disease management for patients with chronic obstructive pulmonary disease: systematic review of evidence

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Abstract

Objective To determine the effectiveness of innovations in management of chronic disease involving nurses for patients with chronic obstructive pulmonary disease (COPD).

Design Systematic review of randomised controlled trials.

Data sources 24 electronic databases searched for English or Dutch language studies published between January 1980 and January 2005.

Review methods Included studies described inpatient, outpatient, and community based interventions for chronic disease management that were led, coordinated, or delivered by nurses. Hospital at home and early discharge schemes for acute exacerbations of COPD were excluded.

Results We identified nine relevant randomised controlled trials, most of which had some potential methodological flaws. All the interventions seemed to be variations on a case management model. The interventions described could be divided into brief (one month) and longer term (around a year) or more intensive interventions. Only two studies examined the effect of brief interventions; these found little evidence of any benefit. Meta-analysis of the long term interventions failed to detect any influence on mortality at 9-12 months' follow-up (Peto odds ratio 0.85, 95% confidence interval 0.58 to 1.26). There was evidence that the long term interventions had not improved patients' health related quality of life, psychological wellbeing, disability, or pulmonary function. The evidence on whether long term interventions reduced readmissions to hospital was equivocal, but the only study exclusively directed at patients on long term oxygen therapy reported a reduction in readmission. We identified several outcomes where little or no evidence was available; these included patients' satisfaction, self management skills, adherence with treatment recommendations, the likelihood of smoking cessation, and the effect of the interventions on carers.

Conclusion There is little evidence to date to support the widespread implementation of nurse led management interventions for COPD, but the data are too sparse to exclude any clinically relevant benefit or harm arising from such interventions.

Introduction

Recognition of the public health burden of chronic obstructive pulmonary disease (COPD) has provided impetus to develop new innovations in clinical service for patients. The literature around these service innovations describes two types of intervention: hospital at home or early discharge schemes for acute exacer-

berations, and interventions aimed at improving the management of COPD as a chronic disease. Such interventions are commonly led, coordinated, and delivered by nurses. A recent review of early discharge and hospital at home schemes for acute exacerbations of COPD suggested that they are safe and should be adopted.¹ Evidence on schemes aimed at improving the chronic disease management of COPD, however, is lacking.

As part of a larger project that attempted to synthesise all the available evidence on the effectiveness of clinical service innovations for COPD provided or led by nurses,² we conducted a systematic review of randomised controlled trials of chronic disease management interventions for COPD.

Methods

Types of trials

To be considered for inclusion, studies had to evaluate clinical service interventions or packages of care aimed at improving the management of patients with COPD in the community. Eligible studies included inpatient, outpatient, or community based interventions that were either led, coordinated, or delivered by nurses. We excluded drug trials, hospital at home, or early discharge schemes for patients with acute exacerbations, educational interventions directed at other healthcare providers, and studies in which a substantial proportion of patients did not have COPD.

Principal outcomes of interest included survival, use of healthcare resources, activities of daily life, patients' health related quality of life (HRQOL), and carers' quality of life.

Identification and selection of trials

We performed a systematic literature review of English and Dutch language papers using a predefined protocol. We searched 16 electronic English language databases for the period January 1980 to January 2005 and eight Dutch citation databases and hand searched the conference proceedings of seven respiratory associations (see bmj.com). We wrote to researchers and practitioners to identify unpublished trials.

Two reviewers working independently screened every citation retrieved in the searches. BC undertook data extraction and quality assessment, which was checked by SJCT. HJMV extracted data from the Dutch language papers. Disagreements were resolved by discussion among the steering group.



Details of searches, ongoing randomised controlled trials, and assessment of trial quality can be found on bmj.com



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Assessment of methodological quality

We used the Delphi list³ and the Jadad criteria⁴ to assess methodological quality. We used our data abstraction and quality assessment to allocate an evidence score to each individual study using the levels of evidence from the Oxford Centre for Evidence-based Medicine.⁵

Synthesis

We grouped the findings of each study by type or duration of intervention and synthesised each outcome variable separately with an overall score for level of evidence for each outcome. When feasible and appropriate we conducted meta-analyses and calculated Peto odds ratios or Cohen's d standardised differences. Potentially important outcomes that had not been evaluated in any of the studies were identified by wider consultation and by the review's advisory groups.

Results

Search for trials

After screening of titles and abstracts we identified 175 potentially relevant articles, of which we included nine randomised controlled trials describing interventions for the management of chronic disease.⁶⁻¹⁴ We identified five potentially relevant ongoing studies whose results are not yet unavailable (see bmj.com). We excluded two other trials due to statistical and data limitations.

Methodological quality

Most of the trials had potential methodological limitations (see bmj.com). We assessed the level of evidence for each of the individual trials to be either 2b ("low quality randomised controlled trial") or 1b- (individual randomised controlled trial with a wide confidence interval; we have also used this where no confidence interval was supplied).⁵

Description of the studies

Most studies included patients with moderate or severe COPD. Interventions could be divided into brief interventions after a hospital admission (two studies,^{11, 12} both around one month in duration) and more intensive¹³ or long term studies (around a year

duration).^{6-10, 14} All the interventions seemed to be variations on a "case management" approach ("the active management of high risk people with complex needs with case managers taking responsibility for caseloads working in an integrated system"¹⁵). All but one of the interventions included home visits by a nurse, with two studies unclear on this point.^{8, 11} Three interventions included telephone follow-up.^{10, 11, 13} Promotion of self care was a major component of most of the home visits. Some interventions included regular spirometry or pulse oximetry.⁸⁻¹⁰ The two most recent studies provided a supply of drugs or prescription for use in the event of an acute exacerbation.^{13, 14} Three of the studies promoted exercise or physical activity.^{9, 13, 14}

Synthesis of findings

The table shows the effects of the brief and long term interventions on the outcomes examined. For most outcomes variation in the presentation of outcome data has precluded meta-analysis. Meta-analysis of the trials of the long term or intensive interventions failed to detect any influence on mortality at 9-12 months' follow-up (Peto odds ratio 0.85 favouring intervention, 95% confidence interval 0.58 to 1.26; figure). We found a similar result when we carried out sensitivity analyses excluding a trial involving only patients on long term oxygen therapy.¹⁰

Information on brief interventions was limited to two randomised controlled trials. Neither of these trials found evidence of a reduction in readmissions to hospital. Evidence for a reduction in all cause readmissions at around 12 months' follow-up in the long term interventions was equivocal. Two studies reported a significant reduction in hospital admissions with their interventions,^{10, 13} but three other studies found no significant effect.^{6, 8, 9} Only two studies reported on respiratory readmissions at 12 months, again the results differed.^{6, 13} The evidence around days spent in hospital and visits to the general practitioner was also equivocal, but there was some evidence for fewer visits to an emergency department (table).

Meta-analysis of the three studies reporting health related quality of life measured by the total score on total St George's respiratory questionnaire at between

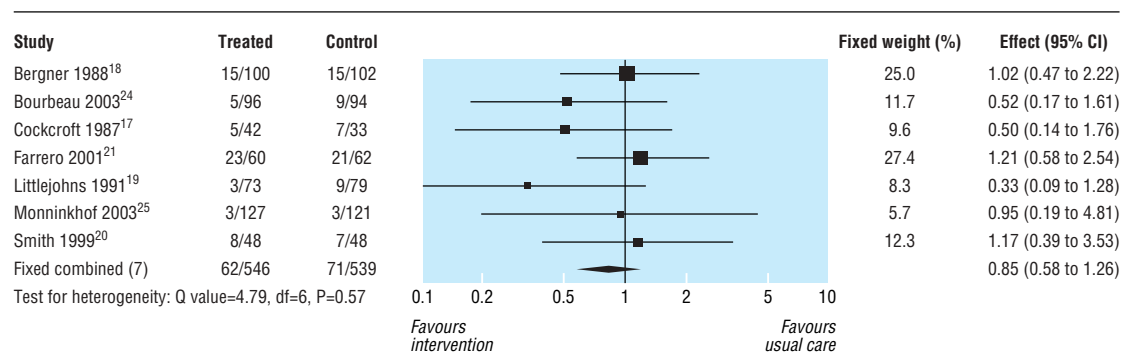
Effects of interventions for management of COPD by nurses in community with estimated level of evidence score

Outcome* examined	Effect of intervention on outcome	Estimated level of evidence†
Patients' HRQOL:		
Brief interventions	No difference detected when measured by disease specific instruments	1a#
Long term or intensive interventions	No difference detected (disease specific or generic instruments) at 12 month follow-up	1a#
Patients' psychological wellbeing: long term interventions	No difference detected	1a#
Impairment and disability: long term interventions	No difference detected in total SIP scores (or outside assessment)	1a# (2b)
No of COPD exacerbations: long term interventions	No difference detected	1a#
Pulmonary function: long term interventions	No difference detected	1a#
Mortality: long term interventions	No difference detected	1a
Emergency department attendance: long term interventions	May be reduced	1a#
No of outpatient visits: long term interventions	No difference detected	1a#
Patients' psychological wellbeing: brief interventions	No difference detected	2b
Patients' knowledge of COPD: long or brief interventions	May be increased	2b
Social support: brief interventions	No difference detected when measured by social support survey	2b
Unscheduled or respiratory readmission: brief interventions	No difference detected	2b
Patients' symptoms: long term interventions	No difference detected	1b-

HRQOL=health related quality of life; SIP=sickness impact profile.

*Outcomes listed are not necessarily primary outcomes of trials.

†Adapted from levels of evidence (Centre for Evidence-Based Medicine)¹⁶: 1a=systematic review with homogeneity of randomised controlled trials, 1a# denotes that at least two randomised controlled trials report on the outcome, but we were unable to perform a statistical meta-analysis (see text for explanation), 1b- = single RCT with wide confidence interval or no confidence interval supplied, 2b= evidence from a single lower quality RCT.



Effects of nurse led management interventions for COPD on mortality from trials of long term or intensive intervention (Peto odds ratios)

three and six months' follow-up found no detectable effect (Cohen's d standardised difference (expressed in units of SD) 0.06, -0.14 to 0.26 , fixed effects model, test for heterogeneity $P = 0.61$).¹²⁻¹⁴

Discussion

At present there is little evidence from randomised controlled trials to support the widespread adoption of chronic disease management by respiratory nurses for patients in the community with moderate or severe COPD. The evidence is sparse and has generally failed to detect any benefit except for readmission to hospital, where the evidence is equivocal.

Only two trials examined brief interventions for chronic disease management, finding virtually no evidence to support their implementation. There is no evidence that long term interventions influence mortality, health related quality of life, psychological wellbeing, disability, or pulmonary function at 12 months. In addition, the evidence around readmissions to hospital following long term intervention is equivocal, suggesting further investigation is required. Of the two studies that reported a reduction in readmissions, one was directed exclusively at patients on long term oxygen therapy.¹⁰ Such patients may benefit from case management.

Strengths and weaknesses of the review

We directed extensive effort at the identification of unpublished and ongoing studies and the systematic documentation of the estimated level of evidence for a wide range of outcomes. However, we included only English or Dutch language papers and we may have overestimated the methodological limitations of the included studies because we relied on published reports.

Comparison with other studies

Our review complements the work of Ram and colleagues, who recently reviewed the effectiveness of hospital at home or early discharge schemes for COPD.¹ All of the studies in their review were led or delivered by nurses, and the authors concluded that they could be safely used to care for patients and seemed to be cost effective.

In contrast to the findings of our disease specific review, a meta-analysis of disease management programmes for a wide variety of chronic illnesses, including COPD, found education of patients and reminders were associated with improvements in

patients' disease control.¹⁶ Much of the evidence on disease management comes from large non-experimental studies of generic interventions.¹⁷ Generic interventions aimed at high risk individuals may be more effective than disease specific interventions for COPD. It is possible that the effect size of interventions for COPD may be too small to be seen in the limited evaluations carried out to date, most of which had potential methodological weaknesses. Elphick and colleagues suggest that systematic reviews of randomised controlled trials often fail to give adequate information on the long term outcomes of chronic diseases. They call for the inclusion of data from observational studies.¹⁸ We attempted this in our extended review² but found that the inclusion of other types of study contributed little to our findings. The extended review also identified a dearth of qualitative research in this area.

What is already known on this topic

There is evidence to support generic interventions for management of chronic disease

The massive public health burden of COPD has driven the development of clinical service innovations around the management of patients

Nurses are the key healthcare personnel involved in chronic disease management interventions for COPD

What this study adds

There is little robust evidence to support nurse management of chronic disease services for patients in the community with moderate or severe COPD

The interventions evaluated to date have not had a detectable effect on mortality, disability, and patients' health related quality of life or psychological wellbeing, while the evidence around hospital readmissions is equivocal

The evidence around other potentially important outcomes—such as patients' adherence to treatment regimens or satisfaction with care and the effect on carers—is extremely weak or absent

Implications for policy makers and future research

Nurse led hospital at home or early discharge schemes for patients with COPD should be prioritised over the type of nurse led models of chronic disease management that have been studied to date. There is little evidence available at present to support the models that have been evaluated. Existing services providing this sort of care should be robustly evaluated against the aims of the particular service.

The evidence around long term or intensive case management and hospital readmission is currently equivocal and requires further study. The potential benefits of schemes for chronic disease management in patients with COPD receiving long term oxygen therapy should also be explored further. Several potentially important outcomes have not been evaluated, including patients' satisfaction, self management, patients' coping and adherence, smoking cessation, and the effects on carers.

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The partial smoking ban in licensed establishments and health inequalities in England: modelling study

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The UK government's white paper *Choosing Health* proposes prohibiting smoking in public places in England, but exempts public houses (pubs) not serving catered food and licensed establishments that require membership.¹ However, passive inhalation of smoke at work may cause 600 deaths per year in the United Kingdom and increases morbidity and mortality among bar workers.² Furthermore, people attempting to quit smoking find that socialising with other smokers makes quitting difficult, and lapses in quitting are more likely in premises where smoking is permitted.³

Concerns exist that exempt establishments are located primarily in deprived areas with the highest smoking prevalence and that a partial ban worsens health inequalities.⁴ We examined if exempt establishments were located predominantly in deprived areas in the borough of Telford and Wrekin.

Methods and results

We determined the catering status of pubs from regularly updated records of local authority licensing and environmental health. These allowed us to identify premises preparing catered food, those serving manufactured snacks, and those not serving food. *Choosing Health* proposes prohibiting smoking only in pubs serving catered food; all others can be exempt. All licensed members' clubs may choose exemption, which we assumed for this study.

 A statistical appendix in on bmj.com

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