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## EVIDENCE-BASED REVIEW

# Systematic review of the effects of chronic disease management on quality-of-life in people with chronic obstructive pulmonary disease

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**KEYWORDS**

Systematic review;  
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**Summary**

**Introduction:** Chronic disease management for patients with chronic obstructive pulmonary disease (COPD) may improve quality, outcomes and access to care.

**Objective:** To investigate effectiveness of chronic disease management programmes on the quality-of-life of people with COPD.

**Methods:** Medline and Embase (1995–2005) were searched for relevant articles, and reference lists and abstracts were searched for controlled trials of chronic disease management programmes for patients with COPD. Quality-of-life was assessed as an outcome parameter. Two reviewers independently reviewed each paper for methodological quality and extracted the data.

**Results:** We found 10 randomized-controlled trials comparing chronic disease management with routine care. Patient populations, health-care professionals, intensity, and content of the intervention were heterogeneous. Different instruments were used to assess quality of life. Five out of 10 studies showed statistically significant positive outcomes on one or more domains of the quality of life instruments. Three studies, partly located in primary care, showed positive results.

**Conclusions:** All chronic disease management projects for people with COPD involving primary care improved quality of life. In most of the studies, aspects of chronic disease management were applied to a limited extent. Quality of randomized-controlled trials was

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not optimal. More research is needed on chronic disease management programmes in patients with COPD across primary and secondary care.  
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## Introduction

Chronic obstructive pulmonary disease (COPD) is a major cause of morbidity and mortality across the world, and its prevalence continues to increase.<sup>1</sup> COPD places a burden on the health-care system and reduces health-related quality of life (HRQOL).<sup>2,3</sup> According to current guidelines, stable COPD is managed using a combination of smoking cessation, pharmacological therapy, education, pulmonary rehabilitation, nutritional interventions, vaccinations, oxygen therapy and surgery.<sup>1,4-7</sup> This multi-component management of COPD usually involves the use of many health-care providers. In spite of the given guidelines, it is still unclear what is the most effective approach of delivering and co-ordinating comprehensive and multidisciplinary care along the disease continuum and across the different health-care systems. In addition, it is conceptually unclear how such programmes should be defined.<sup>8</sup> A wide range of definitions and concepts have been used for changes in healthcare delivery (i.e. transmural care, shared care, multidisciplinary care, integrated care and disease management). The most frequently used innovative approach to avoid fragmentation and discontinuity of health care is chronic disease management. Chronic disease management programmes are interventions designed to manage or prevent a chronic condition using a systematic approach to care, with the potential use of multiple treatment modalities.<sup>9</sup> Compared with traditional healthcare delivery, care delivered using chronic disease management is organized, proactive and integrated.<sup>10</sup> Particularly, integration of health care is a potential method of improving quality, access, user satisfaction and efficiency of care for patients with chronic illness.<sup>8,9,11</sup> The World Health Organization defines integrated healthcare services as a concept of bringing together inputs, delivery, management and organization of services related to diagnosis, treatment, care, rehabilitation and health promotion.<sup>11</sup>

In assessing the effectiveness of treatment for COPD, the appropriate selection of outcome measurement is critical. Objective pulmonary function parameters, such as forced expiratory volume in 1 s (FEV<sub>1</sub>), provide the clinician with an appropriate means of diagnosis, stage severity and prognosis of COPD. However, reduction in FEV<sub>1</sub> is only weakly associated with the patient's perception of symptoms and health-HRQOL.<sup>12</sup> Furthermore, HRQOL is dynamic within the individual, varying with changes in both disease intensity and expectations of health.<sup>13</sup> Exacerbation of COPD is a particularly important, negative influence on HRQOL.<sup>3</sup> Consequently, improving quality of life is considered to be a major goal in widely recognized guidelines for the management of COPD.<sup>1,4-7</sup> The objective of this systematic review is to summarize the effects of integrating care within chronic disease management programmes on quality of life in people with COPD.

## Methods

For this systematic review, Medline and Embase were searched between 1995 and 2006; using the following key words: 'COPD' or 'chronic obstructive pulmonary disease' or 'pulmonary emphysema' or 'chronic bronchitis'; and 'quality of life' or 'health status' or 'health status indicators'.

We selected only randomized-controlled studies comparing quality of life outcomes in outpatient chronic disease management programmes and routine care. We particularly focused on the level of integration or interconnection of COPD-care disciplines or healthcare systems. We excluded studies aimed exclusively at evaluations of methods of case finding, prevention strategies, provider education or provider feedback. Programmes were considered to be integrated care if at least one of the following components was present: (1) multidisciplinary care team, (2) clinical pathway, (3) clinical follow-up, (4) case management, or

**Table 1** Inclusion criteria and study flow from identification to final inclusion.

	Inclusion criteria	Number of studies excluded	Cumulative number of studies
Identification of studies			2098
Title and abstract screening		2000	98
Methodological criteria	Randomized-controlled trial	41	57
	Control group with care-as-usual	13	44
Study population criteria	Clinical diagnosed COPD patients stable at inclusion	3	41
Intervention criteria	Outpatient integrated care programme*	9	32
	Duration of at least 8 weeks	4	28
Outcome measurements	General or disease-specific instrument measuring quality of life	18	10

COPD, chronic obstructive pulmonary disease.

\*Outpatient programme, including at least one of the following components: (1) multidisciplinary care team, (2) clinical pathway, (3) clinical follow-up, (4) case management, and (5) self-management or patient education.

(5) self-management or patient education.<sup>8</sup> Additional inclusion criteria used to select studies are shown in Table 1. Studies published before 1995 were not considered for inclusion, as new guidelines for management of COPD were published in 1995.<sup>1,4-7</sup> The reference lists of the selected studies and relevant reviews were inspected for additional papers. Two reviewers (AN and GdW) independently evaluated the full text of all retrieved papers, made a decision on inclusion or exclusion, and discussed the decisions. Any disagreement was resolved by consensus, with close attention to inclusion and exclusion criteria. Data were collected using a standardized abstraction form. To assess methodological quality, criteria developed by the Cochrane Back Review Group were used.<sup>14</sup> The following 11 criteria were assessed: adequate randomization procedure, concealment of treatment allocation, similarity of baseline characteristics, blinding of patients, blinding of care provider, outcome assessor blinded to the intervention, co-interventions avoided or equal, compliance, withdrawal or drop-out rate, similarity of timing outcome assessment, and intention-to-treat analyses. A total score was computed by counting the number of criteria that were met. High quality was defined as fulfilling six or more of the 11 validity criteria.

To determine the effects of chronic disease management programmes on the quality of life of people with COPD, included studies were analysed for statistically significant differences ( $P \leq 0.05$ ), as well as clinically significant differences in quality of life. Missing data from the primary study reports were requested from the investigators.

## Results

### Study selection

An overview of the study selection process is shown in Table 1. The initial search strategy identified 2098 references. After screening titles and abstracts, 98 potentially relevant

articles were identified. Ten randomized-controlled trials met all our inclusion criteria.<sup>15-24</sup>

### Content of the interventions

Characteristics of the included studies are described in Table 2. All programmes contained education, and nine studies included exercise training; however, the study by Rea et al.<sup>16</sup> carried out a care plan, consisting of a timetable for regular maintenance checks and setting achievable goals for lifestyle changes. Monnikhof et al.<sup>15</sup> and Bourbeau et al.<sup>17</sup> used an action plan to improve self-management in case of exacerbations. The interventions studied also included scheduled appointments with a doctor to monitor patients,<sup>20,24</sup> psychosocial support,<sup>21</sup> relaxation techniques<sup>21,23</sup> smoking cessation,<sup>22</sup> breathing retraining,<sup>18-20,23,24</sup> recreational activities for patients<sup>23</sup> and occupational therapy.<sup>22</sup>

Duration of the interventions varied from 2 to 18 months. The frequency of contact with care providers differed from 4 h daily to 2 h a week. Most interventions took place in secondary care. Three interventions were located in primary care, and included general practitioners, nurses, and physiotherapists.<sup>16,23,24</sup> In secondary care, besides nurses and physiotherapists, clinicians, occupational therapists, psychologists, dieticians and social workers were also involved. The number of disciplines included in the studies reviewed ranged from two to seven.

### Patient characteristics

Patient characteristics of the populations studied are shown in Table 3. Because of differences in inclusion criteria, the proportion of men and women, and the degree of airflow limitation as measured by FEV<sub>1</sub> as a percentage of the predicted value, differed among the studies. Patients' mean

**Table 2** Characteristics of studies included in the review.

Reference	Follow-up (months)	Quality of study	Number of providers primary care/secondary care	Content intervention group*											
				I	II	III	IV	V	VI	VII	VIII	IX	X		
Rea et al., <sup>16</sup> New Zealand	12	6	2/2	1	–	–	–	–	–	–	–	–	–	–	1
Monninkhof et al., <sup>15</sup> The Netherlands	12	8	0/3	1	–	2	–	–	–	–	–	–	–	–	1
Bourbeau et al., <sup>17</sup> Canada	12	8	0/3	1	–	3	–	–	–	–	–	–	–	–	1
Güell et al., <sup>18</sup> Spain	12	7	0/2	1	–	3	3	–	–	–	–	–	–	–	–
Ringbeak et al., <sup>19</sup> Denmark	2	3	0/5	3	–	3	3	–	–	–	–	–	–	–	–
Engström et al., <sup>20</sup> Sweden	12	6/7	0/5	1	1	2	2	–	–	–	–	–	–	–	–
Emery et al., USA <sup>21</sup>	2.5	6	0/2	a:3 b:3	–	a:3 b:–	–	a:3 b:3	–	–	–	–	–	a:2/ b:2	–
Bendstrup et al., <sup>22</sup> Denmark	3	4	0/7	2	–	3	–	–	–	–	1	1	–	–	–
Cambach et al., <sup>23</sup> The Netherlands	3	4	3/1	3	–	3	3	2	2	–	–	–	–	–	–
Wijkstra et al., <sup>24</sup> The Netherlands	18	5	3/1	c:1 d:1	C:1 d:1	c:3 d:1	c:3 d:1	–	–	–	–	–	–	–	–

\* (I) Education, (II) scheduled visit physician, (III) exercise, (IV) breathing retraining, (V) relaxation techniques, (VI) recreation, (VII) occupational therapy, (VIII) smoking cessation support, (IX) psychological support, (X) action plan. –: absent; 1: less than once a week; 2: once a week; 3: more than once a week. a: intervention with exercise; b: intervention without exercise; c: intervention with weekly session physiotherapist; d: intervention of a monthly session with a physiotherapist.

age was approximately equal among the studies, varying from 62 to 69 years. The number of participants included in the studies was relatively small. Seven out of 10 studies included fewer than 30 patients in the intervention or control group.

### Methodological quality

In general, the methodological quality of the studies included in this review was moderate (Table 3). Six studies achieved six or more positive scores on the validity criteria, the determined threshold for high quality. All included studies were randomized-controlled trials. None of the studies were double-blinded, because blinding of patients and care providers is not possible in this type of study.

### Synthesis of the findings

Quality of life was determined at baseline and after the intervention. In Table 3, outcomes on quality of life are summarized. Five studies reported statistically significant differences between the intervention group and the control group in one or more domains of the quality of life instrument.<sup>16,18,21,23,24</sup> Four of these studies used the Chronic Respiratory Questionnaire (CRQ) to determine quality of life.<sup>16,18,23,24</sup> Güell et al.<sup>18</sup> and Cambach et al.<sup>23</sup> found statistically significant improvement in quality of life between the intervention group and the control group for all four domains of the CRQ. Rea et al.<sup>16</sup> reported statistically significant changes in the 'fatigue' and 'mastery' domain,

and Wijkstra et al.<sup>24</sup> in the 'mastery' domain of the CRQ. In the study by Emery et al.,<sup>21</sup> a statistically significant improvement in quality of life was found between patients in the intervention group and the control group, using the Sickness Impact Profile.

Table 3 also shows which studies reported clinically relevant differences in quality of life between baseline and after the intervention among the intervention group and the control group. Seven studies found differences above the minimal clinically important difference threshold in the intervention group<sup>16–20,23,24</sup>; in four studies, clinically relevant improvements in the control group were seen.<sup>16,17,19,20</sup> Güell et al.,<sup>18</sup> Cambach et al.<sup>23</sup> and Wijkstra et al.<sup>24</sup> reported differences in the CRQ above the minimal clinically significant difference threshold in the intervention group, and no clinically relevant improvements in the control group.<sup>18,23,24</sup> No clinically significant deteriorations were found in any of the studies.

### Discussion

In this review, outcome on quality of life of 10 chronic disease management trials concerning integrated care in patients with stable COPD were reviewed. Five studies showed statistically significant positive effects on one or more subscales of the quality of life instruments in the intervention group, compared with the control group. This included all trials partly located in primary care. These three trials also showed clinically significant improvements in quality of life in the intervention group. In addition to

**Table 3** Characteristics of study participants and outcomes on quality of life.

	N	Sex (% male) intervention- control	Mean age intervention/ control	FEV <sub>1</sub> (%pred) intervention/ control	Instruments used to assess quality of life	Statistical outcomes on quality of life between groups	Clinical relevant outcomes on quality of life I	Clinical relevant outcomes on quality of life C
Rea et al. <sup>16</sup>	117	42 (total)	68 (total)	52/50	CRQ, SF36	* (CRQ) + (SF-36)	= (SF-36) - (CRQ)	- (CRQ) + (SF-36)
Monninkhof et al. <sup>15</sup>	248	67/69	65/65	56/58	SGRQ	=	-	-
Bourbeau et al. <sup>17</sup>	191	52/59	69/70	n.a.	CRQ	=	+	+
Güell et al. <sup>18</sup>	47	100/100	63/65	32/41	CRQ	*	+	-
Ringbeak et al. <sup>19</sup>	45	4/29	62/65	50/44	SGRQ	=	+	+
Engström et al. <sup>20</sup>	50	54/50	66/77	31/34	SGRQ, SIP	= (SGRQ) = (SIP)	+ (SGRQ) n.a. (SIP)	+ (SGRQ) n.a. (SIP)
Emery et al. <sup>21</sup>	79	a:50/48 b:42	65/67 67	43/39 43	SIP	a: * b: *	n.a.	n.a.
Bendstrup et al. <sup>22</sup>	32	56/56	64/65	1.02L/min 1.04L/min	CRQ	=	-	-
Cambach et al. <sup>23</sup>	23	47/75	62/62	59/60	CRQ	*	+	-
Wijkstra et al. <sup>24</sup>	36	c:73/92 d:83	62/62 64	43/43 45	CRQ	c: = d: *	c: - d: +	-

a: Intervention with exercise training; b: intervention without exercise training; c: intervention with weekly session with physiotherapist; d: intervention with monthly session with physiotherapist. CRQ, Chronic Respiratory Questionnaire; SGRQ, St. George Respiratory Questionnaire; SF-36, Short Form-36; SIP, Sickness Impact Profile. \*, Statistically significant improvement one or more quality of life domains; =, no statistically significant changes on any quality of life domains; +, clinically relevant improvement one or more quality of life domains; -, no clinically relevant improvement one or more quality of life domains (minimal clinical relevant difference CRQ: 0.5 points on seven-point scale; SGRQ, four points; SF-36, 3-5 points; SIP, not determined); n.a., not applicable.

primary care, secondary-care professionals, including general physicians, physiotherapists, nurses, and pulmonary specialists, were involved in these projects. Most of the trials included in this review studied the effects of pulmonary rehabilitation, including exercise.<sup>15,17–24</sup> This confirms the findings of Lacasse et al.,<sup>25</sup> who recently carried out a meta-analysis of 23 randomized-controlled trials of inpatient, outpatient, and home-based pulmonary rehabilitation programmes for people with COPD. Pulmonary rehabilitation showed statistically significant and clinically relevant improvements in HRQOL, irrespective of whether or not they were part of integrated care. Two studies selected in our review assessed the effects of self-management.<sup>15,17</sup> Only one study reported improvements in quality of life domains. This supports the inconclusive findings of a systematic review studying the effects of self-management programmes on quality of life outcomes.<sup>26</sup> In our study, positive effects relating to quality of life were particularly seen when the disease-specific instrument CRQ was used to determine quality of life. General quality of life instruments are apparently less sensitive to detecting differences in quality of life in interventions for people with COPD. For other chronic diseases, such as diabetes, heart failure and depression, studies on chronic disease management, including primary care, showed inconclusive results on quality of life. Some studies found statistically significant improvements in quality of life between the intervention group and the control group,<sup>27,28</sup> whereas other studies found no differences in quality of life.<sup>29,30</sup>

The results of this review need to be interpreted with caution. First, large variations were found in study population, design, duration, content, outcomes and intensity of the interventions. All included studies were randomized-controlled trials, with substantial variation in methodological quality. The trials were not blinded for obvious practical reasons, and quality of life outcomes were not always shown properly, as quality of life was not the primary outcome in all the studies. Second, selection bias may have occurred because we relied on English papers. Third, the current selection of studies did not focus on the all the effects of chronic disease management or integrated care programmes. In most of these studies, only one or more components were applied (i.e. multiple treatment modalities or self-management interventions). In addition, in most studies, little information was provided on the specific characteristics of collaboration between different disciplines. The current model of chronic disease management and integrated care, embraced by the World Health Organization, have their origins in the chronic care model developed by Wagner.<sup>31</sup> He identified six essential elements for quality in chronic care: community resources and policies, health-care organization, self-management support for patients, delivery-system design, decision support, and clinical information systems. The studies in this review did not include all elements of this chronic care model. In the chronic care model, successful chronic disease management requires a co-ordinated multidisciplinary care team.<sup>31</sup> Quality of communication and collaboration between care providers, and communication with patients, seems to be highly important in improving care for chronically ill patients. Lack of information, however, detracts from the elements of co-operation that are essential for successful

outcome. Our findings are consistent with a recent systematic review,<sup>32</sup> showing that data on efficacy of elements of the chronic care model are limited in patients with COPD. However, the authors applied different inclusion criteria in their analysis, and therefore were able to pool data; they also could not detect significant changes in quality of life.

To date, only Casas et al.<sup>33</sup> have studied all the effects of shared and integrated COPD care between primary-care teams and hospital teams, aiming at generating synergies among different levels of the health-care system and avoiding duplication. Although no improvements in HRQOL were observed, the proposed model of integration between disciplines and health-care systems offers great potential in reducing hospital rates.<sup>33</sup> As this trial only focused on patients with exacerbated COPD, it was excluded from the current review.

## Conclusion

The number of studies of chronic disease management and integration of care for patients with stable COPD that have assessed outcome on quality of life is limited. It is inconclusive whether these programmes, with different levels of integration, improve quality of life. Involvement of primary care in managing COPD seems to have a positive effect on the quality of life of these patients. However, the level of effective integrated care needs to be determined. Implementation in daily practice also needs to be assessed for feasibility and sustainability (including economic). Future research on the effectiveness of chronic disease management programmes should focus on structural implementation strategies of guidelines for managing COPD in primary and secondary care. In addition, more scientific evidence is needed to define the optimal approach of delivering and co-ordinating comprehensive COPD care across different health-care systems.

## Practice points

- Data on efficacy of chronic disease management and elements of the chronic care model in patients with COPD are limited.
- It is inconclusive whether chronic disease management programmes in people with stable COPD can improve HRQOL.
- Involvement of primary care seems to have a positive effect on HRQOL in people with stable COPD.

## Research directions

- The benefits of structural implementation of multi-disciplinary guidelines involving both primary and secondary care needs to be more clearly defined.
- The most effective method of integrating different disciplines and healthcare systems and avoiding fragmentation and discontinuation of COPD care remains to be determined.

## Conflict of interest

All authors declare absence of any financial and personal relationships with people or organizations that could influence the content of this review.

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