Systematic review of the chronic care model in chronic obstructive pulmonary disease prevention and management

CRD summary
This review assessed the chronic care model for patients with chronic obstructive pulmonary disease and concluded that the inclusion of more than one component benefited hospitalisations, emergency/unscheduled visits and length of stay. However, data were limited and more well-designed trials are needed. The conclusions should be regarded with some caution, mainly due to the absence of consistently demonstrated benefits.

Authors' objectives
To evaluate the effectiveness of chronic care model components in patients with chronic obstructive pulmonary disease (COPD).

Searching
MEDLINE, CINHAL and the Cochrane Library were searched up to August 2005 using the reported search terms. In addition, identified articles and reviews were screened, abstracts of national conferences proceedings (1995 to 2005) were searched and experts were contacted. The review was restricted to English language publications.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs), controlled trials and before-and-after studies were eligible for inclusion.

Specific interventions included in the review
Studies that evaluated one or more of the chronic care model components (self-management, delivery system design, decision support or clinical information system) were eligible for inclusion. Studies evaluating specific therapeutic measures such as pulmonary rehabilitation were excluded. The majority of the included studies evaluated only one of the outlined components, and were of predominantly self-management interventions implemented in European countries, the USA, Australia and New Zealand. The duration of the intervention varied from 15 minutes to 80 hours.

Participants included in the review
Studies in COPD were eligible for inclusion, other than that no inclusion criteria for the participants were specified. The included studies mainly targeted individual patients, some targeted groups and some targeted both groups and individuals.

Outcomes assessed in the review
Studies reporting knowledge, dyspnoea, quality of life, lung function, performance-based tests such as a 6-minute walk test, health care use such as length of hospital stay, clinical end points such as mortality, or costs were eligible.

How were decisions on the relevance of primary studies made?
Two reviewers independently selected studies for inclusion. Any disagreements were resolved by consensus.

Assessment of study quality
Two reviewers independently evaluated the studies in relation to blinding of the outcome assessors. The RCTs were assessed using the U.S. Preventive Services Task Force quality criteria, which cover a variety of pertinent quality issues.

Data extraction
Two reviewers independently extracted the data. Information to compute the relative risk (RR) or mean difference was sought.

**Methods of synthesis**
**How were the studies combined?**
Pooled RRs, weighted mean differences or standardised mean differences were obtained using fixed-effect models and the Mantel-Haenszel (for RR) and DerSimonian and Laird (for mean difference) random-effects models, adjusted for sample size and precisions. The results of the random-effects models were reported, together with the 95% confidence intervals (CIs). Only RCTs with at least 3 studies reporting similar measures were pooled statistically. Publication bias was investigated using funnel plots.

**How were differences between studies investigated?**
Statistical heterogeneity was assessed using the Cochran Q test and the I-squared statistic. An I-squared value of 50% was considered heterogeneous; standardised mean differences instead of weighted mean differences were used in that case.

**Results of the review**
Thirty-two studies (n approximately 5,527, exact number of participants unclear) were included: 20 RCTs (n approximately 2,948), 5 controlled trials (n=1,478) and 7 before-and-after studies (n=1,101).

Only 1 RCT met all criteria for good quality, 4 trials had one or more methodological problems and were rated 'fair' quality, and 15 of the 20 RCTs had one or more fatal flaw and were rated 'poor' quality. There was no information on the other studies.

Patients that received at least two chronic care interventions had fewer emergency/unscheduled visits (RR 0.58, 95% CI: 0.42, 0.79; 3 RCTs), fewer hospitalisations (RR 0.78, 95% CI: 0.66, 0.94; 4 RCTs) and a shorter hospital stay (weighted mean difference -2.51 days, 95% CI: -3.40, -1.61; 2 RCTs). Only 2 of the 3 pooled studies showed a statistically significant difference for emergency/unscheduled visits. Only 2 of the 4 pooled studies showed a statistically significant reduction in hospitalisations, one showed no statistically significant difference and the other favoured the control group. Statistical heterogeneity was not reported.

The results assessing only one chronic care component intervention showed no clear evidence supporting the intervention groups over the control groups. The results varied also for other assessed outcomes such as lung function, quality of life, functional status and mortality.

**Cost information**
Three trials reported a 34 to 70% reduction in health care costs in the intervention groups, mainly due to reduced hospitalisations. One RCT reported a non statistically significant trend towards reduced cost. Three before-and-after studies reported an 11 to 23% reduction in cost.

**Authors' conclusions**
Only limited data evaluating chronic care components in COPD management are available; more well-designed trials are needed. Patients who received interventions with at least two components had lower rates of hospitalisations and emergency/unscheduled visits and a shorter length of stay compared with controls.

**CRD commentary**
The review addressed a clear question with some well-defined inclusion criteria. The search included attempts to locate relevant unpublished studies, thus reducing the risk of publication bias being introduced into the review. Only articles published in English were included, which introduces the potential for language bias. The reviewers undertook measures throughout the review process to reduce reviewer bias and errors. The quality of the included RCTs was
assessed in great detail, but no information about the other included studies was given. The validity of pooling the results was difficult to evaluate as there was very little information on individual study designs, interventions, setting, results, or heterogeneity between studies based on intervention and outcome.

The individual studies showed very mixed results regarding the benefits of the implementation of a chronic care model, with several studies not only showing no statistically significant effect but apparently favouring the control intervention. Only a subgroup (with two or more components) showed positive pooled results for selected outcomes, but positive results were also not consistently presented in all pooled studies. The conclusion that more research is needed seems reliable, for example to find out which combinations of components are effective. However, the conclusion that the existing data are limited is controversial given the extent of the located evidence base: only the data showing benefits are sparse.

**Implications of the review for practice and research**

Practice: The authors stated that an effective preventive strategy to reduce health care use is to implement two or more chronic care model components.

Research: The authors stated that well-designed trials comparing comprehensive packages, which implement all chronic care model components, with limited packages are needed to determine which elements are most beneficial.

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