The effectiveness of disease management programmes in reducing hospital re-admission in older patients with heart failure: a systematic review and meta-analysis of published reports
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CRD summary
This review assessed the effect of disease management programmes on hospital readmissions for heart failure, or other causes, among people with heart failure. The authors concluded that such programmes are effective in reducing readmissions. This was a well-conducted review and the authors' conclusions are likely to be appropriate.

Authors' objectives
To assess the effectiveness of disease management programmes in reducing hospital readmissions among elderly people with heart failure.

Searching
MEDLINE (1966 to August 2003), EMBASE (1966 to August 2003) and the Cochrane Library were searched; the search terms were given. No language restrictions were applied. Reference lists of relevant papers were checked. 'Recent' conference proceedings were searched.

Study selection
Study designs of evaluations included in the review
RCTs and non-RCTs were eligible for inclusion in the review.

Specific interventions included in the review
Studies on disease management programmes compared with usual care were sought. These were defined as 'interventions designed to manage heart failure and reduce hospital readmissions using a systematic approach to care and potentially employing multiple treatment modalities'. All programmes had to include patient support and education. The interventions in the included studies provided education on heart failure, including signs and symptoms of deterioration, as well as management strategies. In the majority of the studies nurses were involved in administration or coordination, and telephone contact with patients was used. There were variations in settings (home, out-patients), commencement (in hospital or after discharge) and duration (ranging from a single home visit to 12 months).

Participants included in the review
Studies that included people with heart failure were sought. At least some of the participants had to be aged 65 years or older. The inclusion criteria stated that studies were excluded if less than 75% of the participants had heart failure, or less than 50% were older than 60 years or the mean age was less than 60 years. However, data from 2 randomised controlled trials (RCTs), where the proportion of people with heart failure was small but the trials were reported on separately, were included. The included studies assessed both men and women, and the mean ages ranged from 65 to 79 years. The New York Heart Association classification ranged from I to IV and ejection fractions ranged from 11 to 45%. Many of the participants had serious co-morbidities (acute myocardial infarction, hypertension, heart valve disease and diabetes). People in the studies were on various drugs, such as angiotensin-converting enzyme inhibitors, diuretics, digoxin and beta-blockers.

Outcomes assessed in the review
The outcome of interest was rehospitalisation. Studies that did not report on readmissions were excluded. Outcomes were reported as admissions for heart failure and other cardiovascular causes, all-cause readmission, and a combined outcome of readmission and death. The duration of follow-up ranged from 1 month to 4.2 years in the RCTs and from 2 weeks to 5 years in the non-RCTs.

How were decisions on the relevance of primary studies made?
Two reviewers selected studies for the review. Any disagreements were discussed with a third reviewer and settled by
consensus.

Assessment of study quality
The Jadad scale was used to assess the quality of RCTs. This scored points for items such as randomisation, blinding and follow-up. The maximum score was 5 and a score of 3 or more was taken to indicate high quality. Non-randomised studies were assessed by looking at the degree of control for confounding factors. Two reviewers assessed study quality. Any disagreements were discussed with a third reviewer and settled by consensus.

Data extraction
Two reviewers extracted the data using standardised extraction forms. Any disagreements were discussed with a third reviewer and settled by consensus. The proportion of people rehospitalised over the follow-up period was calculated for each study.

Methods of synthesis
How were the studies combined?
Where there was sufficient homogeneity, the studies were combined in a meta-analysis using the Mantel-Haenszel fixed-effect model. Where heterogeneity existed, but pooling was still possible, the DerSimonian and Laird random-effects model was used. The RCTs were analysed separately to the non-RCTs. A narrative synthesis and detailed evidence tables were also provided. Funnel plots were used to assess publication bias.

How were differences between studies investigated?
Heterogeneity was assessed using the chi-squared test. Pre-planned sensitivity analyses were carried out to assess the effects of differing types of care (home visits, out-patient visits, telephone follow-up), duration of follow-up (longer than 6 months), study quality and study size.

Results of the review
Fifty-four studies were included: 27 RCTs (6,772 participants) and 27 non-RCTs (11,148 participants). Non-RCTs were before-and-after studies and studies with matched controls.

RCTs.
Only 11 trials scored 3 or more for quality. On average, only 26% of the screened participants were included in the trials.

Readmission for heart failure or other cardiovascular cause was assessed in 11 trials. Disease management programmes decreased readmission: the pooled relative risk (RR) was 0.70 (95% confidence interval, CI: 0.62, 0.79).

All-cause readmission was assessed in 16 trials. Disease management reduced admission: the pooled RR was 0.88 (95% CI: 0.79, 0.97). There was statistical heterogeneity between studies (P=0.012). When one study was removed this heterogeneity was reduced (P=0.31), and the pooled RR was 0.85 (95% CI: 0.79, 0.92).

Readmission or death was assessed in 10 trials. Disease management reduced the risk: the pooled RR was 0.82 (95% CI: 0.72, 0.94). There was statistical heterogeneity between studies (P=0.001).

There was no substantial variation in these results when sensitivity analyses were performed for length of follow-up or home visits. For out-patient visits to a clinic, there was no statistical difference in outcomes between the disease management programmes and usual care. When only higher quality studies were pooled, the outcomes were similar to the main analyses and heterogeneity was lost.

Funnel plots suggested that there might have been some publication bias.

Non-RCTs.
Readmission for heart failure was assessed in 5 studies. Three studies reported a significant reduction in readmission, while two showed a trend towards a reduction. The pooled RR for all 5 studies was 0.38 (95% CI: 0.16, 0.93). There was statistical heterogeneity between studies (P<0.001).

All-cause readmission was assessed in 8 studies. Only 3 studies showed a significant reduction in readmission. The pooled RR was 0.50 (95% CI: 0.34, 0.74).

Readmission or death was assessed in 2 studies. Both studies suggested that programmes were beneficial. The pooled RR was 0.37 (95% CI: 0.24, 0.58).

**Cost information**

Twelve RCTs reported costs. Ten trials reported that disease management programmes reduced costs, while one trial reported that the costs were similar to usual care.

Twelve non-RCTs assessed costs. All concluded that there was a reduction with the programmes, although in 2 studies the costs increased in two patient subgroups.

**Authors' conclusions**

Disease management programmes were effective at reducing readmissions in elderly people with heart failure. None of the studies compared different programmes, therefore the relative effectiveness of different types of programmes is not known.

**CRD commentary**

This review evaluated a complex intervention, which the authors have defined broadly. The aims and inclusion criteria of the review were clear, and the database search was appropriate and inclusive. Appropriate methods were employed to minimise bias and error in the study selection, validity assessment and data extraction processes. Detailed evidence tables were provided. The decision to employ meta-analyses was appropriate, as was the use of a priori sensitivity analyses and the assessment of heterogeneity. This was a well-conducted review and the authors' conclusions are an appropriate reflection of the evidence.

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

Practice: The authors did not state any implications for practice.

Research: Trials should be carried out to compare differing types of disease management programmes. Studies should also assess what particular interventions would benefit particular patient subgroups.

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