Post-discharge home-based support for older cardiac patients: a randomised controlled trial

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Abstract

Background: hospital and exercise-based cardiac rehabilitation programmes do not suit many older patients and home-based rehabilitation may be more effective.

Objective: to evaluate a home-based intervention for patients aged 65 years or over discharged home from hospital after emergency admission for suspected myocardial infarction.

Design: a single-blind randomised controlled trial comparing home-based intervention by a nurse with usual care.

Subjects: patients aged 65 years or over discharged home after hospitalisation with suspected myocardial infarction (n = 324).

Intervention: home-based intervention (n = 163) consisted of home visits at 1–2 and 6–8 weeks after hospital discharge by a nurse who encouraged compliance with and knowledge of their treatment regimen, offered support and guidance about resuming daily activities, and involved other community services as appropriate.

Measurements: up to 100 days after admission, data were collected on deaths, hospital readmissions and use of outpatient services. Survivors were sent a postal questionnaire to assess activities of daily living and quality of life.

Results: at 100 day follow-up there was no difference in deaths, activities of daily living or overall quality of life, but those in the intervention group scored significantly better on the confidence and self-esteem subsections. The intervention group had fewer hospital readmissions (35 versus 51, relative risk 0.68, 95% CI 0.47–0.98, P<0.05) and fewer days of hospitalisation after initial discharge (mean difference −1.7, 95% CI −2.09 to −1.31, P<0.05). A total of 42/43 individuals in the intervention group had resumed driving at follow-up, compared with 32/43 in the usual care group (observed difference between proportions 23%, 95% CI 9–37%, P<0.05).

Conclusion: amongst older patients discharged home after hospitalisation for suspected myocardial infarction, home-based nurse intervention may improve confidence and self-esteem, and reduce early hospital readmissions.

Keywords: elderly people, myocardial infarction, ischaemic heart disease, cardiac rehabilitation
Background

Cardiac rehabilitation can promote recovery, enable patients to achieve and maintain better health, and reduce the risk of death in people with heart disease [1–3]. A combination of exercise, psychological and educational interventions appears to be most effective, with the primary aim being to facilitate physical, psychological and emotional recovery and enable patients to achieve an improvement in their health and functional status. Many of the problems experienced by people with heart disease are not due to physical illness, but to anxiety and misconceptions about their health. Effective intervention must therefore provide accurate, consistent and individualised support and information that can be understood by patients.

Cardiac rehabilitation forms one of the cornerstones of the National Service Framework (NSF) for coronary heart disease [4]. Outcome of those admitted to hospital with suspected myocardial infarction, but in whom the diagnosis is not confirmed, is at least as poor as in those with confirmed infarction and rehabilitation should be available to all [5]. However, provision has been variable, with older patients, women and those from ethnic minorities being under-represented [6]. This being despite more than half of the target population for cardiac rehabilitation being aged over 65 years and approximately one quarter aged over 75 years [7]. Not only are fewer older patients referred, they are less likely to attend when invited, and more likely to drop out [8]. This may be because of a perception that cardiac rehabilitation is less relevant or too late, or a feeling that elderly patients will be out of place in hospital-based programmes [9]. Certainly, particular problems may arise because of greater difficulties learning new patterns of behaviour, presence of co-morbid conditions, mobility and transport difficulties, overprotective attitudes of caregivers, and low expectations of patients, their families and professionals. Home-based cardiac rehabilitation may address some of these issues and has been proposed recently as the treatment of choice in low-risk older patients after myocardial infarction [10].

We report a randomised controlled trial designed to examine the short-term effect of a simple home-based intervention by a support nurse versus usual care among patients aged 65 years or over discharged home from hospital after emergency admission for suspected myocardial infarction.

Methods

Patient recruitment

The study was a prospective, randomised controlled trial conducted in three district general hospitals in the Birmingham area. Patients aged 65 years or over admitted to coronary care units, general or geriatric medical wards with a suspected myocardial infarction were eligible to participate if ward staff judged them likely to be discharged home soon. Exclusion criteria were a discharge address outside the hospital catchment area, discharge home before baseline assessments and randomisation could be completed, or failure to obtain written consent. The relevant local research ethics committees approved the study.

Patients were randomised to home-based intervention or control group in a sequential fashion using sealed envelopes with computer-generated random allocation codes. A sealed master copy of the code was held away from the study site and at the end of the study the allocation of patients was checked and no discrepancies were identified.

Patient management

Patients not allocated to the intervention group served as controls and received all the usual post-discharge care. This involved general advice from ward-based staff, outpatient clinic follow-up as necessary and access to the local cardiac rehabilitation programme offered as per usual practice. In addition to all usual post-discharge care, patients allocated to the home-based intervention group received at least two home visits after hospital discharge by a cardiac support nurse. These were 1–2 and 6–8 weeks after discharge. Extra visits and telephone contacts were permissible if the nurse identified a specific need and purpose.

The support nurse was trained in cardiac support. Her remit was broad but specifically she (i) encouraged patients to comply with and have knowledge of their treatment regimen; (ii) offered information, support and guidance about risk factor reduction; (iii) advised about appropriate exercise and stress management; (iv) gave advice on smoking cessation, alcohol intake and diet; (v) encouraged resumption of everyday activities and social interaction.

Verbal advice was backed up by written information presented in the form of an individualised booklet. This contained general information about safe levels of activity and a simple 6-week graded exercise programme, details of personal risk factors, useful telephone numbers and advice on when to seek medical advice and how to manage recurrent breathlessness and chest pain.

Baseline assessment

A baseline interview, supplemented by information from relatives and from medical notes, was used to collect demographic and background information. All patients also completed the Hospital Anxiety and Depression (HAD) Scale [11]. The interview was completed by research assistants, after informed consent from patients to participate in the study and immediately before randomisation. Baseline information on patients allocated to the intervention group was then made available to the cardiac support nurse along with contact information.

Follow-up assessment

Outcome was measured at 100 days, as this has been proposed as a suitable trial endpoint when assessing quality of life following myocardial infarction [12]. The research assistants first verified participants’ status and contacts with health services since hospital discharge by contact with the general practitioner and review of hospital records. They then posted a questionnaire to the patient that incorporated the Extended Activities of Daily Living (EADL) Scale [13] and also the Quality of Life after Myocardial Infarction...
Questionnaire [14]. A reminder and further mailing were sent to non-respondents after 2 weeks and, if necessary, patients were then contacted by telephone and encouraged to return the questionnaire or offered help with completion (by means of a home visit from the research assistant).

The clinical data collected at baseline and information about subsequent hospital contacts were later verified by an independent clinician (A.J.B.), who was blind to allocation. The diagnosis of myocardial infarction was based on standard criteria (at least two of: chest pain, new ECG changes and/or a two-fold rise in creatinine kinase levels) [15].

**Statistical analysis**

The primary outcome was quality of life (Quality of Life after Myocardial Infarction Questionnaire). Secondary outcomes were mortality, residence, hospital readmissions and outpatient attendances, functional ability (EADL) quality of life subscales and resumption of car driving. A power calculation suggested that 155 in each group would have 80% power to detect a clinically significant 12 point difference in means on the Quality of Life after Myocardial Infarction Questionnaire using a two-group t-test with a 0.05 two-sided significance level.

**Results**

During 16 months of patient recruitment, 449 patients were identified as potentially fulfilling the study criteria and 324 (72%) were randomised: 163 into the intervention group and 161 into the control group. Reasons for ineligibility and refusal, and subsequent management and outcome are shown in Figure 1.

![Figure 1](https://academic.oup.com/ageing/article-abstract/34/4/338/10656)

**Figure 1.** Numbers of patients identified as eligible for inclusion in study, reasons for not being randomised and subsequent drop-out.
The groups were adequately matched at baseline, with no significant differences in demographic or clinical characteristics (Table 1, available as Appendix 1 in the supplementary data on the journal website www.ageing.oupjournals.org). Nearly half of the patients were aged over 75 years. There were 200 patients with confirmed myocardial infarction and most of the others had a discharge diagnosis of angina, with a small number having non-cardiac chest pain, heart failure or cardiac dysrhythmias.

Although all three study hospitals had a specific cardiac rehabilitation programme which operated without any stated upper age limit, only 12 (6%) patients with confirmed myocardial infarction (and two patients with angina) were referred to the programmes (eight intervention and six usual care). Eight of these were known to have attended.

At 100 day follow-up, there were no significant effects of intervention upon mortality, home circumstances, functional ability or overall quality of life (Table 2 [available as Appendix 2 in the supplementary data on the journal website] and Table 3). However, those in the intervention group scored significantly better on the confidence and self-esteem subsections of the quality of life questionnaire. It was also found that, of the 43 (32%) respondents in the intervention group who were car drivers prior to hospital admission, 42 had resumed driving at follow-up, whereas in the usual care group there were also 43 (32%) previous drivers but only 32 of these had returned to driving (observed difference between proportions 23%, 95% CI 9–37%, \( P < 0.05 \)). Use of hospital services from discharge to 100 days is shown in Table 4. Patients allocated to the intervention group were significantly less likely to be readmitted to hospital. The mean number of hospital bed days saved per patient was 1.7 days (95% CI \(-2.09\) to \(-1.31\)). There was no significant impact of intervention upon the number of outpatient visits.

**Discussion**

This is the first UK study to evaluate home-based cardiac rehabilitation specifically aimed at an older population. It demonstrates a significant reduction in hospital readmission and an improvement in confidence and self-esteem. The results suggest that education and guidance can be effective in the absence of organised exercise, though the lack of an exercise component may have contributed to the failure to demonstrate significant changes in physical and other aspects of quality of life. Simple information and guidance after myocardial infarction has been shown previously to improve psychological, but not physical or social domains of quality of life [16], although patients older than 70 years were excluded.

It is likely that reassurance and encouragement accounts for the differences shown between groups on measures of confidence and self-esteem, and in the greater proportion of people resuming driving. Older drivers are increasing in number and unnecessary withdrawal from driving is likely to lead to increased dependency and greater risk of social isolation and worsening functional status. Certainly of those abilities that are associated with autonomy and independent living, capacity to meet transportation needs is of paramount importance.

The study also demonstrated a significant reduction in hospital readmissions, which is likely to be due to the educational component of the intervention, as well as the reassurance

<table>
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<tr>
<th>Table 3. Functional outcome and quality of life at 100 days</th>
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<tr>
<td><strong>Mean difference (95% CI)</strong></td>
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<tr>
<td><strong>Extended Activity of Daily Living Scale (EADL): mean (SD) scores</strong></td>
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<tr>
<td>Total (worst to best possible score = 23–189)</td>
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<tr>
<td>Sub-section scores Mobility (0–6) 0.2 (–0.22 to 0.62)</td>
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<td>Kitchen tasks (0–5) 0.1 (–0.34 to 0.14)</td>
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<tr>
<td>Domestic tasks (0–5) 0.4 (0.01 to 0.79)</td>
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<tr>
<td>Leisure activities (0–6) 0.1 (–0.21 to 0.41)</td>
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<tr>
<td><strong>Quality of Life Questionnaire: mean (SD) scores</strong></td>
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<tr>
<td>Total (worst to best possible score = 27–189)</td>
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<tr>
<td>Sub-section scores Physical symptoms (5–35) 0.9 (–0.47 to 2.27)</td>
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<tr>
<td>Life restriction (6–42) 0.7 (–1.52 to 2.92)</td>
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<tr>
<td>Confidence (4–28) 2.6 (1.37–3.83) ( P &lt; 0.05 )</td>
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<td>Self-esteem (6–42) 3.4 (1.01–5.79) ( P &lt; 0.05 )</td>
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<td>Emotional adjustment (6–42) 0.8 (0.61–2.21)</td>
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<th>Table 4. Use of hospital services from discharge to 100 days</th>
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<td><strong>Comparison</strong></td>
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<tr>
<td>Number (%) of patients readmitted to hospital from discharge to 100 days</td>
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<tr>
<td>Relative risk = 0.68 (95% CI 0.47–0.98), ( P &lt; 0.05 )</td>
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<tr>
<td>Mean (SD) days in hospital from discharge to 100 days</td>
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<tr>
<td>Mean difference = –1.7 (95% CI –2.09 to –1.31), ( P &lt; 0.05 )</td>
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<tr>
<td>Number (%) of patients attending hospital outpatient clinics from discharge to 100 days</td>
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<tr>
<td>Relative risk = 0.97 (95% CI 0.80–1.17)</td>
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provided by the study nurse. Reduced rates of readmission for coronary heart disease were found previously in a study of primary care-based rehabilitation during the first year after acute myocardial infarction in older patients compared with age-matched controls in a neighbouring district [17], though most trials of cardiac rehabilitation have shown little or no improvement in clinical outcomes [7].

The study was underpowered to detect any difference in function, an important outcome in the older population. Nor was it possible to ascertain any changes in compliance with secondary prevention measures. The main strength is showing that older people can participate in cardiac rehabilitation and benefit from so doing; a recent meta-analysis involving nearly 9,000 subjects showed that the mean age of participants in cardiac rehabilitation was 55 years (range 48–71) [3].

Early ambulation and progressive graded activity are now standard management following an acute coronary event and physical exercise is generally at the core of formal cardiac rehabilitation programmes. In older patients, exercise conditioning post-myocardial infarction has been shown to improve functional activity and minimise dependency [10]. Home-based light exercise programmes can be as effective as more intensive exercise training [18, 19] and a choice between home- and hospital-based programmes may be the best strategy [20]. This is now the subject of a large, pragmatic randomised controlled trial with no age restrictions to be conducted in the same geographical area as our study [21]. Strategies also need to be developed that improve referral and adherence rates of older patients to cardiac rehabilitation programmes.

In conclusion, we have shown that a relatively simple intervention can reduce hospital readmission for older patients after suspected myocardial infarction and subsequent length of stay for patients readmitted. Furthermore, improved confidence and self-esteem were associated with a greater number of patients returning to driving. This simple home-based intervention could be relatively easily incorporated into intermediate care packages.

References


Key points

- Home-based cardiac rehabilitation is feasible in older patients.
- Home-based cardiac rehabilitation can improve confidence and self-esteem, and reduce subsequent hospital readmissions.
- Cardiac rehabilitation for older people may result in greater resumption of driving and thus promote independence.

Acknowledgements

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Conflicts of interest

None to report.
Introduction
Ageing affects all components of the heart (muscular, interstitial and vascular) [1]. Characteristic changes include left ventricular (LV) hypertrophy, myocardial fibrosis and alterations in coronary vasculature [2]. Previous in vivo human studies, mostly performed with the use of echocardiography, reported increased ventricular wall thickness, higher myocardial mass and little changes in LV size in older people with generally preserved global systolic function [3–5].