

Title: Home-Based Cardiac Rehabilitation: A Review

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Abstract

Cardiac rehabilitation has positive effects on mortality, morbidity, quality of life and many cardiac risk factors. Cardiac rehabilitation is usually delivered within a hospital or 'centre' setting, however, home based programmes may offer greater accessibility and choice to patients. While there have been fewer studies of home based cardiac rehabilitation, the available data suggest that it is acceptable, safe and effective and has comparable results to hospital based programmes. Furthermore, home based cardiac rehabilitation results in longer lasting maintenance of physical activity levels in patients compared with hospital programmes. It has the potential to be more cost effective for patients who cannot easily access their local hospital or centre. Home based cardiac rehabilitation may be particularly useful in patients in a remote or rural setting. Despite the options available and the evidence based benefits, the uptake of cardiac rehabilitation remains low. It is the responsibility of all cardiac healthcare workers to ensure that the uptake of cardiac rehabilitation improves.

Abstract word count: 157

Keywords: Cardiac rehabilitation, remote, rural, home, community

Search strategy

A literature review of home based cardiac rehabilitation using the following search strategy. The following terms were used to search PubMed, EMBASE, CINAHL and the Cochrane controlled trials register (CCTR): myocardial infarction/ischaemia, angioplasty, coronary artery bypass graft, heart failure, cardiac rehabilitation, exercise rehabilitation, exercise therapy, psychotherapy, community rehabilitation. The identified search results were manually checked to identify relevant studies. Reference lists of appropriate studies were also hand searched to identify potential inclusion of further research. The articles included had to involve human participants, be available in English and be focused on post-discharge care.

Studies were included in the review if they met the following criteria:

- Cardiac rehabilitation in a home or community setting
- Date range (as MEDLINE) 1950 to 2009
- Patient had been discharged from hospital
- Patients following acute myocardial infarction (MI), percutaneous transluminal coronary angioplasty, coronary artery bypass graft (CABG), coronary heart disease (CHD), congestive heart failure (CHF).
- At least one of the following outcome measures had to be included:
 1. Physical activity levels
 2. Psychological status (anxiety, depression, quality of life, distress)
 3. Clinical outcomes (including, but not exclusively, cholesterol levels, blood pressure, oxygen consumption (VO₂), hospital readmissions, smoking status)

Introduction

Cardiac patients who participate in cardiac rehabilitation have significant reductions in mortality and morbidity, improvements in exercise tolerance, symptoms, blood lipid profiles, blood pressure and psychosocial well-being (Clark et al, 2005; Taylor et al, 2004; Jolliffe et al, 2001). Cardiac rehabilitation has traditionally been viewed as a hospital-based intervention but there are several recognised barriers to uptake (Daly et al, 2002) including distance and ease of access (Dollard et al, 2004) that may contribute to poor attendance.

Home-based programmes, for example the Heart Manual (Lewin et al, 1992) and the Angina Plan (Lewin et al, 2002), have been developed to provide a nurse-led, community based, self-help programme for patients. This approach may help overcome some of the barriers to patient attendance especially for patients who may not be able to repeatedly attend a hospital-based programme. Both the Heart Manual and Angina Plan have been shown to be effective strategies in providing a self help programme for patients unable to attend a hospital-based rehabilitation programme (MacLean et al, 2007; Lewin et al, 2002; Lewin et al, 1992). Education forms a key part of any rehabilitation programme (Table 1) and home-based rehabilitation gives a more flexible, menu-driven approach for patients. Home based cardiac rehabilitation may therefore offer an opportunity to improve delivery and uptake of cardiac rehabilitation.

Clinical guidelines exist to ensure good practice in programmes being run across the country. Such guidelines include Scottish Intercollegiate Guidelines Network (SIGN) number 57: Cardiac Rehabilitation (2002), National Service Framework; Coronary

Heart Disease; Chapter 7 Cardiac Rehabilitation (2000) and British Association of Cardiac Rehabilitation; Standards and Core Components for Cardiac Rehabilitation (2007). Rehabilitation begins immediately post cardiac 'event' and continues on to encourage long term maintenance of a healthier lifestyle (Table 2). Despite its prominence in national guidelines, the uptake of cardiac rehabilitation remains poor. Health care professionals and particularly cardiac nurses have a key role to play to ensure that this situation improves (Table 3).

Home based cardiac rehabilitation

The published studies of home based cardiac rehabilitation are very heterogeneous with a great range of interventions offered and variety of 'control' treatments. Notwithstanding these methodological difficulties certain conclusions can be drawn from the available trials (Arthur et al, 2002; Bethell and Mullee 1990; Bethell et al, 1999; Canyon and Meshgin 2008; Carlson et al, 2000; Dalal et al 2010; Dalal et al.2007; Frasure-Smith et al. 1997; Gary et al. 2004; Higgins et al. 2001; Jolly et al. 2007; Jolly et al. 1999; Kodis et al, 2001; Lacey et al, 2004; Lear et al, 2003; Marchionni et al, 2003; Oliveira et al, 2008; Robertson et al, 2002; Smith et al, 2004; Taylor et al, 1997; Young et al, 2003). Some of these trials directly compared home with hospital based patients (Dalal et al, 2010; Dalal et al, 2007; Higgins et al, 2001; Jolly et al, 2007; Jones et al, 2009; Kodis et al, 2001; Marchionni et al, 2003; Robertson et al, 2002; Smith et al, 2004) although there is little standardisation of cardiac rehabilitation programmes between studies making comparisons difficult.

Two leading studies in home versus hospital rehabilitation are the Birmingham Rehabilitation Uptake Maximisation (BRUM) study (Jolly et al, 2007) and the Cornwall

Heart Attack Rehabilitation Management Study (CHARMS) trial with preference arms (Dalal et al, 2007). Both these studies made use of the Heart Manual (Lewin et al, 1992), which can be used as a standalone intervention or can be integrated alongside hospital based rehabilitation. BRUM and CHARMS trials compared results from the stand alone Heart Manual with patients completing the more traditional hospital based classes. Both studies found no significant difference in outcomes between the two groups, including depression scores, cholesterol levels, blood pressure and incremental shuttle walk test (ISWT), (Jolly et al, 2007; Dalal et al, 2007). The CHARMS trial offered patients a preference in their rehabilitation choice, but this did not significantly alter outcomes measured (Dalal et al, 2007). This data supports the suggestion that patients undergoing home rehabilitation will not see inferior outcomes when comparing the above factors.

The recent Cochrane review (Dalal et al, 2010) has carried out full meta-analysis on the available research on home versus hospital studies. The review found no significant difference between home and hospital rehabilitation for the following outcomes; mortality, cardiac events, exercise capacity, modifiable risk factors, blood pressure, total cholesterol and health related quality of life. This supports findings from the BRUM and CHARMS studies and shows that patients receiving both home and hospital based rehabilitation benefit in many ways by completing their rehabilitation.

Benefits to cardiac patients

Cardiac rehabilitation reduces mortality (Miller et al, 1984), future cardiac events and hospital readmissions (Sinclair et al, 2005; Young et al, 2003). It also reduces serum cholesterol, probably by improved exercise and medication adherence (Dalal et al,

2007). This effect can be achieved by telephone follow up and home-based rehabilitation (Higgins et al, 2001; Lear et al, 2006), which appears as effective as hospital based rehabilitation programmes (Jolly et al, 2007; Dalal et al, 2007). Home based cardiac rehabilitation is also associated with a reduction in blood pressure (Jolly et al, 2007; Lear et al, 2006). Similarly smoking cessation is improved by cardiac rehabilitation with similar improvements in both home and hospital rehabilitation groups (Jolly et al, 2007). However, not all intervention studies have shown benefits in cardiovascular risk reduction. One general practice-based programme involving a specialist liaison nurse, who provided a structured follow up for patients in the community, showed no significant difference in the clinical parameters measured (Jolly et al, 1999). This would suggest there may be little benefit in providing 'general practice only' based follow up care and that a more focused or intense programme is required.

In patients with chronic stable angina, community-based cardiac rehabilitation reduces the frequency of angina and shortness of breath (Bethell and Mullee 1990). These improvements are similar to those seen in patients attending hospital based cardiac rehabilitation (Jolly et al, 2007). Bethell & Mullee (1990) considered the long term (11 years) benefits of community based rehabilitation and noted that over this time period that the positive effect of rehabilitation remained, although differences were small. These community based studies signalled the beginning of introducing alternatives to hospital based rehabilitation and the results were promising. Care should be taken when assessing patient reported "angina burden" in isolation as patients who undergo

successful cardiac rehabilitation may paradoxically report increased number of anginal episodes depending on their level of activity.

Cardiac rehabilitation also increases quality of life (Dalal et al, 2007; Jolly et al, 2007; Marchionni et al, 2005) and reduces anxiety and depression (Dalal et al, 2007; Jolly et al, 2007; Lacey et al, 2004). However, not all psychological interventions have been shown to have a positive effect (Frasure-Smith et al, 1997) and patients with significant psychological morbidity should be considered for referral to a clinical psychologist although timely access to these services within the NHS can be problematic.

Home-based rehabilitation appears to be as effective in terms of outcomes, but there are negative aspects involved in patients who do not attend group exercise. These include lack of social support available from fellow cardiac patients, minimal direct contact with a healthcare professional once discharged (unless home visits are offered alongside), lack of supervision of exercise with the risk of poor technique occurring at home and a lack of patient motivation if exercising alone.

Physical activity and exercise

The risk of developing coronary heart disease (CHD) is 20-50% lower in individuals who participate in a moderate amount of physical activity on a regular basis (ACSM 2006). Exercise is therefore a key component of phase III cardiac rehabilitation (Table 2; Table 4) and should, where possible, be delivered by trained professionals. Home cardiac rehabilitation interventions are associated with improvements in physical activity levels and functional ability (Oliveira et al, 2008; Arthur et al, 2002; Higgins et al, 2001). When comparing home rehabilitation with comprehensive hospital based care

there appears to be little or no difference in physical activity outcomes between the two (Jolly et al, 2007; Smith et al, 2004; Arthur et al, 2002; Kodis et al, 2001; Carlsson et al, 2000), suggesting that both approaches are effective. However, there is some evidence that home rehabilitation exercise may have longer lasting effects than hospital rehabilitation in terms of activity levels (Marchionni et al, 2003). It has been suggested by patients that home rehabilitation is seen as “more of a lifestyle change...rather than treatment” (Jones et al, 2009). Patients feel the onus of control themselves during home rehabilitation, whereas in hospital, others are “in control” (Jones et al, 2009).

While heterogeneity exists within rehabilitation programs, it is estimated that the average cost per patient is less than £200, with home based cardiac rehabilitation being slightly less expensive (Taylor et al, 2007; Jolly et al, 2007).

The role of the cardiac nurse in delivering cardiac rehabilitation

The delivery of successful cardiac rehabilitation requires integrated care from a range of healthcare professionals, but the role of the cardiac nurse is crucial in this pathway. Health care workers who have contact with cardiac patients have a responsibility to facilitate best care and refer to other available services, this includes cardiac rehabilitation. Patients who might benefit from rehabilitation should be identified and assessed early in the acute care setting where the first phase of rehabilitation can begin (Table 2) e.g. by individually assessing and introducing the patient to the Heart Manual or Angina Plan. The cardiac nurse has a responsibility to ensure that the cardiac rehabilitation pathway begins and that formal referrals are made so that continuity and follow up are maintained. There appears to be progress in this area. Between 08-09,

29% of networks have increased uptake of home options available (Flint et al, 2010), an indication of positive change in this area. Competency in the knowledge of the benefits and different components of the cardiac rehabilitation process are necessary to provide vital support for the patient and their families.

Discussion

While there are limited data regarding “home versus hospital” cardiac rehabilitation, both appear to be effective at improving clinical outcomes, cardiovascular risk factors and fitness (Dalal et al, 2010). Home rehabilitation may prove more successful in maintenance of physical fitness in cardiac patients (Marchionni et al, 2003). Measurements of the prevalence of angina should be interpreted with caution. While frequency of angina in cardiac patients may be a major factor in their quality of life, angina may increase following successful cardiac rehabilitation because patients are exercising more, or being more socially active. Hospital re-admission is an important outcome in terms of cost effectiveness and has arguably greater implications for those living in remote and rural areas. Re-hospitalisation rates following initial recovery from MI range from 5-41%. (Sinclair et al, 2005; Robertson et al, 2003). Both forms of rehabilitation are shown to reduce re-hospitalisation rates and make in-patient stays shorter.

There is a well established relationship between anxiety and depression and patients with coronary heart disease (Nemeroff et al, 1998). This can affect heart rhythm, blood pressure and can elevate insulin and cholesterol levels with highly anxious patients at 3-6 times greater risk of MI and sudden death (Serber et al, 2009). In the two main home-

based rehabilitation programmes under review, psychological components are central to the successful rehabilitation of patients (Lewin et al, 2002; Lewin et al, 1992).

When home-rehabilitation, in its' many forms, has been directly compared to hospital based programmes, there appears to be a consensus that there is no significant difference in outcomes for patients between these two approaches (Dalal et al, 2010). Evidence even suggests that patients receiving home rehabilitation may maintain greater levels of physical activity than those completing hospital-based programmes (Smith et al, 2005; Marchionni et al, 2003). The review of the data suggests that home programmes can, and should, be offered alongside hospital intervention, instead of as a secondary option. This would support an approach based on patient preference and indeed may help increase the uptake of cardiac rehabilitation which remains dismally poor, especially in those who see distance or lack of time as a major barrier to attendance.

Limitations of existing research

It should be noted that as there is great heterogeneity between study populations drawing firm conclusions is difficult. For example, the variation in mortality between studies is likely to reflect the lack of standardisation of entry criteria to cardiac rehabilitation programmes even within clinical trials. Often, the entry criteria to clinical trials are limiting and therefore not applicable to the varied cardiac patient population who would benefit from rehabilitation. The risk of further cardiac events and death are clearly related to patient characteristics but also temporal distance from the index event, thus, if there is a delay in recruitment of patients into cardiac rehabilitation then death

rates within the programme will tend to be lower as a proportion of higher risk patients may have died before commencing cardiac rehabilitation. Thus, the lack of standardisation of rehabilitation programmes makes direct comparisons between studies difficult. This might explain the variety in outcomes seen when comparing home rehabilitation with usual care and the lack of impact in some studies (Jolly et al, 1999; Frasure-Smith et al, 1997). Another problem with these data was the lack of detail regarding “usual” or “standard” care. The majority of studies provided little information on what care these patient groups received. Lack of detail about study design makes it difficult to evaluate the true effect of interventions.

Further research

There is lack of research covering longer term follow up of patients completing rehabilitation, this information would provide vital knowledge on outcomes such as mortality and physical activity maintenance for those receiving home-based rehabilitation. Alternative methods of delivery of cardiac rehabilitation such as “tele-rehab or interactive internet-based programmes have the potential to improve uptake. These approaches are potentially accessible to many and could offer further choice and flexibility currently not widely available. This is particularly relevant for patients in remote and rural areas, but this option should be made available to all suitable for rehabilitation.

Conclusion

Patient groups who are most likely to benefit from the provision of home rehabilitation services vary, and those living in remote and rural locations who are unable to attend

formal supervised classes may be one of those groups. In geographical regions where a considerable proportion of patients live in remote communities, and where the current provision and accessibility of cardiac rehabilitation is inadequate, home-based intervention appears a safe, viable and effective option. Rehabilitation in the form of self-help manuals which offer advice on risk factor reduction (e.g. smoking cessation and diet advice) and increasing physical activity levels (e.g. Heart Manual/Angina Plan) are inexpensive and potentially accessible to all. These interventions are not new to cardiac rehabilitation; the Heart Manual has been available for over 15 years now. The evidence shows that this is an effective method of rehabilitation, yet few NHS trusts offer this type of intervention to their patients as a standard adjunct, or as an alternative to hospital based care. For remote and rural residents, a self-help package may offer a convenient means of delivering the information that would be missed by not being able to attend a hospital-based programme. This form of delivery could help to minimise the cost incurred by the patient and offer the added benefit that family and friends could be more involved in providing support and encouragement. There is a need to offer genuine choice of rehabilitation for patients to improve uptake, and by providing the option of home or hospital based, patients can choose the route they feel would be most suited to them. This should be an option for all patients who are appropriate for cardiac rehabilitation referral.

The successful implementation of all phases of cardiac rehabilitation relies on the clinical team and it is the responsibility of all staff that have contact with cardiac patients to be competent in their knowledge of the benefits of rehabilitation. Staff must also be able to identify and be aware of the appropriate referral pathways for their

clinical surroundings and ensure that suitable patients are offered cardiac rehabilitation and are encouraged to participate.

Key bullet points

- There is a lack of clear guidelines on what constitutes home-based cardiac rehabilitation
- Most published studies are small and have poorly defined control groups
- There is no consistent difference in outcomes between home versus hospital-based cardiac rehabilitation
- Home cardiac rehabilitation appears safe and effective at improving cardiac risk factors
- Home cardiac rehabilitation may have longer lasting effects in terms of physical activity maintenance
- Home cardiac rehabilitation may be more acceptable and convenient to rural patients
- Home cardiac rehabilitation may be more cost effective for health care providers

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Education

- *Address health benefits/ cardiac misconceptions* – “Staff should identify and address cardiac misconceptions in patients with CHD” (SIGN 2002).
- *Smoking cessation* – Help and advice from a trained advisor on approaches to stop smoking.
- *Nutrition advice* – In all cases, not just those who would benefit from weight loss.
- *Sexual activity* – BHF have produced a factfile on sexual activity following myocardial infarction.
- *Psychological wellbeing* – Concentrate on signs and symptoms of anxiety and depression.
- *Pathophysiology and symptoms* – Educate patient on heart disease.
- *Risk factor modification* – including blood pressure, glucose, lipids.
- *Occupational factors* – returning to work.
- *Drug and surgical intervention* – educating on drug therapy and potential surgical intervention commonly associated with heart disease.
- *Cardiopulmonary Resuscitation* – Teaching patients and families basic life support skills.

Table 1 – Educational components of comprehensive cardiac rehabilitation

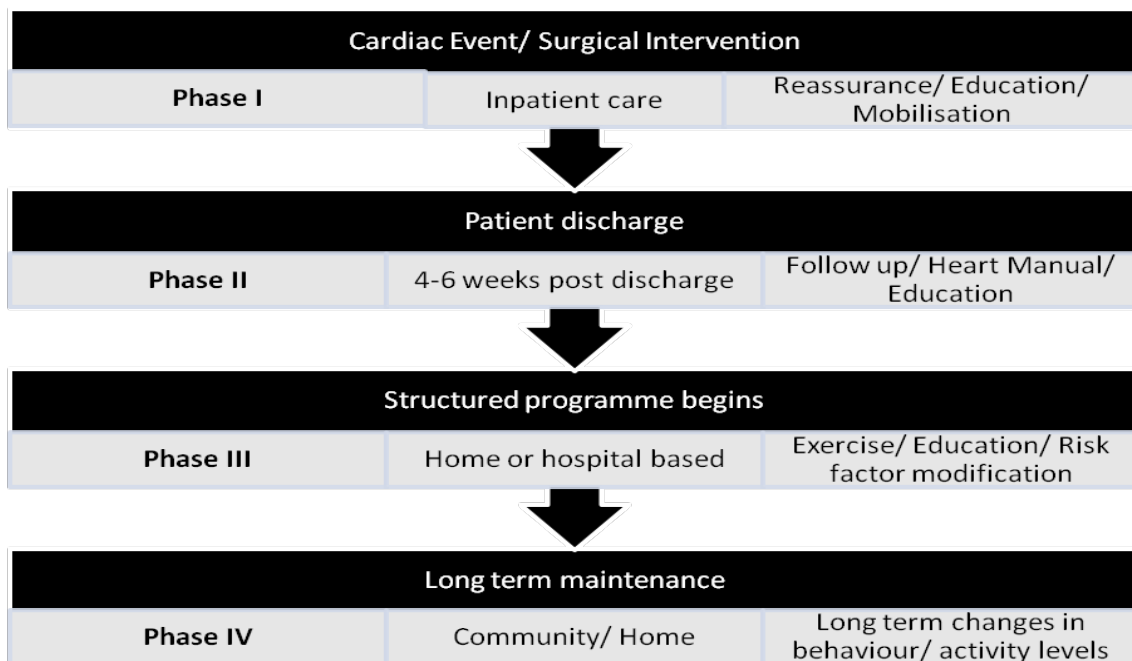


Table 2 – Four phases of cardiac rehabilitation

Responsibilities of the cardiac nurse

- ✓ Identify suitable patients for rehabilitation (e.g. Post MI, CABG, PCI, Heart Failure, Angina)
- ✓ Consider under represented groups (e.g. elderly, women, ethnic minorities)
- ✓ Ensure patients are aware of the potential benefits of ALL phases of cardiac rehabilitation
- ✓ Ensure formal referrals to phase III occur (Home and/or hospital rehabilitation)

Table 3 ¹ Responsibilities of the cardiac nurse.

Physical Activity

- *Benefits* – mortality and psychological outcomes
- *Assessment* – Risk assessment is vital before commencing activity. Exercise tests may be necessary for higher risk patients.
- *Exercise content and intensity* – individually prescribed by trained professional
- *Location* – Low to moderate intensity can be safely undertaken at home or hospital setting
- *Monitoring* – perceived exertion scale can be taught or using pulse monitor in certain cases.

Table 4 – Prescribing physical activity.

¹ MI – Myocardial Infarction
CABG – Coronary Artery Bypass Graft
PCI – Percutaneous coronary intervention