Cardiac rehabilitation programme for coronary heart disease patients: An integrative literature review

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Previous Western cardiac rehabilitation (CR) purported to improve patients’ quality of life and health-related parameters for cardiovascular diseases (CVD). Nursing’s role in CR was minimally identified. The purpose of this integrative literature review was to determine the effectiveness of current CR programmes and to determine if nurses are included in multidisciplinary CR teams. An online search of databases for the National Institutes of Health Library, Medline, CINAHL, Blackwell Synergy and PsychINFO electronic databases, with keywords—cardiac rehabilitation, lifestyle modification, secondary prevention, quality of life, effects of rehabilitation—identified 13 articles published 2001–2006 for inclusion. Cardiac rehabilitation programmes provided significant improvement in participants’ quality of life, exercise capacity, lipid profile, body mass index, body weight, blood pressure, resting heart rate, survival rate, mortality rate and decreased myocardial infarction (MI) risk factors, although there was limited participation. They also decreased depression and anxiety. Eight studies included Nurses as CR providers, but without clear descriptions of their role. Nurses in developing countries need to participate in CR programmes to improve patients’ participation, and to focus on modalities with lower overhead costs, such as home-based CR, and to clearly articulate their unique contributions.

Key words: cardiac rehabilitation, effects of rehabilitation, lifestyle modification, quality of life, secondary prevention.

INTRODUCTION
Cardiovascular diseases (CVD) continue to be the number one killer, worldwide. They are responsible for 30% of all deaths, with an estimated 17.5 million deaths each year.1 Fortunately, as medical technology and surgical techniques have improved, patients’ survival rates have also improved. For instance, the American Heart Association (AHA) reported a 22% decrease in mortality in the decade previous to 2003.2

In addition to improved technological advances to save lives, health-care professionals have also designed specific
programmes that help CVD survivors to overcome the negative consequences of their cardiac event, to return to their normal lives and to prevent other cardiac events in the future. One of these major programmes is cardiac rehabilitation (CR). The goals of CR are to decrease disability, recurrent coronary events, recurrent hospitalization and death.3

Cardiac rehabilitation began to appear in health-related journals in the 1940s. However, it was not until 1953 that health-care providers began a concerted effort to seriously study CR as an effect intervention for CVD patients. A panel of experts met to discuss ways to decrease disability and loss of work for cardiac patients. They reviewed current treatments and made recommendations for other treatments and studies to test them.4 The original World Health Organization definition for CR was, ‘the total activities needed to ensure the best physical, mental and social conditions to enable patients to return to their place in the community in order to conduct active and productive lives’.5 Since that time, CR programmes have included many strategies, such as lifestyle modification, physical exercise, education and counseling.6

In 1995, the Agency for Health Care Policy and Research, coupled with the National Heart, Lung and Blood Institute (AHCPR) published guidelines for CR in the USA.7 In 2000, Europe’s Department of Health’s National Service Framework in Europe also set standards for CR.8 Other Western health-care organizations—American College of Cardiology, American Heart Association, European Heart Association—have strongly suggested guidelines for CR, which are updated, periodically.9 However, there has not been a standardized evaluation protocol to measure the effectiveness of the results. Unfortunately, there are no published CR recommendations or studies from developing countries. These countries have increasing needs for CR, as they become more advanced in cardiac technologies and surgeries.1

As CR programme developers in developing countries evaluate guidelines and research from more developed countries, with which to develop their own guidelines, they expect to find standardized application of guidelines. However, there seems to be no previous standardized application of the rehabilitation process, nor specific timelines for participation: articles published in the early 2000s, which evaluated CR through the new millennium, continued to show disparities in the use and effectiveness of CR programmes;10 as early as 1992, researchers were recommending multidisciplinary teams to improve CR outcomes,11 though only a few studies identified the contribution of nurses.12,13 Many populations, especially older people and women, were underserved in CR.14,15 Even after years of research and recommendations, there were still CR programmes that contained only physical exercise components.16,17

Though physicians traditionally comprise the discipline that refers patients to CR programmes, in the US, Nurse Practitioners also refer patients. The AHCPR guidelines stress the utilization of multidisciplinary teams, which include nurses.7 As nursing is a rapidly growing profession in developing countries, nursing leaders would be excellent health-care providers to develop, or work in collaboration with physicians to develop CR programmes in these countries.

In light of the disparities observed in Western CR through the years, the purpose of this integrated literature review was to evaluate research in CR during the last 5 years: (i) What is nursing’s role in CR? (ii) Who is participating in CR? (iii) What types of interventions are being used? (iv) How long are current CR programmes? (v) What physical and psychological changes are CR patients experiencing?

**METHODS**

Literature published between 2001 and 2006 was searched through multiple electronic databases; the National Institutes of Health Library, Medline, CINAHL, Blackwell Synergy and PsychINFO. The search for literature was restricted to those published in the new millennium, reflecting the underlying assumption that newer findings would reflect improved techniques in providing CR and be more applicable in light of the dramatic advancement in CR efforts. The search was conducted using keywords presented in the articles’ title; those keywords were: cardiac rehabilitation, lifestyle modification, secondary prevention, quality of life and effects of rehabilitation. Papers were included for review if they possessed the following inclusion criteria: they had to be available as full text articles written in English, published between 2001 and 2006 in peer reviewed journals, that addressed post hospital discharge CR; CR was considered the independent variable; study participants had a diagnosis of CVD and/or had a cardiac-related procedure; the study identified the effects of rehabilitation enrolment; and the length

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of the intervention was identified. On the other hand, papers were excluded if they only reported patients’ attendance at rehabilitation programmes, patients’ or health workers’ perception about CR programmes or lifestyle modification plans and studies that dealt with rehabilitation programmes as dependent variables. Of the 170 articles available in that time period, 13 articles met the inclusion criteria, and were included in the current integrative review.

RESULTS
Thirteen studies were evaluated to determine whether nurses were helping with CR, the ages and gender of participants, what proportion were male and female, the length of current CR programmes, what types of interventions were used, and what physical and psychological effects did CR patients experience.

Nurses provided intervention in eight of the 13 studies. In fact, three of the studies were nursing studies. However, specific nursing roles were not addressed. Sample sizes varied from 18 to 1812, with mean ages of 55–82 years. Male participation ranged from 49% to 87%, whereas female participation ranged from 13% to 100%. Study lengths varied from 2 weeks to 3 years. Six studies incorporated both lifestyle modification and exercise, three studies used exercise alone, and two studies used lifestyle modification alone as an independent variable (Please see Table 1). Quality of life, exercise capacity, lipid profile, body mass index/weight, blood pressure and anxiety/depression were outcome, or dependent variables in the studies (Please see Table 2).

Some studies reported low attendance rates (24% and 25%, respectively). In contrast, one study reported 100% completion and two other studies, one of which had an all female sample, reported high attendance rates (91% and 97%). Results also revealed variation between male and female participation in rehabilitation programmes. In five of the thirteen studies, women’s participation was >30% of the total sample number (please see Table 1). However, none of the authors reported referral rates for males and females, which might show less referral for females, as has been documented elsewhere. The majority of the studies addressed CR in institutional settings. However, two utilized home-based care with similar results; both types showed improved quality of life and increased exercise tolerance.

Modalities (interventions) of CR programmes
Lifestyle modification provided education about adoption of healthier lifestyles, which decrease the risk of additional cardiac events. Lifestyle modification programmes were based on low-fat diets, moderate exercise, stress management techniques and group support. The educational component of these studies included information about cardiac risk factors, appropriate medication use, smoking cessation and weight loss.

Physical exercise was used as the only intervention by three of the studies. One of these studies focused on strength exercise, whereas the other two provided differing exercises for two groups; their first groups were given aerobic training and their second groups were given combined aerobic and strength training exercises. Nevertheless, all three found significant improvement in exercise capacity.

Physiological consequences of CR programmes
Physiological improvement was measured through improved exercise capacity, improved lipid profiles, weight loss/lower body mass index, decreased blood pressure and decreased anxiety or depression (Please see Table 2). All except two studies found significant improvement in patients’ exercise capacity and exercise tolerance.

Witt et al.’s findings revealed an improvement in the participants’ 3 years survival rate, a decreased mortality rate and decreased MI risk factors. Similarly, Warrington et al. discovered patients needed additional knowledge of cardiac risks, signs and symptoms. Such knowledge might prevent the delay of seeking medical attention when needed, which would be reflected in better outcomes in the future.

Psychological consequences of CR programmes
The authors of eight of the studies used the Short Form-36 to measure patients’ quality of life. They reported significant differences in the quality of life between their rehabilitation groups and the control groups (Please see Table 2). Two studies found less depression in CR completers than in control groups, although a different scale was used in each; Yoshida reported a significant improvement in anxiety status within the rehabilitation group.

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### Table 1: Demographic data, length of programme, design and rehabilitation modalities

<table>
<thead>
<tr>
<th>Author(s) (year)</th>
<th>Sample size</th>
<th>Mean Age</th>
<th>Gender</th>
<th>Length of programme</th>
<th>Modality used</th>
<th>Type of LM</th>
<th>Intervention providers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chan <em>et al.</em> (2005)</td>
<td>18</td>
<td>63</td>
<td>70%</td>
<td>30%</td>
<td>7 weeks</td>
<td>†</td>
<td>Diet, exercise, stress manage, meds</td>
</tr>
<tr>
<td>Hung <em>et al.</em> (2004)</td>
<td>18</td>
<td>70</td>
<td>—</td>
<td>100%</td>
<td>8 weeks</td>
<td>†</td>
<td>Diet, exercise, stress manage, social support</td>
</tr>
<tr>
<td>Koertge <em>et al.</em> (2003)</td>
<td>440</td>
<td>58</td>
<td>79%</td>
<td>21%</td>
<td>12 weeks</td>
<td>†</td>
<td>Diet, exercise, stress manage, social support</td>
</tr>
<tr>
<td>Lear <em>et al.</em> (2002)</td>
<td>302</td>
<td>64</td>
<td>82%</td>
<td>18%</td>
<td>3 mo</td>
<td>†</td>
<td>Diet, exercise, risks factors, meds</td>
</tr>
<tr>
<td>Pasquali <em>et al.</em> (2003)</td>
<td>862</td>
<td>67</td>
<td>63%</td>
<td>37%</td>
<td>4 weeks</td>
<td>†</td>
<td>Exercise, risk factors, counselling</td>
</tr>
<tr>
<td>Sanderson <em>et al.</em> (2005)</td>
<td>228</td>
<td>62</td>
<td>—</td>
<td>100%</td>
<td>12 weeks</td>
<td>†</td>
<td>Exercise, risk factors, counselling</td>
</tr>
<tr>
<td>Simchen <em>et al.</em> (2001)</td>
<td>372</td>
<td>55</td>
<td>‡</td>
<td>‡</td>
<td>‡</td>
<td>‡</td>
<td>Diet, exercise, wt loss, stress manage</td>
</tr>
<tr>
<td>Song <em>et al.</em> (2001)</td>
<td>114</td>
<td>64</td>
<td>65%</td>
<td>35%</td>
<td>12 weeks</td>
<td>†</td>
<td>Diet, CV Risks, smoking</td>
</tr>
<tr>
<td>Verges <em>et al.</em> (2004)</td>
<td>95</td>
<td>57</td>
<td>87%</td>
<td>13%</td>
<td>8 weeks</td>
<td>†</td>
<td>Diet, CV Risks, smoking</td>
</tr>
<tr>
<td>Warrington <em>et al.</em> (2003)</td>
<td>53</td>
<td>82</td>
<td>72%</td>
<td>28%</td>
<td>14 weeks</td>
<td>†</td>
<td>Diet, counselling</td>
</tr>
<tr>
<td>Witt <em>et al.</em> (2004)</td>
<td>40</td>
<td>&gt;65</td>
<td>49%</td>
<td>51%</td>
<td>9 weeks</td>
<td>†</td>
<td>Diet, exercise, risk factors, meds</td>
</tr>
<tr>
<td>Yoshida <em>et al.</em> (2001)</td>
<td>85</td>
<td>57</td>
<td>87%</td>
<td>13%</td>
<td>2 weeks</td>
<td>†</td>
<td>Diet, exercise, stress manage, smoking cessation</td>
</tr>
</tbody>
</table>

† yes. ‡ not mentioned. § participated. CV, cardiovascular; EX, exercise; LM, lifestyle modification; LM & EX, lifestyle modification & exercise.
Table 2 Dependent variables and significant results ($p = 0.05$)

<table>
<thead>
<tr>
<th>Author(s) (year)</th>
<th>Participation</th>
<th>QOL</th>
<th>Exercise tolerance/capacity</th>
<th>Improved lipid panel</th>
<th>Weight/BMI</th>
<th>BP</th>
<th>Smoke cessation</th>
<th>Anxiety/depression</th>
<th>Follow-up period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chan et al. (2005)</td>
<td>25%</td>
<td>↑</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6 months</td>
</tr>
<tr>
<td>Hung et al. (2004)</td>
<td>97%</td>
<td>↑</td>
<td>↑</td>
<td>↑</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ND</td>
</tr>
<tr>
<td>Koertge et al. (2003)</td>
<td>91%</td>
<td>↑</td>
<td>↑</td>
<td>↑</td>
<td>↓↓</td>
<td>↓↓</td>
<td></td>
<td></td>
<td>3 months/12 months</td>
</tr>
<tr>
<td>Lear et al. (2002)</td>
<td>—</td>
<td>↑</td>
<td>↑</td>
<td>↑</td>
<td>↓↓</td>
<td>↓↓</td>
<td></td>
<td></td>
<td>3, 6 months × 3 years</td>
</tr>
<tr>
<td>Pasquali et al. (2003)</td>
<td>24%</td>
<td>↑</td>
<td>↑</td>
<td>↑</td>
<td>NS</td>
<td>↓</td>
<td></td>
<td></td>
<td>6 months</td>
</tr>
<tr>
<td>Sanderson et al. (2005)</td>
<td>—</td>
<td>↑</td>
<td>↑</td>
<td>↑</td>
<td>↑</td>
<td>↓</td>
<td></td>
<td></td>
<td>ND</td>
</tr>
<tr>
<td>Simchen et al. (2001)</td>
<td>58%</td>
<td>↑</td>
<td>↑</td>
<td>↑</td>
<td>↓↓</td>
<td>↓↓</td>
<td></td>
<td></td>
<td>ND</td>
</tr>
<tr>
<td>Song et al. (2001)</td>
<td>88%</td>
<td>↑</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ND</td>
</tr>
<tr>
<td>Vorder Muhll et al. (2002)</td>
<td>80%</td>
<td>↑</td>
<td>↑</td>
<td>↑</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ND</td>
</tr>
<tr>
<td>Warrington et al. (2003)</td>
<td>51%</td>
<td>↑</td>
<td>↑</td>
<td>↑</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ND</td>
</tr>
<tr>
<td>Witt et al. (2004)</td>
<td>55%</td>
<td>↑</td>
<td>↑</td>
<td>↑</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 years</td>
</tr>
<tr>
<td>Yoshida et al. (2001)</td>
<td>—</td>
<td>↑</td>
<td>↑</td>
<td>↑</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1, 6, 12 months</td>
</tr>
</tbody>
</table>

† yes. ↑, increased; ↓, decreased. BMI, body mass index; NS, not significant; QOL, quality of life.
Koertge et al. reported significant improvement in stress management behaviour in both genders, post CR. Similarly, Simchen et al. reported significant improvement in self-perception of overall health status among the rehabilitation group. In summary, although none of the studies examined every aspect of CR, there are clear signs as to the effectiveness of these programmes to decrease disability and future risks and to improve the quality of life for CVD patients.

DISCUSSION

The results of these studies indicated that patients with CVD will have great advantages from enrolment in a CR programme, even though all the studies did not include all the same elements. Unfortunately, some of the studies’ results supported earlier claims of low CR programme participation, especially among women. Surprisingly, several studies specifically evaluated women’s and elderly patients’ participation in CR, with favourable results. This data support the notion that health-care providers are now recognizing the need to refer women and the elderly to CR programmes. It also shows that CR is effective in improving both physiological and psychological factors for all CVD patients.

Contrary to previous concerns about nursing’s role in CR, the current study discovered eight out of the 13 studies utilized nurses, including three studies that were performed by nurses. Nurses are in an excellent position to encourage and enhance enrolment and participation in CR. Dedicated follow-up by nurses can encourage patients’ continuation in CR, especially in home-based CR. In fact, in three studies not examined here, there were significant differences in participation, simply because of telephone calls from nurses. Nurses need to be more assertive in having their expertise in CR acknowledged; even the studies that were conducted by nurses did not specify the unique role of nurses.

This study did not address the costs for CR: however, other researchers have found home-based CR patients maintained better improvement for older patients than did hospital-based CR, at substantially lower financial costs. As others have determined older patients are more compliant with home-based CR at 6 months follow-up, home-based CR seems to be an acceptable logical way to provide support for these groups of patients. Indeed, other home-based studies revealed good participation and completion rates. The causes of patients’ commitment to home-based programmes might be because such programmes avoid many barriers that could hamper participation or even completion of traditional rehabilitation programmes, such as transportation challenges, financial challenges, or special needs of patients which might make it difficult to attend traditional rehabilitation centres.

Such programmes would also serve developing countries well, where there are very limited resources for traditional CR. They would also allow for cultural differences in societies where it is not accepted for men and women to exercise together. Furthermore, Nurses have traditionally served as case managers, which would be helpful in home-based CR.

Results also revealed variation between males and females in their attendance in the rehabilitation programmes. If women and men are attending the same classes, women might choose to drop-out, rather than be seen as less effective than men. This might have been borne out in the study that consisted entirely of women, where there was a 97% attendance rate, and showed both increased exercise capacity and quality of life. Clearly, appropriate referrals and methods of motivation for women can improve their participation. The overall improvement in patients’ quality of life is a good indicator that the participants improved psychologically as well as physically.

Since this study began, three important papers have been published: a method to clearly measure and identify the delivery of CR services. The AHA and American Association of Cardiovascular and Pulmonary Rehabilitation’s Scientific Statement supports that method. They also restated the importance of the role of CR, with the goals of decreasing disability, decreasing risk factors for future events and improving the quality of life, post cardiac event. Wenger, co-author of the initial AHCPR Guidelines, clearly discussed each of those goals in her ‘Current Status of Cardiac Rehabilitation’ report for the American College of Cardiology. We have developed a table that shows these goals, with their necessary elements (please see Table 3). Using the recommendations of these three papers will provide a more effective way to provide CR and to measure its effectiveness. Even though the studies evaluated in this review all showed improvements in CVD’s status, for maximum effect, future programmes should incorporate these new guidelines and utilize a standardized measure of effectiveness.
**Table 3** Cardiac rehabilitation components and recommendations

<table>
<thead>
<tr>
<th>Component</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Assessment</td>
<td>12 lead ECG, perceived health status, HRQOL, current medications and needs. Yearly influenza vaccination.</td>
</tr>
<tr>
<td>Tobacco</td>
<td>Smoking cessation, if ready, relapse prevention skills, decrease exposure to second-hand smoke. Provide social support.</td>
</tr>
<tr>
<td>Nutrition</td>
<td>Assess caloric intake. Address fats, sodium, nutrients and eating habits. Individualized culturally appropriate dietary modifications.</td>
</tr>
<tr>
<td>Weight</td>
<td>Ht, wt, waist circumference, body mass index 18.5–24.9 kg/m², diet, physical activity/exercise, behavioural modification. Increased exercise time for wt loss.</td>
</tr>
<tr>
<td>Physical activity</td>
<td>Assess readiness/barriers. Minimum of 30 min, increase to 60 min per day. Initial low impact with gradual increase in duration and intensity.</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td>Check for orthostatic hypotension. 140/90 mmHg, improve to 120/80 mmHg.</td>
</tr>
<tr>
<td>Exercise training</td>
<td>For stable patients, aerobic and resistance training. For all patients training specific to patient needs.</td>
</tr>
<tr>
<td>Lipid management</td>
<td>Measure total cholesterol, HDL-C, LDL-C, triglycerides. Lipid lowering medications as needed. Goal: &lt;100 mg/dL. LDL-C &lt;130 mg/dL, if triglycerides are &gt;200 mg/dL. HDL-C at &lt;130 mg/dL.</td>
</tr>
<tr>
<td>Medications</td>
<td>Adherence to prescribed medications. Education and counselling about role of medications and adherence needs.</td>
</tr>
<tr>
<td>Diabetes</td>
<td>Assess all CVD patients for DM. Goal HgA₁c &lt;7%. Self monitoring of blood glucose levels, medications. Data collection Record of accomplishments, changes in intervention needs over time.</td>
</tr>
</tbody>
</table>

Adapted from Wenger (2008). CVD, cardiovascular diseases; DM, diabetes mellitus; ECG, electrocardiogram; HDL-C, High Density Lipoprotein cholesterol; LDL-C, Low Density Lipoprotein cholesterol.

**Limitations**

Doing a literature review in a developing country is challenging, as many journal articles are not available as full text articles. To pay-for-view is cost exorbitant. This limits the studies one can review. There are also limitations within the reviewed articles themselves: convenience samples were used in each of the studies reviewed although seven of them used control groups. However, none of them used random assignment in control vs. experiment groups. Moreover, patients who self-select into experimental groups might have a higher commitment towards a healthy lifestyle. This commitment might improve their physical and psychological status in a manner that differs from control groups. Small attendance rates and small sample sizes in some of the studies also decrease the generalizability of their findings. None of the studies discussed cultural variations. Nonetheless, the findings are impressive in a population that normally has dismal rates of morbidity and mortality.

**Implications and recommendations**

As the population of survivors from cardiac events increases and ages, appropriate CR programmes need to be developed to meet their changing needs. This will improve their overall physiological and psychological health, thus decreasing their risks of additional cardiac events. Nurses are taking an increasing role in CR programmes. Nurses have traditionally been recognized as patient advocates who can run CR programmes, enhance enrolment and participation, while providing follow-up support to CR patients. Nurses can focus on home-based life style modifications, which provide excellent results with much lower overhead costs. They also need to develop programmes that appeal to women and the elderly, with which to improve their participation in rehabilitation programmes.

Cardiac rehabilitation programmes are useful as a technique to improve patients’ physiological and psychological status, and decrease cardiac risk factors. To improve
patients’ participation, as well as to achieve the maximum benefits of CR, programmes need to be based on the newest recommendations. Nurses in developing countries need to develop and/or participate in multidisciplinary CR programmes that are culturally sensitive. They also need to perform intervention studies to determine whether international recommendations are effective for their populations.

REFERENCES