



Making Exercise Sticky: Long term maintenance of physical activity following cardiac rehabilitation.

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Aspen Regional Health



Executive Summary

Making Exercise Sticky: Long term maintenance of physical activity following cardiac rehabilitation.

Aspen Regional Health is in the initial stages of implementing a chronic disease management strategy. One of the components of this strategy will be to provide community based chronic disease exercise programs (CDEP). Positive short term results have been demonstrated in a pilot CDEP. For the CDEPs to be effective for the participant and Aspen in the long run, however, CDEPs must also be successful in supporting positive long term exercise behavior change. Due to a paucity of literature in CDEPs, the author chose to review the cardiac rehabilitation program (CRP) literature, as an example of a well researched chronic disease management program, and compare the results from this review to other chronic conditions in order to make generalized, applicable recommendations.

The specific research question asked was:

Among adults participating in a cardiac rehabilitation program what interventions are more effective than standard care to support the long term maintenance of exercise behavior?

Methods of the Review

A total of 84 articles were retrieved from the Cochrane Library, Pub Med, MEDLINE, HEALTHSTAR, EMBASE, CINAHL, the medical & health sciences collection, the psychology & behavioral collection, and the nursing & allied health databases between October 29th, 2007 and December 12, 2007. From this review 6 articles met the studies inclusion and exclusion criteria and were assessed for validity, importance, and applicability. Data was extracted from three randomized controlled trials found to be of moderate to strong evidence. The results were compared to other chronic conditions to make recommendations.

Findings from Systematic Review

There was considerable heterogeneity in the literature with respect to the type of interventions and the outcomes measured for exercise maintenance in adults following completion of a CRP. Two articles of strong methodological quality demonstrated that exercise consultation over the phone or in small group counseling sessions is effective in improving subjective physical activity and exercise maintenance 12 months following the completion of a CRP. These findings are consistent with literature reporting on exercise maintenance in type II diabetics and sedentary adults. Additionally, an integral component of the standard care in these programs was a strong emphasis on participant self efficacy, including goal setting and relapse prevention strategies. The findings can be used to guide CDEP development in the absence of research with this specific population. Future research and evaluation should focus on examining the effectiveness of heterogeneous chronic disease management exercise programs in the long term maintenance of exercise behavior.

Recommendations

Based on the systematic review described above and comparing the results to other chronic conditions the following recommendations were developed in collaboration with Aspen's Chronic Disease and Physical Therapy Clinical Leads and a Staff Exercise Therapist in charge of the pilot site:

- 1. Programs should strongly advocate for and promote self efficacy.**
 - This can be accomplished through strong formal and informal ties to self management strategies.
 - Additionally, participants should be encouraged to keep activity logs and independently monitor important vital indicators for their respective medical conditions such as blood pressure or blood glucose levels.

- 2. Programs should encourage physical activity goal setting** with participants at discharge. Potential barriers to maintaining physical activity should be discussed, and mitigation strategies should be brainstormed and planned.

- 3. Subjective and objective measures of physical activity should be consistently recorded** at baseline (entry into the CDEP), at discharge from the

program, and at one year following completion of the program. The results should be shared and discussed with participants. This will additionally allow the Region to easily evaluate efficacy of the program.

- 4. Consultation with an exercise professional** such as a Physical Therapist or a health professional trained in exercise prescription for chronic disease populations should occur at discharge, at 6 months from discharge, and one year from discharge.

A detailed report including the background, methods, results, discussion of results, and conclusions can be obtained by contacting:

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Aspen Regional Health



Making Exercise Sticky: Long term maintenance of physical activity following cardiac rehabilitation.

CONTEXT & ISSUE

Aspen Regional Health is in the initial stages of implementing a chronic disease management (CDM) program. One of the components of this strategy will be to provide community based chronic disease exercise programs (CDEP). These programs will be open to a heterogeneous population including individuals living with a chronic disease(s) and/or leading sedentary lifestyles. The goal of these programs is to introduce physical activity in a non-threatening environment and ultimately lead to positive long term exercise behavior change. For the individual this will increase self-efficacy for exercise and healthy living and be a gate way to other positive health behavior changes. For the health region this program should lead to decreased pressure on resources and services through the creation and support of healthier citizens. Short term outcomes from a pilot program in Hinton have demonstrated a positive effect for participant outcomes. The long term benefits, however, are contingent on maintenance of exercise behavior following completion of the CDEP.

In June 2007 a preliminary literature review was initiated to search for articles relevant to exercise maintenance following participation in an exercise program in a CDM model. This search was ineffective in finding relevant studies. As a result the author contacted key informants to discuss possible changes to the search strategy. Although most CDM programs in Alberta manage chronic conditions heterogeneously, it was learnt that the chronic disease literature is almost exclusively condition specific. It was thus recommended to search the literature for exercise maintenance strategies in condition specific chronic disease populations.

Once more a literature review was performed using the terms “cardiovascular disease” (CVD), “diabetes”, and “chronic obstructive pulmonary disease” in place of “chronic

disease". This search resulted in an extremely fertile result. To ensure the systematic review would be feasible for one primary reviewer it was decided to conduct a systematic review of the literature for effectiveness of long term maintenance of exercise in only one of these chronic disease populations.

To answer this question the reviewer chose to focus on CVD, and more specifically, cardiac rehabilitation (CR) for the following reasons:

- CVD is recognized by the world health organization as one of the major preventable chronic diseases.
- The CR literature is a fertile source of evidence based research.
- CR program structure is similar to the planned CDM strategy in that it is multi-modal and exercise programs play an integral role.

Consequently the author's strategy was to complete a systematic review for effective interventions that support long term maintenance of exercise in a CR population. Following this the author would compare the interventions that were found to be successful in the systematic review with similar interventions in other chronic disease populations to look for any consistencies.

RESEARCH QUESTION

Among adults participating in a cardiac rehabilitation program what interventions are more effective than standard care to support the long term maintenance of exercise behavior?

BACKGROUND

Cardiovascular disease (CVD) is the leading cause of death globally (1). In Canada, CVD accounted for 74 626 deaths in 2004 (2). CVD costs the Canadian economy more than \$18 billion dollars annually (3). Physical inactivity, along with an unhealthy diet, and tobacco use, are among the most important modifiable risk factors for CVD (1).

Cardiac rehabilitation has been defined by the World Health Organization as "the sum of activities required to influence favourably the underlying causes of the disease, as well as to provide the best possible physical, mental, and social conditions, so that patients

may, by their own efforts, preserve or resume when lost as normal a place as possible in the community” (4).

Cardiac rehabilitation programs (CRP) are used following recovery from acute cardiac events as well as for the secondary prevention of CVD. Exercise-based rehabilitation, a major component of CRPs, has been reported to improve physical performance, psychological functioning, and social adaptation and functioning (5). It has also been demonstrated to reduce mortality, morbidity, and recurrent events (5, 6). Jolliffe et al 2001 reported a 13% - 27% reduction in all cause mortality and a 26% - 31% reduction in total cardiac mortality following participation in exercise-based CRP (6). Rees et al 2004 reported short term improvements in exercise capacity and quality of life in heart failure patients with exercise-based rehabilitation (7).

In addition to the health benefits derived from CRPs, several economic benefits have been reported including the reduction of rehospitalization rates, decreased need for cardiac medications, reduced consumption of medical care, increased return to work rates, and overall improved cost effectiveness (8, 9, 10, 11).

In order to maintain the benefits of exercise-based rehabilitation this behavior must be continued (12). Alarming, 30% - 60% of individuals stop participating in regular physical activity in the first 6 months following completion of a CRP (13, 14, 15). These attrition rates are similar with those reported for the general population (16).

The purpose of this scientific review was to determine what interventions are more effective than standard care in supporting long term maintenance of exercise behavior among adults following participation in a CRP.

METHODS OF THE REVIEW

The review was conducted in a systematic manner by the author in consultation with Faculty from SEARCH Canada, Librarians from the Centre for Health Evidence, and Colleagues from Aspen Regional Health. The methodology of the review was divided up into three components: study identification, study selection, and study assessment.

Study Identification

Articles were identified using keywords, sources, and limiters based on a PICO question formed in consultation with librarians from the Centre for Health Evidence and a SEARCH Canada faculty member.

The keywords used in this literature search were cardiac rehabilitation, maintenance, adherence, exercise, and physical activity. The keywords were entered using Boolean logic to limit the search results in order to complete the project with only one primary reviewer. They were divided into mesh headings based on the PICO question:

Among adults participating in a cardiac rehabilitation program what interventions are more effective than standard care to support the long term maintenance of exercise behavior?

The terms “cardiac rehab\$” AND (exercise OR “physical activity”) AND (maintenance OR adherence) were entered in to selected databases.

The following electronic databases were searched: The Cochrane Library (1997-Dec 2007), Pub Med (1997-Dec 2007), MEDLINE (1997-Dec 2007), EMBASE (1997-Dec 2007), Health Star (1997-Dec 2007), CINAHL (1997-Dec 2007), and the EBSCO interface to search the medical & health sciences collection (1997-Dec 2007), the psychology & behavioral collection (1997-Dec 2007), and the nursing & allied health collection (1997-Dec 2007).

The search was limited to “all adults”, humans, and English language.

The search was conducted between October 29, 2007 and December 12, 2007. Refer to Appendix A for an itemized list of the searches and results from each database including dates, sources, keywords, limiters, and the number of citations generated.

All identified studies were managed in a refworks folder. A full text version of each article was subsequently reviewed for inclusion and exclusion criteria as outlined by the study selection criteria.

Study Selection

The full text versions of all retrieved citations were reviewed by the author to see if they met the predetermined inclusion and exclusion criteria.

To meet the inclusion criteria set out by the author the articles had to:

1. Measure exercise or physical activity (PA) capacity following participation in a CRP.
2. Re-measure exercise or PA at a minimum of 6 months from the completion of the CRP.
3. Have an intervention that was designed to support exercise maintenance following participation in a CRP.

Articles that satisfied all inclusion criteria were then passed through an exclusion filter for relevance. Articles in which an exercise program was not a primary component of the CRP were excluded. A complete list of all articles retrieved by the search and their scoring for inclusion and exclusion criteria can be found in appendix B.

Study Assessment

The assessment process was used as a quality filter. A grade of evidence was assigned to each article after assessing them for validity, importance and applicability.

Validity was assessed by applying the guidelines described in “The Users’ Guides to the Medical Literature” for studies of therapy (17). This technique applies 2 sets of 4 questions to determine the validity of an article. The second set of 4 questions for validity (Did the experimental and control groups retain a similar prognosis after the study started?) asks about whether or not patients, clinicians, and outcome assessors were aware of group allocation. Due to the nature of the interventions in the selected studies it was not possible for the subjects or clinicians to be unaware of group allocation. Consequently, in developing a validity score the reviewer did not consider the two questions pertaining to the patients’ and clinicians’ awareness of group allocation (see table 1). This left 6 remaining questions of validity for the article to be assessed by. For each question the article was given a score of 1 or 0 if they either met the expectation of the question or did not, respectively. The summative scores for the validity questions created a “questions of validity” score. The “questions of validity score” was then translated in to an overall validity score in the following manner: Articles that scored either 5 or 6/6 for the questions of validity were given an overall validity score of 1. If the article scored 4 or less for the questions of validity it was given an overall validity score of 0. Table 1 was used to assess and score articles for validity.

Table 1

Are the Results Valid?	Answer	Questions of Validity Score
Did the experimental and control groups begin the study with a similar prognosis?		N/A
Were patients randomized?		0 or 1
Was randomization concealed?		0 or 1
Were patients analyzed in the groups to which they were randomized?		0 or 1
Were patients in the treatment and control groups similar with respect to known prognostic variables?		0 or 1
Did experimental and control groups retain a similar prognosis after the study started?		N/A
Were patients aware of group allocation?		Not considered
Were clinicians aware of group allocation?		Not considered
Were outcome assessors aware of group allocation?		0 or 1
Was follow-up complete?		0 or 1
Questions of Validity Score		0-6/6
Overall Validity Score*		0 or 1

* Articles that score 5-6/6 for questions of validity received an overall validity score of 1. Articles that score 0-4/6 received an overall validity score of 0.

Importance of the results was determined by considering the sample size of each study and whether or not a power calculation was performed to determine sample size. Studies with a sample size of 100 or greater or that performed and met a sample size criteria as determined by a power calculation were considered as acceptable importance and given a score of 1. Studies that did not meet the criteria were not considered to have acceptable importance and were given a score of 0.

Applicability was determined by applying predetermined questions of external relevance developed by the author to ensure applicability to the population of interest in the author's local context. Those articles that were either considered moderate or strong for external relevance received a score of 1 for applicability. Those that were considered poor received a score of 0.

The questions used to determine external relevance and assign an applicability score are displayed in table 2.

Table 2

	External Relevance Criteria				
Article	Primary outcome was an objective or subjective measure of PA or exercise	Duration of exercise program = 6 to 12 weeks	Intervention could be realistically implemented	External Relevance Score*	Applicability Score**

* Articles were given a score from 0 – 3 for external relevance depending on how many of the relevance criteria were met.

Poor external relevance = 0-1/3

Moderate external relevance = 2/3

Strong external relevance = 3/3

** Articles that had moderate or strong external relevance were given an applicability score of 1. Articles that had poor external relevance were given an applicability score of 0.

An overall quality score, or grade of evidence, was assigned to each article by summing scores for validity, importance, and applicability. Articles that received an overall quality score of 0-1/3 were considered to have a poor grade of evidence. Articles that received an overall quality score of 2/3 or 3/3 were considered to have a moderate or strong grade of evidence, respectively. Studies with a grade of moderate or strong were to be considered during the synthesis of results.

During the study assessment the author also extracted information from the studies assessed including the design, purpose, sample size, randomization process, a description of the initial CRP (duration, intensity, mode, frequency, supervision, volume and other components of the CRP), a description of the treatment received by the experimental and control groups (i.e. interventions), the outcome measures used, the frequency outcomes were taken at, the methods of statistical analysis, and the results.

RESULTS

Description of Studies

The search strategy generated a total of 306 potential citations. The author easily identified 222 citations that were duplicates. An attempt was made by the author to obtain the full text version of the remaining 84 articles to apply the inclusion and exclusion criteria outlined in the methods of this review. A full text article was obtained for 80 of the 84 citations. The 4 that were unable to be retrieved were thesis (18, 19, 20, 21). In these cases the inclusion and exclusion criteria were applied to the abstract.

7 randomized controlled trials (RCTs) of the 84 articles appeared to meet the inclusion and exclusion criteria (Brubaker et al 2000 (22), Hughes et al 2007 (12), Izawa et al 2005 (23), Lear et al 2003 (24), Moore et al 2006 (25), Sniehotta et al 2005 (26), & Yates et al 2005 (27)). These 7 RCTs were then reviewed in further detail during the assessment for quality and the data extraction process. At this time it was revealed that 1 of the 7 articles (Sniehotta et al. 2005) was ambiguous with respect to the timing of the assessment of the second set of outcome measures. The author was contacted to clarify the discrepancy and subsequently the article was excluded from further assessment as the author clarified that the second follow up time was in fact only 4 months from the completion of the CRP. The remaining 6 articles were assessed for quality.

The 6 articles assessed for quality included 762 subjects. 373 subjects received usual care during and following their CRP. 389 subjects received an intervention designed to increase maintenance of exercise during or following their CRP. Length of the initial CRP ranged from 11 weeks to 6 months. The initial CRP was 11-12 weeks in 3 of the trials, 16 weeks in 1 trial, 6 months in another and 1 author did not report the length of the initial CRP. There was no consistency between how authors reported the stage of the CRPs, however all 6 CRPs were outpatient based programs. Four trials reported a frequency of 2-3 sessions per week and two authors did not report frequency. Other descriptors of the initial CRPs such as duration of sessions, intensity, and mode were not consistently reported.

There was considerable variability between the interventions used and the outcomes measured among the 6 trials. Interventions included in person and telephone consultations with health professionals to discuss behavior modification strategies, subjects keeping anthropometric, physiologic, subjective and objective exercise records, small group counseling and behavior modification sessions, booster sessions in a CRP, or a combination of the above listed interventions. The usual care following a CRP was

equally heterogeneous, but usually included either advice to continue with physical activity or some form of educational material advising the same.

Primary outcome measures included functional capacity, lipid profile, body composition, subjective and objective PA, cardio-respiratory fitness, exercise maintenance, self efficacy for physical activity, global risk for ischemic heart disease (IHD), and health and behavioral outcomes. There was also a slough of secondary outcome measures used. Some articles did not specifically identify their primary outcome measure or listed multiple primary outcome measures. All trials consistently reported some measure of PA, exercise, or exercise maintenance in their report. Outcomes were assessed at baseline, which was either immediately following completion of or within the first month following a CRP, and at a 6 months (2 trials), 9 months (1 trial), and 12 months (3 trials) after completion of the CRP.

Methodological Quality

Three of the six studies met acceptable criteria for validity as outlined in the methods of this review (Hughes et al 2007, Lear et al 2003, Moore et al 2006). The same three trials met acceptable criteria for importance. Four trials satisfied the pre-determined criteria for applicability (Brubaker et al 2000, Hughes et al 2007, Moore et al 2006, Yates et al 2005). 5 out of the 6 trials used either a subjective or objective measure of physical activity or exercise as one of their primary outcome measures. 3 of 6 trials had CRPs that were between 6-12 weeks duration. 4 of the 6 trials had interventions that could be realistically implemented within the author's occupational context. The 2 interventions that could not realistically be implemented were deemed too resource intensive for the applied setting. The results from the assessment of validity, importance, and applicability are displayed in tables 3, 4, & 5, respectively.

Of the 6 RCTs that were assessed for quality in relationship to the review question asked, 3 were found to be of poor quality, 1 was found to be of moderate quality, and 2 were found to be of strong quality. The 3 articles that were found to be of poor quality were not subsequently included in the data synthesis process. The overall grade or quality of evidence table for the 6 RCTs is displayed in table 6.

Table 3

Results from Assessment of Validity

Article	Questions of Validity Score	Overall Validity Score	Comments
Brubaker et al. 2000	4/6	0	Groups were dissimilar at baseline and 9 months, article reported differing results with ANOVA and ANCOVA for these follow up times; does not mention if randomization was concealed
Hughes et al. 2007	5/6	1	Does not mention if assessors were blind
Izawa et al. 2005	4/6	0	Does not mention if randomization was concealed; Does not mention if assessors were blind
Lear et al. 2003	5/6	1	Does not mention if assessors were blind
Moore et al. 2006	6/6	1	
Yates et al. 2005	3/6	0	Does not mention if randomization was concealed; Does not mention if assessors were blind; Follow up was not complete

Table 4

Results from Assessment of Importance

Article	Sample Size	Power Calculation	Importance Score
Brubaker et al. 2000	n = 31	No	0
Hughes et al. 2007	n = 70	Yes – met power calculation	1
Izawa et al. 2005	n = 45	No	0
Lear et al. 2003	n = 302	Yes – met power calculation	1
Moore et al. 2006	n = 250	Yes – met power calculation	1
Yates et al. 2005	n = 64	No	0

Table 5

Results from Assessment of Applicability

Article	Primary outcome was an objective or subjective measure of PA or exercise	Duration of exercise program = 6 to 12 weeks	Intervention could be realistically implemented	External Relevance Score	Applicability Score
Brubaker et al. 2000	√	√	√	3/3	1
Hughes et al. 2007	√	√	√	3/3	1
Izawa et al. 2005	√	X (6 months)	X	1/3	0
Lear et al. 2003	X (global IHD risk)	X (16 weeks)	X	0/3	0
Moore et al. 2006	√ (months of exs)	√	√	3/3	1
Yates et al. 2005	√	X (not described)	√	2/3	1

Table 6

Summary of Results

Article	Validity	Importance	Applicability	Strength of evidence
Brubaker et al. 2000	0	0	1	Weak
Hughes et al. 2007	1	1	1	Strong
Izawa et al. 2005	0	0	0	Weak
Lear et al. 2003	1	1	0	Moderate
Moore et al. 2006	1	1	1	Strong
Yates et al. 2005	0	0	1	Weak

SYNTHESIS OF RESULTS

RCTs were synthesized in categories based on the nature of the interventions used. Three categories were established: 1. interventions primarily based on consultation, 2. interventions primarily based on an active intervention(s) (e.g. exercise logs, booster exercise sessions, etc.), or 3. interventions based on a combination of consultation and an active intervention(s). 3 RCTs satisfied the quality criteria posed by the review. One of the trials had an intervention that included both consultation and an active intervention(s), while the other two trials were primarily consultative.

The 2003 study by Lear et al described their intervention as an extensive lifestyles management intervention (ELMI). The ELMI was designed to decrease global risk for IHD, which included maintenance of physical activity and physical fitness. The ELMI included behavior modification counseling sessions, booster cardiac rehabilitation sessions four times during the first month following completion of a CRP and once a month in the second and third months following cardiac rehabilitation, and additionally received once a month phone calls for all months but 6 & 9, in which they received a face to face counseling session instead. This study recruited 302 subjects exiting a 16 week CRP and randomized them to either an experimental group or a control group. The control groups completed their CRP and were informed that they would be contacted in 12 months for a follow up assessment by the researchers. The experimental group received the ELMI. The primary outcome measured in this trial was global risk for IHD. The article also had several secondary outcome measures including subjective PA and objective physical fitness measures. The authors observed a non-significant trend in favor of the intervention for their primary outcome and non-significant results for all secondary outcome measures. The authors did note that the usual care group had no remarkable deterioration in global risk or individual risk factors for IHD which is inconsistent with findings from other articles following participation in a CRP. It was hypothesized that both a self selection bias and awareness of being re-tested may have contributed to the unusually high maintenance of global risk factor profile for IHD in the control group. This article received a quality grade of moderate.

Both Hughes et al, 2007, and Moore et al, 2006, were graded as strong quality. Both studies had interventions that were primarily consultative. In 2007, Hughes et al examined the effect of exercise consultation on maintenance of PA and cardiovascular fitness in the year following completion of a phase III CRP. They recruited 70 subjects

exiting an 11 week CRP and randomized them in to a control group and an experimental group. The control group received an exercise leaflet upon completion of the CRP as per usual care. They also received a similar package at 6 months and 2 unrelated phone calls from the program at 3 & 9 months to keep contact time consistent between the experimental and control group. The experimental group received the same exercise leaflet at discharge and 6 months from discharge that the control group received. They additionally had a 30 minute face to face consultation based on the Transtheoretical Model of behavior change and the Relapse Prevention Model at baseline and 6 months. They also received phone consultations discussing the same at 3 & 9 months. The primary outcomes measured were subjective and objective measures of PA and measures of cardio-respiratory fitness. The authors found that the experimental group had statistically significant improvements in subjective PA and trends towards improvements in objective PA, but not of statistical significance. The discrepancy between subjective and objective PA measures was explained by the noted limitations in the objective PA outcome measure tool, namely a uniaxial MTI accelerometer. No statistical significance was found for cardio-respiratory fitness. Hughes et al also noted that the control groups levels of PA and cardio-respiratory fitness did not decline as much as anticipated based on previous studies. They too hypothesized that this may have been caused by the control group's awareness of being re-tested.

Moore et al, 2006, set out to test the effectiveness of small group counseling sessions at the end of a CRP and in the first 2 months following discharge on exercise maintenance. They recruited 250 subjects exiting a 12 week CRP and randomized them in to a control group and an experimental group. The control groups received routine education during the CRP and were given an exercise prescription to follow at discharge as per usual care. They were also taught how to use and given heart rate monitors and diaries and were asked to use these tools and submit them once a month for the next 12 months. The experimental group received all the same things that control group received and additionally received 5 small group counseling sessions (3 during the last 3 weeks of the CRP and 1 in the first and second month following discharge, respectively). The small group counseling sessions were based on a cognitive-behavioral model of health behavior change which included the social problem-solving model, self-efficacy theory, expectancy-value theory, and relapse prevention theory. The primary outcome measured was exercise maintenance (defined as # of months in which participants continued to exercise). Moore et al found a statistically significant result in exercise

maintenance in the experimental group at 12 months following completion of the CRP. They reported that the control group was 76% more likely to discontinue exercising in the year following a cardiac event than participants in the intervention group. Secondary outcomes measured included exercise frequency, exercise amount, and compliance to intensity recommendations. None of the secondary outcome measures achieved statistical significance.

INTERPRETATION & DISCUSSION

Based on two strong quality RCTs there is evidence to support the effectiveness of exercise consultation to improve subjective PA and continuation of exercise 12 months following the completion of a CRP. Hughes et al's exercise consultation sessions were conducted using one on one consultation on 4 occasions over the year following completion of a CRP (two telephone sessions at 3 & 9 months & two in person sessions at baseline and 6 months). They were based on the Transtheoretical model of Behavior change and the Relapse Prevention model.

Moore et al demonstrated the effectiveness of small group counseling and behavioral modification sessions to increase exercise maintenance in the year following completion of a CRP. These counseling sessions were based on cognitive-behavioral theoretical frameworks including the social-problem solving model, self-efficacy theory, expectancy-value theory, and relapse prevention theory.

These findings are consistent with previous reports of exercise consultation being used as an effective intervention to promote and maintain PA with the general population and with type II diabetics (28, 29, 30).

In contrast, Lear et al 2003 did not find any statistically significant improvements in subjective PA or objective physical fitness in the year following a CRP when comparing standard care to a combined consultation and active intervention coined the ELMI. It is worthwhile noting that although the intervention did target and measure maintenance of PA and physical fitness, the primary aim of the intervention was to reduce the global risk for IHD.

It is interesting to note that both Hughes et al 2007 and Lear et al 2003 noticed that the control groups receiving usual care in their respective studies both exceeded the

expectations of previous reports for exercise maintenance and global risk for IHD following a CRP (31, 32). It is possible that a Hawthorne effect may account for these unusually high rates of exercise maintenance. Brubaker et al 2000 (22) noticed a similar finding in their work. It seems plausible that awareness of being re-assessed following completion of a CRP may be incentive enough for participants to remain physically active. This area could be further studied by well designed RCTs.

The author of this review recognizes several limitations of the review. While the methodological design was developed in consultation with a SEARCH Canada Faculty advisor, due to a scarcity of resources, only the primary author was able to apply the methodological criteria of the review. Consequently there was no check by a secondary author against the application of the study identification, selection, and assessment criteria. Additionally, while the author attempted to keep the methodological criteria consistent with established guidelines for appraising studies of therapy (User's Guides to the Medical Literature, 2002), some alterations were made to reflect the unique circumstances of the review; specifically, excluding the two questions of validity regarding subjects' and clinicians' awareness of group allocation. This could potentially bias the validity scores in this review. Finally, the grade of evidence given will bias the results in favor of a clinical population of interest to the author. That is, the applicability score received reflected a context that was clinically important to the author.

This body of evidence had some methodological limitations as well. With respect to validity, while the author recognized that for studies of this nature it is not possible for patients and clinicians to be unaware of group allocation to the interventions, it would seem reasonable to expect that outcome assessors remain unaware. However, only two of the six articles that were assessed reported the assessors not having awareness of subjects' group allocation. In terms of importance, of the 6 articles included in the review only 3 had conducted power calculations to determine sample size and only 2 of those had sample sizes greater than 100. Additionally, although 6 articles re-measured baseline outcomes at 6 months or greater following completion of cardiac rehabilitation, only 3 of these articles re-measured outcomes at a minimum of 12 months. There was also a wide variety of interventions used. Although for the purpose of this review the author has broadly classified them as either being primarily consultative, primarily active interventions, or a combination of consultative and active, the actual methodology of each intervention was quite unique, thus making comparisons difficult. Further complicating comparisons was the heterogeneity of outcome measures used. This body

of evidence could be strengthened by larger trials, over longer periods of time, with more consistent interventions and outcome measures specifically targeting and assessing exercise maintenance.

While there has been a significant amount of research dealing with maintenance or adherence to exercise or PA in cardiac rehabilitation, there is considerable variability in this body. Much of the research has focused on either adherence to exercise during cardiac rehabilitation, or short term maintenance of PA following completion of a CRP. The body of literature dealing with long term maintenance of PA following completion of a CRP is much less fertile.

CONCLUSIONS

There is a small amount of strong research to support the use of exercise consultation, in the form of small group counseling sessions or combined telephone and face to face follow up based on current models of health behavior change, to support the continuation of exercise and self report physical activity one year following the completion of a CRP.

Patient awareness of being re-tested for measures of physical activity and exercise capacity may positively influence physical activity behavior. Consideration should be given to designing future RCTs with awareness of follow up re-assessment for physical activity and exercise testing as an intervention.

Larger, long term, well designed RCTs with consistent interventions and outcome measures for exercise maintenance are required to confirm reports of exercise consultation being an effective intervention for the long term maintenance of exercise in the year following cardiac rehabilitation.

ORGANIZATIONAL RECOMMENDATIONS

Based on the systematic review described above and comparing the results to other chronic conditions the following recommendations were developed in collaboration with Aspen's Chronic Disease and Physical Therapy Clinical Leads and a Staff Exercise Therapist in charge of the pilot site to support the development of world class CDEPs.

- 1. Programs should strongly advocate for and promote self efficacy.**
 - This can be accomplished through strong formal and informal ties to self management strategies.
 - Additionally, participants should be encouraged to keep activity logs and independently monitor important vital indicators for their respective medical conditions such as blood pressure or blood glucose levels.

- 2. Programs should encourage physical activity goal setting** with participants at discharge. Potential barriers to maintaining physical activity should be discussed, and mitigation strategies should be brainstormed.

- 3. Subjective and objective measures of physical activity should be consistently recorded** at baseline (entry into the CDEP), at discharge from the program, and at one year following completion of the program. The results should be shared and discussed with participants. This will additionally allow the Region to easily evaluate efficacy of the program.

- 4. Consultation with an exercise professional** such as a Physical Therapist or a health professional trained in exercise prescription for chronic disease populations should occur at discharge, at 6 months from discharge, and one year from discharge.

DISSEMINATION

Scheduled dissemination

February 2008

1. Present draft presentation of methods and results to SEARCH VI colleagues and SEARCH Faculty at SEARCH Classic module V.

March 2008

2. Present findings and recommendations to relevant clinical leads in Aspen. Engage them in a discussion regarding the transferability of recommendations into existing programs. Refine recommendations based on discussion.
3. Present project findings and recommendations to relevant stakeholders in Aspen CDEP pilot site.
4. Discuss findings from local project with PT lead from East Central Health. Make a plan to formally present to CDM team in East Central Health if desired.

April 2008

5. Present results to Living Well team in David Thompson Health Region. Engage them in discussion regarding what they are doing and what seems to be working.
6. Submit final report to SEARCH Classic Canada and the *Journal of Cardiopulmonary Rehabilitation and Prevention* for publishing.

May 2008

7. Present project and poster at the *SEARCHing for knowledge in the health care community* conference in Lethbridge, May 20, 2008.

July 2008

8. Present project at SEARCH Canada Annual General meeting.

October 2008

9. Present results of project at 2nd annual Alberta Physical Therapy Conference.

Unscheduled Dissemination:

10. Presentation of project in various forms to various groups including:

- Senior management team and relevant staff in Aspen.
- Communicate results to Physiotherapists through the Alberta Physiotherapy Association and Canadian Physiotherapy Association.
- Other interested Health regions through discussion with SEARCH VI participants.
- Various relevant conferences as opportunities arise.
- SEARCH Canada Biennial Conference.

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APPENDIX A

Study Identification Table

Date	Source	Keywords	Limiters	Results (new)	Refworks Folder
21/11/07 (updated December 2007)	Pubmed	"cardiac rehabilitation" AND maintenance AND exercise	Published in last 10 years, humans, english, All Adult: 19+years	23 (23)	Pubmed1
21/11/07 (updated December 2007)	Pubmed	"cardiac rehabilitation" AND maintenance AND "physical activity"	As above	10 (1)	Pubmed2
21/11/07 (updated December 2007)	Pubmed	"cardiac rehabilitation" AND adherence AND exercise	As above	22 (18)	Pubmed3
21/11/07 (updated December 2007)	Pubmed	"cardiac rehabilitation" AND adherence AND "physical activity"	As above	5 (2)	Pubmed4
21/11/07 (updated December 2007)	OVID-medline	cardiac rehab\$.mp. AND maintenance.mp. AND exp Exercise/	1997-2008, humans, english	16 (2)	Medline1
21/11/07 (updated December 2007)	OVID-medline	cardiac rehab\$.mp. AND maintenance.mp. AND (physical activity.mp. OR exp Motor Activity/)	As above	8 (0)	Medline2
21/11/07 (updated December 2007)	OVID-medline	cardiac rehab\$.mp. AND adherence.mp. AND exp Exercise/	As above	13 (4)	Medline3
21/11/07 (updated December 2007)	OVID-medline	cardiac rehab\$.mp. AND adherence.mp. AND (physical activity.mp. OR exp Motor Activity/)	As above	7 (0)	Medline4

21/11/07 (updated December 2007)	OVID- healthstar	cardiac rehab\$.mp. AND maintenance.mp. AND exp Exercise/	1997- 2007, humans, english	24 (1)	Healthstar1
21/11/07 (updated December 2007)	OVID- healthstar	cardiac rehab\$.mp. AND maintenance.mp. AND (physical activity.mp. OR exp Motor Activity/)	As above	10 (0)	Healthstar2
21/11/07 (updated December 2007)	OVID- healthstar	cardiac rehab\$.mp. AND adherence.mp. AND exp Exercise/	As above	25 (4)	Healthstar3
21/11/07 (updated December 2007)	OVID- healthstar	cardiac rehab\$.mp. AND adherence.mp. AND (physical activity.mp. OR exp Motor Activity/)	As above	7 (0)	Healthstar4
29/11/07 (updated December 2007)	OVID - EMBASE	"cardiac rehab\$" AND (maintenance OR adherence) AND (exercise OR "physical activity")	1997- 2008, English, humans	53 (17)	Embase (all)
23/11/07 (updated December 2007)	EBSCO- cinahl	"cardiac rehabilitation" AND maintenance AND exercise	1997- 2008, English, all adult	16 (4)	Cinahl1
23/11/07 (updated December 2007)	EBSCO- cinahl	"cardiac rehabilitation" AND maintenance AND "physical activity"	As above	9 (0)	Cinahl2
23/11/07 (updated December 2007)	EBSCO- cinahl	"cardiac rehabilitation" AND adherence AND exercise	As above	13 (3)	Cinahl3
23/11/07 (updated December 2007)	EBSCO- cinahl	"cardiac rehabilitation" AND adherence AND "physical activity"	As above	4 (1)	Cinahl4
23/11/07	Cochrane	"cardiac	1997-	9 (0)	Cochrane1

(updated December 2007)	Library	rehabilitation” AND maintenance AND exercise (titles, abstracts and keywords)	2007		
23/11/07 (updated December 2007)	Cochrane Library	“cardiac rehabilitation” AND maintenance AND “physical activity” (titles, abstracts and keywords)	1997-2007	3 (0)	Cochrane2
23/11/07 (updated December 2007)	Cochrane Library	“cardiac rehabilitation” AND adherence AND exercise (titles, abstracts and keywords)	1997-2007	10 (1)	Cochrane3
23/11/07 (updated December 2007)	Cochrane Library	“cardiac rehabilitation” AND adherence AND “physical activity” (titles, abstracts and keywords)	1997-2007	2 (0)	Cochrane4
23/11/07 (updated December 2007)	EBSCO-biomedical and behavioral	“cardiac rehabilitation” AND (maintenance OR adherence) AND (exercise OR “physical activity”)	1997-2008	10 (3)	Biomedical/behavioral (all)
03/12/07	EBSCO – Nursing & Allied Health Collection	"cardiac rehabilitation" AND (maintenance OR adherence) AND (exercise OR "physical activity")	1997 - 2008	7 (0)	N&AH (all)

APPENDIX B

Study Selection

Inclusion Criteria

1. Articles that measured exercise or PA capacity following participation in a CR program.
2. Articles that re-measured exercise or PA at a minimum of 6 months from the end of the CR.
3. Articles in which the intervention was a strategy to support exercise maintenance following participation in CR.

Exclusion Criteria

4. Articles in which an exercise program was not a component of CR.

Author	Title	Journal	Inclusion Criteria Exclusion Criteria E = excluded B = background A =accepted
Alexander JL, Wagner CL. 2006	How cardiac rehabilitation relates to quality of life.	Rehabil.Nurs s.	1. x 2. x 3. x 4. E/B
Allison MJ, Keller C. 2000	Physical activity maintenance in elders with cardiac problems.	Geriatr.Nurs .	1. √ 2. x 3. x 4. E/B
Annesi JJ. 1998	Effects of computer feedback on adherence to exercise.	Percept.Mot .Skills.	1. x 2. x 3. x 4. E
Banzer JA, Maguire TE, Kennedy CM, O'Malley CJ, Balady GJ. 2004	Results of cardiac rehabilitation in patients with diabetes mellitus.	Am.J.Cardio l.	1. √ 2. x 3. x 4. E
Benzer W, Oldridge NB. 2001	Current concepts in cardiac rehabilitation medical considerations and outcomes evaluations.	Journal of Clinical and Basic Cardiology	1. x 2. x 3. x 4. E
Bethell HJ. 2006	Exercise- based cardiac rehabilitation.	Medicine	1. x 2. x 3. x 4. x E
Bjarnason-	Recommendations for resistance	Eur.J.Cardio	1. x

Wehrens B, Mayer-Berger W, Meister ER, Baum K, Hambrecht R, Gielen S, et al. 2004	exercise in cardiac rehabilitation. Recommendations of the German Federation for Cardiovascular Prevention and Rehabilitation.	vasc.Prev.Rehabil.	2. x 3. x 4. E
Blanchard CM, Courneya KS, Rodgers WM, Fraser SN, Murray TC, Daub B, et al. 2003	Is the theory of planned behavior a useful framework for understanding exercise adherence during phase II cardiac rehabilitation?	J.Cardiopulm.Rehabil.	1. x 2. x 3. x 4. E/B
Blanchard CM, Rodgers WM, Courneya KS, Daub B, Black B. 2002	Self-efficacy and mood in cardiac rehabilitation: should gender be considered?	Behav.Med.	1. √ 2. x 3. x 4. E
Blanchard CM, Rodgers WM, Courneya KS, Daub B, Knapik G. 2002	Does barrier efficacy mediate the gender-exercise adherence relationship during phase II cardiac rehabilitation?	REHABIL PSYCHOL	1. x 2. x 3. x 4. E
Bock BC. 2002	Issues in predicting adherence to cardiac rehabilitation.	J.Cardiopulm.Rehabil.	1. x 2. x 3. x 4. E
Bock BC, Carmona-Barros RE, Esler JL, Tilkemeier PL. 2003	Program participation and physical activity maintenance after cardiac rehabilitation.	Behav.Modif.	1. x 2. √ 3. √ 4. E/B
Bock BC, Albrecht AE, Traficante RM, Clark MM, Pinto BM, Tilkemeier P, et al. 1997	Predictors of Exercise Adherence Following Participation in a Cardiac Rehabilitation Program.	Int.J.Behav. Med.	1. √ 2. x 3. √ 4. E/B
Boesch C, Myers J,	Maintenance of exercise capacity and physical activity	J.Cardiopulm.Rehabil.	1. √ 2. √

Habersaat A, Ilarraza H, Kottman W, Dubach P. 2005	patterns 2 years after cardiac rehabilitation.		3. x 4. E/B?
Brezinka V, Dusseldorp E, Maes S. 1998	Gender differences in psychosocial profile at entry into cardiac rehabilitation.	J.Cardiopul m.Rehabil.	1. x 2. x 3. x 4. E
Brubaker PH, Rejeski WJ, Smith MJ, Sevensky KH, Lamb KA, Sotile WM, et al. 2000	A home-based maintenance exercise program after center-based cardiac rehabilitation: effects on blood lipids, body composition, and functional capacity.	J.Cardiopul m.Rehabil.	1. √ 2. √ 3. √ 4. √ A
Burns KJ, Camaione DN, Froman RD, Clark BA,3rd. 1998	Predictors of referral to cardiac rehabilitation and cardiac exercise self-efficacy.	Clin.Nurs.Res.	1. x 2. x 3. x 4. E
Caldwell MA, Dracup K. 2001	Team management of heart failure: the emerging role of exercise, and implications for cardiac rehabilitation centers.	J.Cardiopul m.Rehabil.	1. x 2. x 3. x 4. E
Carlson JJ, Johnson JA, Franklin BA, VanderLaan RL. 2000	Program participation, exercise adherence, cardiovascular outcomes, and program cost of traditional versus modified cardiac rehabilitation.	Am.J.Cardio l.	1. √ 2. x 3. √ 4. E/B
Carlson JJ, Norman GJ, Feltz DL, Franklin BA, Johnson JA, Locke SK. 2001	Self-efficacy, psychosocial factors, and exercise behavior in traditional versus modified cardiac rehabilitation.	J.Cardiopul m.Rehabil.	1. x 2. x 3. x 4. E/B
Cheema BS, O'Sullivan AJ, Chan M, Patwardhan A, Kelly J, Gillin A, et al. 2006	Progressive resistance training during hemodialysis: rationale and method of a randomized-controlled trial.	Hemodial int.	1. x 2. x 3. x 4. E
Christian AH, Cheema AF, Smith SC, Mosca L. 2007	Predictors of quality of life among women with coronary heart disease.	Qual.Life Res.	1. x 2. x 3. X 4. E

Cobb SL, Brown DJ, Davis LL. 2006	Effective interventions for lifestyle change after myocardial infarction or coronary artery revascularization.	J.Am.Acad. Nurse Pract.	1. x 2. x 3. x 4. E/B
Daly J, Sindone AP, Thompson DR, Hancock K, Chang E, Davidson P. 2002	Barriers to participation in and adherence to cardiac rehabilitation programs: a critical literature review.	Prog.Cardio vasc.Nurs.	1. x 2. x 3. x 4. E/B
Deligiannis A, Kouidi E, Tassoulas E, Gigis P, Tourkantonis A, Coats A. 1999	Cardiac effects of exercise rehabilitation in hemodialysis patients.	Int.J.Cardiol .	1. x 2. x 3. x 4. E
Digenio AG, Noakes TD, Joughin H, Daly L. 1999	Ventilatory responses to exercise in patients with asymptomatic left ventricular dysfunction.	Med.Sci.Sp orts Exerc.	1. √ 2. x 3. x 4. E
Donker FJS. 2000	Cardiac rehabilitation: A review of current developments.	Clin.Psychol .Rev.	1. x 2. x 3. x 4. E
A. S. Elokda. 2002.	Effect of exercise training on oxidative stress in sedentary subjects	University of Iowa; - Thesis	1. x 2. x 3. x 4. E NB – thesis, excluded based on abstract
Elokda AS, Nielsen DH. 2007	Effects of exercise training on the glutathione antioxidant system. European Journal of Cardiovascular Prevention and Rehabilitation	Journal of Cardiovascular Prevention and Rehabilitation	1. x 2. x 3. x 4. E
Elrod CS. 2007	Patient adherence to self-monitoring recommendations taught in extended phase I cardiac rehabilitation.	CARDIOPU LM PHYS THER J	1. x 2. x 3. x 4. E
Evans J, Turner S, Bethell H. 2004	Results and cost of meeting the National Service Framework for Coronary Heart Disease requirement for 12 month follow-up after acute coronary events.	J.Public.He alth.(Oxf)	1. √ 2. √ 3. x 4. E/B

Finlayson JM. 1997	The role of exercise in rehabilitation after uncomplicated myocardial infarction.	Physiotherapy	1. x 2. x 3. x 4. E
Fitchet A, Doherty PJ, Bundy C, Bell W, Fitzpatrick AP, Garratt CJ. 2003	Comprehensive cardiac rehabilitation programme for implantable cardioverter-defibrillator patients: a randomised controlled trial.	Heart	1. √ 2. x 3. √ 4. E/B
Fleury J, Lee SM, Matteson B, Belyea M. 2004	Barriers to physical activity maintenance after cardiac rehabilitation.	J.Cardiopulm.Rehabil.	1. x 2. x 3. x 4. E/B
Fragnoli-Munn K, Savage PD, Ades PA. 1998	Combined resistive-aerobic training in older patients with coronary artery disease early after myocardial infarction.	J.Cardiopulm.Rehabil.	1. x 2. x 3. x 4. E
Franklin BA, Swain DP, Shephard RJ. 2003	New insights in the prescription of exercise for coronary patients.	J.Cardiovasc.Nurs.	1. x 2. x 3. √ 4. E/B
Gallagher R, McKinley S, Dracup K. 2003	Predictors of women's attendance at cardiac rehabilitation programs.	Prog.Cardiovasc.Nurs.	1. √ 2. x 3. x 4. E
Giallauria F, Paragliola T, Pilerici F, Del Forno D, De Lorenzo A, Manakos A, et al. 2005	Role of smokers in the household and of cardiac rehabilitation in smoking behaviour after acute myocardial infarction.	Monaldi Arch.Chest Dis.	1. x 2. x 3. x 4. E/B
Glazer KM, Emery CF, Frid DJ, Banyasz RE. 2002	Psychological predictors of adherence and outcomes among patients in cardiac rehabilitation.	J.Cardiopulm.Rehabil.	1. √ 2. x 3. x 4. E/B
Graham H. 2003	A conceptual map for studying long-term exercise adherence in a cardiac population.	Rehabil.Nurs.	1. x 2. x 3. x 4. E/B
A. R. Gregory. 1998.	Cardiac rehabilitation exercise adherence: the influence of exercise benefits, barriers, locus of control, and intrinsic	Rush University, College of Nursing;–	1. √ 2. x 3. x 4.

	motivation	Thesis.	NB – thesis, excluded based on abstract
Gunstad J, Luyster F, Hughes J, Waechter D, Rosneck J, Josephson R. 2007	The effects of obesity on functional work capacity and quality of life in phase II cardiac rehabilitation.	Prev.Cardiol	1. √ 2. x 3. x 4. E
Gupta R, Sanderson BK, Bittner V. 2007	Outcomes at one-year follow-up of women and men with coronary artery disease discharged from cardiac rehabilitation: what benefits are maintained?	J.Cardiopul m.Rehabil.P rev.	1. √ 2. √ 3. x 4. E/B
Hass CJ, Feigenbaum MS, Franklin BA. 2001	Prescription of Resistance Training for Healthy Populations.	Sports Medicine	1. x 2. x 3. x 4. E
Hellman EA. 1997	Use of the stages of change in exercise adherence model among older adults with a cardiac diagnosis.	J.Cardiopul m.Rehabil.	1. √ 2. x 3. x 4. E/B
Hershberger PJ, Robertson KB, Markert RJ. 1999	Personality and appointment--keeping adherence in cardiac rehabilitation.	J.Cardiopul m.Rehabil.	1. √ 2. x 3. x 4. E
T. B. Hong. 2001.	Spouse involvement in cardiac patients' exercise behavior change	Wayne State University; - Thesis	1. x 2. x 3. x 4. E NB – thesis, excluded based on abstract
Hudson J, Symons LM, Bates MD, Stacey PO. 1998	A qualitative analysis of adherence to exercise and cardiac rehabilitation.	J.Sports Sci.	1. x 2. x 3. x 4. E/B
Hughes AR, Gillies F, Kirk AF, Mutrie N, Hillis WS, MacIntyre PD. 2002	Exercise consultation improves short-term adherence to exercise during phase IV cardiac rehabilitation: a randomized, controlled trial.	J.Cardiopul m.Rehabil.	1. √ 2. √ 3. x 4. E/B ***
Hughes AR, Mutrie N, Macintyre PD. 2007	Effect of an exercise consultation on maintenance of physical activity after completion of phase III exercise-based	Eur.J.Cardio vasc.Prev.R ehabil.	1. √ 2. √ 3. √ 4. √

	cardiac rehabilitation.		A
Izawa KP, Watanabe S, Omiya K, Hirano Y, Oka K, Osada N, et al. 2005	Effect of the self-monitoring approach on exercise maintenance during cardiac rehabilitation: a randomized, controlled trial.	Am.J.Phys. Med.Rehabilit	1. √ 2. √ 3. √ 4. √ A
Izawa KP, Yamada S, Oka K, Watanabe S, Omiya K, Iijima S, et al. 2004	Long-term exercise maintenance, physical activity, and health-related quality of life after cardiac rehabilitation.	Am.J.Phys. Med.Rehabilit.	1. √ 2. √ 3. x 4. √ E/B?
Jones M, Jolly K, Rafferty J, Lip GYH, Greenfield S. 2007	'DNA' may not mean 'did not participate': A qualitative study of reasons for non-adherence at home-and centre-based cardiac rehabilitation.	Fam.Pract.	1. x 2. x 3. x 4. E/B
Kärner A, Tingström P, Abrandt-Dahlgren M, Bergdahl B. 2005	Incentives for lifestyle changes in patients with coronary heart disease.	J.Adv.Nurs.	1. x 2. x 3. x 4. E
King ML, Williams MA, Fletcher GF, Gordon NF, Gulanick M, King CN, et al. 2005	Medical director responsibilities for outpatient cardiac rehabilitation/secondary prevention programs: A statement for healthcare professionals from the American Association for Cardiovascular and Pulmonary Rehabilitation and the American Heart Association.	J.Cardiopulm.Rehabil.	1. x 2. x 3. x 4. E
King S, David S, Newton H, Hevey D, Rafferty F, Horgan JH. 2000	The effect of dietary modification on the training outcome and body composition in patients undergoing a cardiac rehabilitation programme.	CORONARY HEALTH CARE	1. √ 2. x 3. x 4. E
LaBresh KA, Fonarow GC, Smith SC, Jr, Bonow RO, Smaha LC, Tyler PA, et al. 2007	Improved treatment of hospitalized coronary artery disease patients with the get with the guidelines program.	Crit.Pathw Cardiol.	1. x 2. x 3. x 4. E
Kovacs AH. 2007	Cardiovascular disease and depression in older men and	Geriatrics and Aging	1. x 2. x

	women.		3. x 4. E
Kronish IM, Rieckmann N, Halm EA, Shimbo D, Vorchheimer D, Haas DC, et al. 2006	Persistent depression affects adherence to secondary prevention behaviors after acute coronary syndromes.	Journal of General Internal Medicine	1. x 2. x 3. x 4. E
La Forge R. 1997	Mind-body fitness: encouraging prospects for primary and secondary prevention.	J.Cardiovas c.Nurs.	1. x 2. x 3. x 4. E
Lane D, Carroll D, Lip GYH. 1999	Psychology in coronary care.	QJM - Monthly Journal of the Association of Physicians	1. x 2. x 3. x 4. E
Lear SA, Ignaszewski A, Linden W, Brozic A, Kiess M, Spinelli JJ, et al. 2003	The Extensive Lifestyle Management Intervention (ELMI) following cardiac rehabilitation trial.	Eur.Heart J.	1. √ 2. √ 3. √ 4. √ A
Leung YW, Ceccato N, Stewart DE, Grace SL. 2007	A prospective examination of patterns and correlates of exercise maintenance in coronary artery disease patients.	J.Behav.Me d.	1. √ 2. √ 3. x 4. E/B
Lichtenberger CM, Martin Ginis KA, MacKenzie CL, McCartney N. 2003	Body image and depressive symptoms as correlates of self-reported versus clinician-reported physiologic function.	J.Cardiopul m.Rehabil.	1. x 2. x 3. x 4. E
Luszczynska A, Sutton S. 2006	Physical activity after cardiac rehabilitation: Evidence that different types of self-efficacy are important in maintainers and relapsers.	Rehabilitatio n Psychology	1. √ 2. √ 3. x 4. E/B
McCartney N. 1998	Role of resistance training in heart disease.	Med.Sci.Sp orts Exerc.	1. x 2. x 3. x 4. E
Moore SM,	Effects of a CHANGE	Ann.Behav.	1. √

Charvat JM, Gordon NH, Pashkow F, Ribisl P, Roberts BL, et al. 2006	intervention to increase exercise maintenance following cardiac events.	Med.	2. √ 3. √ 4. √ A
Moore SM, Dolansky MA, Ruland CM, Pashkow FJ, Blackburn GG. 2003	Predictors of women's exercise maintenance after cardiac rehabilitation.	J.Cardiopulm.Rehabil.	1. √ 2. x 3. x 4. E/B
Moore SM, Ruland CM, Pashkow FJ, Blackburn GG. 1998	Women's patterns of exercise following cardiac rehabilitation.	Nurs.Res.	1. √ 2. x 3. x 4. E
V. Pepin. 2003.	Physical function in older coronary patients: Responses to cardiac rehabilitation	Arizona State University;– Thesis.	1. √ 2. x 3. x 4. NB – thesis, excluded based on abstract
Rozanski A, Blumenthal JA, Davidson KW, Saab PG, Kubzansky L. 2005	The epidemiology, pathophysiology, and management of psychosocial risk factors in cardiac practice: The emerging field of behavioral cardiology.	J.Am.Coll.Cardiol.	1. x 2. x 3. x 4. E
Ruland CM, Moore SM. 2001	Eliciting exercise preferences in cardiac rehabilitation: initial evaluation of a new strategy.	Patient Educ.Couns	1. x 2. x 3. x 4. E/B
Rushford N, Murphy BM, Worcester MU, Goble AJ, Higgins RO, Le Grande MR, et al. 2007	Recall of information received in hospital by female cardiac patients.	Eur.J.Cardiovasc.Prev.Rehabil.	1. x 2. x 3. √ 4. E
Salamonson Y, Everett B, Davidson P, Andrew S. 2007	Magnitude of change in cardiac health-enhancing behaviours 6 months following an acute myocardial infarction.	Eur.J.Cardiovasc.Nurs.	1. x 2. x 3. x 4. E
Schairer JR, Keteyian SJ, Ehrman JK, Brawner CA,	Leisure time physical activity of patients in maintenance cardiac rehabilitation.	J.Cardiopulm.Rehabil.	1. √ 2. x 3. x 4.

Berkebile ND. 2003			E
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