

THE EFFECTIVENESS OF CARDIAC REHABILITATION PROGRAMS IN
FEMALES FOLLOWING AN ACUTE MYOCARDIAL INFARCTION

Submitted by

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We hereby recommend that the research project prepared under our supervision by Katie Carnelia entitled The Effectiveness of Cardiac Rehabilitation Programs in Females Following an Acute Myocardial Infarction will be accepted as partial fulfillment for the degree of Master of Physician Assistant.

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ABSTRACT

Introduction: The incidence of myocardial infarctions (MIs) is increasing yearly in the United States and with it the concurrent morbidity (ie., disability) and mortality resulting from these events. Although once considered a “male” disease, recent epidemiological studies have reported approximately 2.8 million females have a myocardial infarction (MI) each year. While cardiac rehabilitation programs (CRP) have shown success in reducing risk factors for secondary event, the majority of these successes have been reported for male patients. That is, whether or not the same outcomes have occurred for female MI patients as a result of CRP have not been adequately addressed. The purpose of this paper was to review the literature in an attempt to determine if current CRP are equally effective for both genders. Methodology: A systematic review of the literature was performed in order to evaluate the data on the outcome of CRP between genders during the time frame of 1986-2006. Articles evaluated included data on the outcome of CRP between males and females. The following MeSH search terms were used: cardiac rehabilitation, gender differences, females, compliance, effectiveness, myocardial infarction, and heart attack. Results: Twenty-one articles met the inclusion criteria. Nine of the articles directly addressed the outcome of females in CRP while six indirectly addressed outcome based on referral and utilization patterns. Five articles were background articles. Discussion: Based on the literature, CRP are not as effective for females since CRP were developed originally for males. Female clinical profiles vary from males, with females having more comorbidities at an older age, thus CRP fail to address the unique needs of females following a myocardial infarction. This discrepancy may lead to a lack of compliance and failure to adequately improve physically and emotionally following an MI. These findings are significant to determine the importance of developing more applicable and appropriate CRP that

focus on the specific needs of females. This knowledge may enhance females' CR experience, adherence, and outcomes. Limitations of this review include the inability to experience the results directly, the variable methodology of previous studies, and the lack of high quality studies addressing females in CRP specifically. Conclusion: While the incidence of myocardial infarctions is increasing dramatically in females, CRP still fail to understand and address the multidimensional differences between males and females in terms of responding to and adhering to CRP. As a result, this review hopes to shed more light onto the need for CRP more specifically designed to meet the needs of females.

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INTRODUCTION

Myocardial infarctions (MIs) are becoming more common, particularly in females, and often result in costly debilitations or death. Approximately 500,000 people die each year from myocardial infarctions.¹ Once considered a “male” disease,² 2.8 million females currently have a history of an myocardial infarction (MI).³ In order to decrease morbidity and mortality associated with an MI and enhance overall quality of life, cardiac rehabilitation programs (CRP) offer a viable option for improving physical capacity, reducing emotional distress, and modifying risk factors.⁴ Unfortunately, many eligible patients are not referred or do not utilize CRP⁵⁻⁷ despite the demonstrated benefits.^{2,4,7} Understanding the components, purpose, and goals of CRP will help to identify the overwhelming need for people who suffer from a myocardial infarction to participate in such programs. A primary problem is determining if current CRP are as effective for females as for males, and if not, ways to improve CRP.

The focus of cardiac rehabilitation has always tended to favor males,^{8,9} particularly since cardiovascular disease is more often associated with males, despite evidence of cardiovascular disease as the leading cause of morbidity and mortality in both genders.^{8,9} Additionally, research gaps exist since middle aged males are the primary target of most research studies. Males frequently present at a younger age, often in the 5th or 6th decade of life, commonly with the defined, classic symptoms of an MI (chest pain, radiation of pain to the left shoulder, and shortness of breath),^{2,8} while females usually do not present with the same complaints and their symptoms (atypical chest pain and concurrent comorbidities like hypertension and diabetes) do not usually occur until the 7th or 8th decade.^{8,10,11} As a result, the question of CRP effectiveness for females arises. “Optimal treatment is not necessarily the same treatment for all.”^{7,9} Since females are presenting at an older age with somewhat different risk factors and minimal research has focused specifically on women’s health, the physical and cardiac needs of females are often

overlooked or just assumed to be the same as that of males.¹⁰ Therefore, current CRP should be examined more closely to include benefits not only for males but for females as well.

Background: Phases of CRP

Cardiac rehabilitation is a noninvasive, multidimensional⁵ secondary prevention program recommended for patients with a history of cardiovascular disease.^{2, 11} The majority of CRP consists of three distinct phases.¹² The first phase occurs in the hospital almost immediately following a myocardial infarction or cardiac event. The second phase is early recovery and occurs the first few weeks to months following the hospital stay. Finally, the third phase is the maintenance phase that is recommended throughout the life of the patient and consists of regular cardiovascular exercise and healthy lifestyle modifications. The combination of these three phases enhances the quality of life and decreases the patients' cardiac risk factors.

Phase 1

The first phase of cardiac rehabilitation includes patient education and easy, basic daily activities such as sitting up in bed, joint range of motion techniques, and walking. These activities encourage the patient to be active in reducing the harmful effects of the MI and accelerate the ability to perform activities of daily living. It is also the initial opportunity to involve the patient in their own care, in other words, creating patient accountability for their recovery.

Phase 2

The second phase of cardiac rehabilitation starts following hospital discharge and usually lasts up to three months with outpatient rehabilitation sessions two to three times per week. In this phase of therapy, activity levels are increased progressively as tolerated under direct healthcare supervision to ensure patient wellbeing and social support. Additionally, this phase consists of continued patient education and lifestyle changes in diet, smoking, alcohol

consumption, and resuming normal daily activities, as well as addressing any patient-specific risk factors, such as stress and comorbidities.¹²

Phase 3

The final phase of cardiac rehabilitation focuses on long term maintenance. With this phase, the patient attempts to maintain and improve their physical condition as well as the lifestyle modifications addressed during the first two phases of cardiac rehabilitation. The patient is encouraged to continue regular exercise sessions at home or a local workout facility. This phase continues indefinitely in the hopes of reducing the risk of additional cardiac events and associated mortality.

LITERATURE REVIEW

Since the rate of cardiovascular disease and the incidence of acute myocardial infarctions (MIs) are increasing in both males and females, it is vital to evaluate the effectiveness of CRP in terms of gender and identify gender differences in the outcome of CRP. Studies have demonstrated that CRP is an important intervention to reduce the risks of further myocardial incidences.¹⁰ In addition, guidelines have recommended that CRP should be initiated for patients following an MI.^{4, 13, 14} Studies have also shown that a large portion of female patients are either not being referred or are inadequately utilizing CRP.^{2, 5, 13} As a result, the positive benefits of CRP for males may not or are not being achieved by female patients. For the general population, the benefits of CRP include improved confidence, risk factor reduction, and a lower rate of MI recurrence⁴ as well as improving quality of life^{6,11,12} and prolonging lifespan.² Therefore, low participation rates in CRP may inhibit female patients from not only realizing or understanding the health benefits of CRP, but may also prevent them from improving their existing cardiovascular condition,⁷ leading to higher morbidity and early mortality.

As acute MIs become more common, finding ways to improve overall quality of life and decrease reoccurrences following a cardiac event become important. Cardiac rehabilitation is a secondary prevention program that addresses the multifactorial dimensions of healing following a cardiac event, although many patients believe it is merely an exercise regime. Physical, education, counseling, and behavioral lifestyle components are generally included in a standard cardiac rehabilitation program.^{5,14, 15} The goals of cardiac rehabilitation are to: 1) bring patients back to a functional level in order to continue and complete activities of daily living; 2) alleviate symptoms, such as shortness of breath and chest pain, upon moderate physical activity; and 3) reduce or better control risk factors for further myocardial damage, such as obesity and hypertension.¹⁴ However, determining if males and females experience equal benefits from participation in cardiac rehabilitation is difficult to differentiate.¹³ The main reason for this difficulty is the shortage of quality studies addressing cardiac rehabilitation that have included females as well as presentation differences in gender profiles following an MI.

Gender Differences in Clinical Profiles

Females suffering from an MI differ from their male counterparts in the following characteristics: demographic, physiologic, medical profiles, exercise capacity, and psychosocial. When considering demographic characteristics, females tend to be older^{9,11, 14, 16, 17} and living alone (i.e., widowed).¹¹ With respect to physiologic characteristics and medical profiles, females have more documented comorbidities¹⁸ such as hypertension^{7,9,11}, diabetes^{7, 11, 18} and hyperlipidemia.^{11, 14} Females typically have lower exercise capacity¹¹⁻¹³ as well as lower exercise tolerance than men.⁵ In the psychosocial domain, the literature suggests that on entering CRP, females have less social support¹⁹ and lower self-esteem^{10,11} related to body image and ability to modify health behaviors. In quality-of-life domains, females have reported lower energy levels¹² and more functional and psychosocial problems.^{5-7, 10, 11} In summary, upon entry

into CPR, females are older, more likely to present with multiple pre-existing medical conditions, possess lower exercise capacity, have less social support, and higher levels of psychological distress along with reduced quality-of-life.

Gender Differences to CR Referral Patterns and Utilization

Although males and females benefit from CRP, referral and utilization patterns differ between genders. Females are generally less knowledgeable about CRP, referred less commonly^{11, 13, 16} to CRP and are less likely to participate when referred.^{11, 15-17} When females are enrolled, they are more likely to miss sessions than males.^{10,11} In summary, females are underrepresented and are less adherent to CRP.

Gender Differences in CR Outcomes

The outcomes of CRP appear to differ between genders. CRP outcomes are based on risk factor modification, enhanced exercise capacity, and improved quality of life. There is some support in the literature that males often improve with respect to body mass, body fat, and lipid profile¹¹ while females have shown improvement primarily only in body fat reduction.^{11, 12} With respect to exercise conditioning, both males and females show steady physical capacity improvements.^{12, 14} Additionally, the knowledge of physical limitations improved following completion of CRP.²⁰ However, gender differences in psychological improvements in anxiety and depression^{10,11} and quality of life factors^{11, 12, 21} are not very clear. In summary, there is evidence to suggest that, in general, CRP improves exercise capacity and quality of life while reducing negative effects of risk factors. However, whether or not these improvements are similar for both genders has not been clearly established by the literature.

PURPOSE OF THE STUDY

Whether or not current cardiac rehabilitation programs (CRP) are as effective for females as they are for males is unknown since it has not been adequately addressed with quality research

studies. Therefore, the purpose of this study is to review existing literature addressing the effectiveness of CRP following an acute MI in females and to examine gender differences in three areas of CRP: 1) baseline clinical profiles at CRP entry; 2) referral patterns and utilization; and 3) outcomes and possible changes in approach to females.

METHODOLOGY

A systematic literature review was performed to identify quality, evidence based studies that address the effectiveness of CRP and gender differences of three areas of CRP including clinical profiles, referral patterns and utilization, and outcomes. Articles included in the study were related to female inclusion in or referral to CRP and the resulting effectiveness in CRP outcomes following a myocardial infarction. The following electronic databases were searched: MedLine, CINHAL, PyschInfo and Cochrane. The databases were searched for articles which met the inclusion criteria from 1986-2006. The following MeSH terms were used: cardiac rehabilitation, gender differences, compliance, effectiveness, myocardial infarction, heart attack, women, females and outcomes. Each study was reviewed for quality and application to the current question of interest.

RESULTS

From 1986-2006, twenty-six articles were analyzed for inclusion criteria. Raw data can be seen in Appendix A. Of those articles, twenty-one articles met the inclusion criteria as previously described in the methodology. Results of the literature are outlined in Figure 1. Since all the articles did not directly address specific gender differences in CRP outcome, some of the articles were still included if they indirectly related to gender outcomes. However, five of the total twenty-six articles analyzed were excluded for lack of relevancy to the research question or the outcome was not divided by gender. These excluded articles can be seen in Appendix B.

Nine of the articles related directly to gender outcomes and results of CRP.⁶⁻¹⁴ These articles addressed specific parameters of CRP, such as functional capacity, emotional changes, anxiety, quality of life, and coping with stress. Of these articles, three articles fell under a level 1 evidence while five were level 2 and one was level 3.

Six of the articles indirectly addressed CRP results through referral and utilization patterns.^{2, 4 5, 15-17} Only one of these articles is level 1 evidence while four are level 2, and one is level 3. These articles primarily focused on referral and utilization rates for CRP between males and females. Each of these articles support the problem that females are less likely than males to be referred to, utilize, or adhere to CRP. Therefore, females are not experiencing the potential benefits of CRP.

Six of the articles contained background information regarding CRP.^{1, 3, 18-21} The background articles were included to help support the magnitude of the issue. Each of these articles illustrates the need for MI patients to use CRP, however they do not specifically address the outcome differences between genders. Despite being background articles, one of the articles represent level 1 evidence, four were level 2, and one was level 3.

Based on the division of the levels of evidence, along with the separation of categories of results based on direct and indirect outcome, the overall grade of this review is a B.

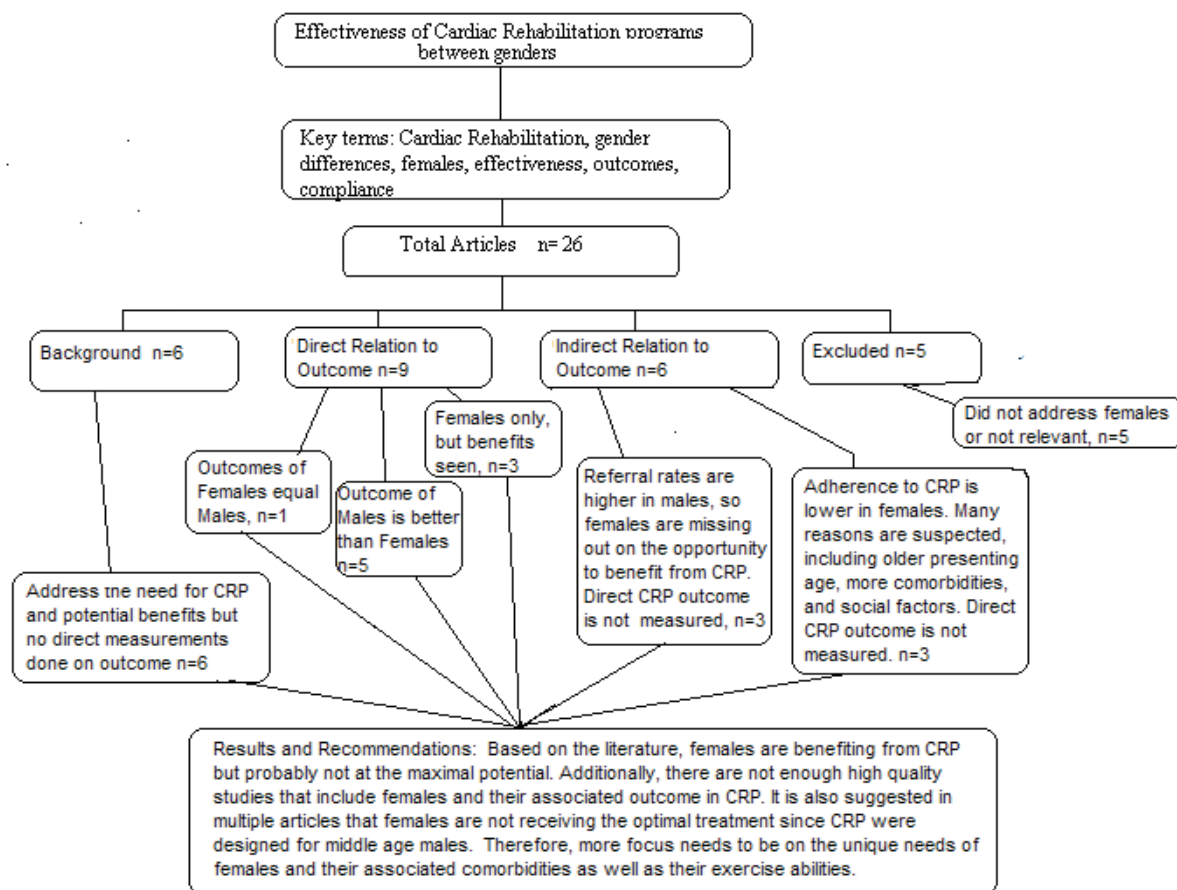


Figure 1: Result of the Literature Review Flow Sheet

DISCUSSION

Evidence in Literature

The results of the literature suggest that females benefit from CRP, although not to the same degree as males.^{5, 7, 12, 14} Some articles even suggest that females may benefit from CRP more than males since they start at a lower functional capacity with more comorbidities.^{5,7,12,14} The literature strongly supports the need of CRP for females in order to have maximal cardiovascular benefits following an MI.^{5, 7, 11} Areas of improvement include physical, such as functional or exercise capacity,^{1,7,8,11,12,14,21} emotion, such as stress adaptation,^{8, 11, 21} and psychological, such as lower levels of depression and anxiety.¹¹ Additional aspects of life

enhanced by participation in CRP include quality of life^{1, 7, 11, 12, 21} and reduction of risk factors.
9, 11

The manner in which females are treated following an MI is also an area of concern which was a theme addressed in many of the articles. It is suggested that females are treated less aggressively than males,^{2, 8, 13} although no definitive reason is documented except possibly that females present atypically with smaller vessels, making surgical intervention more difficult to perform and complete successfully. In addition, since current CRP were originally designed for middle aged men,^{8,9,14} females, since they present at an older age with more emotional and physical limitations, will likely benefit to a greater degree from a CRP designed specifically to meet their unique needs.^{5-7, 9, 12, 16}

Therefore, the literature supports the need for female participation in CRP; however, these current programs need to be adapted and modified to treat the female patients not just their myocardial infarction and associated comorbidities. Programs should address the insecurities of females as well as their physical shortcomings and emotional limitations.

Weaknesses/Gaps in the literature

A significant area of weakness is the exclusion of the guidelines and requirements of the CRP, although multiple studies indicate that current CRP are designed for males. Without knowing the particulars of the programs in relation to the gender outcomes of the program, it is difficult to discern the optimal approach for improving CRP to better suit and benefit females. Therefore, it is likely that females are not receiving the best opportunity to make a more complete recovery to a normal lifestyle and reduce the risk of suffering a subsequent cardiac event.

The primary gap in the literature seen throughout the majority of the articles is the failure of the studies to focus primarily on the outcome and needs of females in CRP. Many of the

studies revolved around males despite evidence that females also need and deserve the opportunity to benefit from CRP in order to enhance quality of life following an MI. Another considerable gap in the literature is the lack of high quality studies available. It was difficult to locate a randomized controlled trial study that included females' response to current CRP; therefore, more research is needed to further address the concern.

Validity of the review

This review was completed using a systematic approach to a variety of reputable databases. Upon completion of the search, peer reviewed articles were selected for inclusion based on the criteria outlined in the methodology. The articles were then graded based on the quality and level of evidence. The results in Figure 2 represent the breakdown, by percentage, of articles included in the review, based on level of evidence.

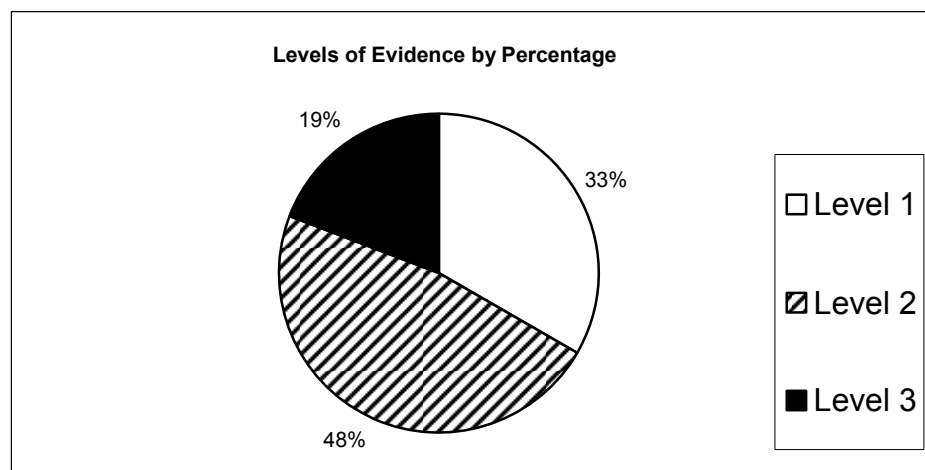


Figure 2: Articles divided by Levels of Evidence

Figure 2 illustrates that 33% of the articles were level 1, 48% were level 2, and 19% were level 3. The overall grade that can be applied to this review is a B since most of the articles have a level of evidence of 2 and 3; indicating more high quality studies are needed. In addition to the twenty-one articles included in the study, five articles were excluded for not meeting inclusion criteria. A comprehensive listing of all articles reviewed can be seen in Appendix A.

Weaknesses of the Review

In order to help support the findings of this review, it is necessary to evaluate the shortcomings of the validity of the literature review. First, a wider variety of databases could have been used in order to determine if additional articles were available. Secondly, more of the articles referenced in the inclusion articles could have been researched in an effort to find more articles that addressed the research question. Third, the names of the articles and journals could have been blinded in order to prevent any bias towards a particular article. Finally, inclusion criteria could have been more strict, eliminating any article that did not directly relate to CRP outcome. Excluding those articles, however, would have severely limited the number of inclusion articles since many high quality articles that evaluate females' outcome in CRP do not exist.

CONCLUSION

While the incidence of MIs is increasing in females, CRP offer a way to better understand cardiac disease and ways to evade, or at least reduce, the associated harmful effects in both females and males. However, the present CRP practices still fail to understand and address the multidimensional differences between females and males in terms of responding to and adhering to CRP. Since clinical profiles vary from females and males in that females present at an older age with more comorbidities, a more specialized CRP for females may be more effective.^{5-7, 9, 12,}

¹⁶ As was illustrated in this review, there is noticeable support for the use and adherence to CRP in that females do benefit from CRP, although the extent is unclear since females have not been the focus of many high-quality studies. Therefore, it is important for health care professionals to recognize the unique needs of females so optimal cardiac rehabilitation opportunities are encouraged in order to minimize the negative effects of MIs and the associated comorbidities.

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APPENDIX A

Raw Data

Study and Year	Grade	Level of evidence	Methodology & Demographics	Findings	Critical Analysis
Ades et al. 1992	B	Retrospective, nonrandomized	226 Consecutive patients after MI or CABG enrolled in CRP	Increase in peak aerobic capacity similar between males and females. Physician recommendation is the most significant predictor of CRP completion, although males are referred more often than females	More vigorous encouragement is aimed at males despite the possibility females benefit more from CRP since their condition is often more severe at presentation
Benz Scott et al 2002	C	systematic literature review	Review of 23 published, peer-reviewed articles about women's referral, enrollment, and completion of CRP	Women often miss out of life saving CRP due to age, cost, and low referral rates.	A wide variety of facets influence involvement or lack thereof in CRP. It is the responsibility of health care providers to evaluate the needs of each patient
Beswick et al 2004	B	systematic literature review	A variety of databases were reviewed from 2001 to present. 957 relevant articles were chosen	Women are often left out of CRP, although it is recommended for all MI patients. It is suggested current CRP should adapt to meet the needs of women.	Although this article illustrates the need for intervention to improve adherence to CRP, no direct methods have been identified to do such thing.
Burell et al 2002	B	pilot study	20 2-hour group sessions over 1 year with 5-9 cardiac patients per session, for psychosocial intervention	Low dropout rate with quality of life improvement and decreased stress and exhaustion	Addressing psychosocial issues helps enhance physical health in patients with cardiac disease
Clark et al 2005	B	realist study	47 participants in CR in Scotland	Positive effects of CRP were related to social aspects, such as patient camaraderie, and body focus, such as knowledge of physical barriers	Promoting confidence in the patients will help maintain the lifestyle changes associated with CRP.

Cooper et al 2001	B	systematic review of literature	Review MEDLINE, PSYCINFO and CINAHL databases from 1978-2001 for literature that included at least one predictor variable	All eligible patients are not offered CRP. However, non-attenders of CRP are likely to be older with more severe illness and lower income.	Attendance may improve by physician recommendation and addressing CRP misconceptions. Since this is a universal disease, gender and cultural barriers should be considered to implement an appropriate program
Deshotels et al 1995	B	Descriptive, comparative	215 CR patients were given questionnaires on QOL	Morbidity, including depression, is higher in women after MI or revascularization. Social norms may discourage women from participating in CRP.	Intervention and CRP should be gender not disease specific and CRP for females should focus on family support and depression reduction.
Evenson et al 1998	A	Prospective	3,841 patients on AMI Registry in Minnesota were contacted by phone for interview 1 year after hospitalization	Females were less likely to use CRP	Tailoring CRP to fit needs of females, such as family support, may increase compliance with CRP utilization and completion
Fridlund 2000	A	non random	12 month pre/post test of 240 Swedish women after 1st MI to evaluate medical and behavioral components	50% took part in CRP. Those in CRP reported more angina and less emotional support. Both groups engaged in behavioral changes to reduce risk factors and normalize BP	CRP are not designed for women. Increased reports of angina may be due to better knowledge and understanding of symptoms.
Halm et al 1999	C	Comparative	Convenience sample of 87 were selected over 12 months with angina, MI, or CABG were enrolled in CR	For Phase II CRP, more females were eligible but more males were referred to and completed CRP	Better education for understanding that CRP is multifaceted and its vital to tailor CRP to women's needs and risk factors: increased adipose tissue, Tg levels, and limited exercise knowledge

Heid et al 2004	B	Comparative descriptive	592 Charts were reviewed with 202 included as well as interviews of the participants	Females involvement in CR was influenced by: desire for better health, social factors, CR misconceptions, and timing	Since referral rates are similar between genders but utilization is not, changes need to be made to ensure women are physically and emotionally ready to prioritize their health.
Jackson et al 2000	B	exploratory descriptive	Convenience sample of 10 participants interviewed 7, 14, 21 days post hospital discharge	The key cause for concern is the lack of reliable information, although all patients engaged in effective introspection and emotional development throughout the study.	CRP are a great opportunity for social support but there may be a preference for all female groups. Overall, CRP effects on women are relatively unexplored and poorly understood.
Johnson et al 1999	A	Randomized control trial	Comparison of inpatient care with normal care and extended program with follow up at 2 weeks and 2,6, and 12 months	Inpatient care improved knowledge, lowered anxiety/depression, and increased satisfaction with treatment. Extended program care also showed additional benefits.	By involving patients with their own treatment and getting them started early, the benefits of CRP may be maximized.
Lavie et al 1995	B	Retrospective, nonrandomized	458 Consecutive patients in Mass. Enrolled in Phase II CR after a major cardiac event	Females had significant improvement in percent body fat, exercise capacity and QOL, but no improvement in lipids or BMI. Similar improvements as males. Peak HR higher in men, likely due to more effort exerted	CRP valuable for both males and females, maybe more for females since they have lower functional capacity to begin with. Need more emphasis on lipid and depression control. More vigorous encouragement for CR.
Lavie et al 1999	B	Prospective	102 women with cardiac disease after CRP completed questionnaires related to depression and QOL	Number of depressed women dropped following completion of CRP	Involving patients in their own health care has been shown to enhance recovery.

Lerner et al 1986	A	Retrospective, Cohort	Review of 1240 patients with CHD from the Framingham population after 26 years of observation	Females constituted 40% of CHD but a 40 fold difference between age extremes while males made up 60% with a 6 fold difference. Larger proportion of unrecognized MI in females. MI more common in men, angina in women	Important to catch female CHD early because risk of morbidity and mortality higher with increased age
Michie et al 2005	C	Questionnaire	62 patients were followed up at 2 months and 29 patients were followed up 8 months post CRP	Patients showed an increase perception of control over their illness, more confidence to control risk factors, and decreased anxiety/depression.	Long term effects of CRP may improve distress and enhance the benefits of physical health.
Mitchell et al 1999	C	cross sectional	6 patients from a YMCA in Idaho were interviewed post cardiac event to evaluate strategies to overcome barriers	Participants did not find ways to overcome barriers but rather found ways to ensure continued participation	Further research is needed. However, patients and health care providers must work together to set goals and enhance improvement and patient independence
Moore et al 2003	B	Prospective, longitudinal, descriptive	64 women were chosen for a 1-hour interview	Only 48% exercised 3 months post CRP while 25% did not engage in exercise at all post CRP. Barriers and benefits are predictors of total amount of exercise	To enhance effects of CRP, maximize social support and overcoming barriers to exercise.
Oldridge et al 1991	A	Randomized control trial	201 Low risk patients with depression or anxiety were randomly put into group for exercise/behavioral intervention vs. Conventional care for 8 week intervention	Consistently small but better improvements for the rehab group over the convention care group	Confidence boosters and risk reduction supplement the rehab group, offering opportunity for more significant improvements in less time
Schuster et al 1991	B	exploratory descriptive	101 patients given questionnaires to evaluate exercise tolerance, self-efficacy, and anxiety	Females scored worse in all areas: exercise tolerance, self-efficacy, and anxiety.	CRP needs better focus on the differences between males and females.

Thompson et al 1997	A	systematic review of literature	Review MEDLINE and CINAHL databases from 1986-1996 for literature that included original research or literature reviews	Benefits of CRP are similar for both men and women. However, current CRP focus on the needs of middle class, caucasian males.	Further research needs to address the specific needs of females.
Todaro et al 2004	A	systematic review of literature	Review MEDLINE and PsychLit from 1965-2002 for articles addressing gender differences in referral patterns to CRP	Women present with more severe medical conditions, underutilize CRP, and are less informed. While women and men have some similar benefits of CRP, such as quality of life, men show greater improvements in some physical components, such as BMI.	Although it is clear that women and men both benefit from CRP, perhaps greater benefits are seen with men since CRP were designed around the needs of men.
Williams et al 2004	B	Retrospective look at medical records	1595 patient charts were reviewed to evaluate differences in treatment between males and females	In general, women, who often present at an older age, receive less intense treatment, including fewer thrombolytics or heparin therapy and had a higher 30 day mortality rate compared to males.	Differences in therapy is likely related to age presentation.
Willich et al 2001	B	Prospective study	2441 consecutive patients were enrolled in 18 inpatient rehab centers	Benefits of CRP were only partially maintained during the first year post MI/CABG/PCTA, perhaps by lack of treatment coordination.	There is an obvious need to have better long term control of risk factors and maintenance of physical improvements post CRP.
Yates et al 2003	B	cross sectional	222 Surveys to compare CR participants versus non-participants	Patients using CRP had better modified risk factors, less stress, and were more involved in exercise programs. Patients were more likely to use CRP if referred by their physician.	Health care providers need to take a more active approach in involving their patients in CRP, which helps the patients feel more in control of their disease.

APPENDIX B
Discarded articles

Johnston M, Foulkes J, Johnston D, Pollard B, Gudmundslottir H. Impact on patients and partners of inpatient and extended cardiac counseling and rehabilitation: A controlled trial. *Psychosomatic Medicine*. 1999;61:225-233.

Michie S, O'Connor D, Bath J, Giles M, Earll L. Cardiac rehabilitation: The psychological changes that predict health outcome and healthy behaviour. *Psychology, Health & Medicine*. 2005;10(1):88-95.

Oldridge N, Guyatt G, Jones N, et al. Effects on quality of life with comprehensive rehabilitation after acute myocardial infarction. *Am J of Cardio*. 1991;67:1084-1089.

Williams R, Fraser A, West R. Gender differences in management after acute myocardial infarction: Not 'sexism' but a reflection of age at presentation. *J of Public Health*. 2004;26(3):259-263.

Willich S, Muller-Nordhorn J, Kulig M, et al. Cardiac risk factors, medication, and recurrent clinical events after acute coronary disease. *European Heart J*. 2001;22:307-313.

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