WOMEN'S PHYSIOLOGICAL RESPONSES TO A 10 WEEK CARDIAC REHABILITATION PROGRAM

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THESIS FINAL ORAL DEFENSE FORM

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The candidate has successfully completed the thesis oral defense.

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This thesis is approved by the College of Health, Physical Education, and Recreation.

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ABSTRACT

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This study investigated the effectiveness and overall satisfaction of a pilot cardiac rehabilitation program designed for women. The study looked at changes in functional capacity and endurance, body composition, and blood lipids. Ten female cardiac patients who were at least 3 months post cardiac event volunteered to participate in the program. Subjects exercised 3 days per week for 60 minutes at 40-60% of HRR determined from a symptom-limited GXT. Subjects underwent an identical battery of tests before and after the program. The tests were a 6 minute walk test, a single stage treadmill test, body fat via skinfolds, and blood lipids. At the completion of the program a 3 part questionnaire was also completed to determine perceived satisfaction and adherence, and to assess general preference to participate in a cardiac rehabilitation program. Results were compared with paired t-tests. There were significant improvements ($p < .05$) in body fat, predicted VO_2, and distance walked in the 6 minute walk test. Body fat decreased 7.9%, predicted VO_2 increased 12.2%, and 6 minute walk distance increased 5.8%. There were no significant differences ($p > .05$) in body weight, total cholesterol, HDLs, LDLs, and triglycerides, however small improvements were seen in all of the variables. Family obligations and clinical depression were the reasons for two women to dropout of the program. The women enjoyed the activities offered, felt the time and location were convenient, and felt no significant changes should be made to the pilot program. These findings indicate that a similarly designed program can positively improve outcome measures, and increase perceived satisfaction and compliance in women who participate in cardiac rehabilitation.

DEDICATION

I would like to dedicate this poem written by my loving mother who has encouraged and supported me throughout my life. I love you.

HURRAH! CARRIE DALLMANN AND KERRILYN HAYES

Hurrah, for Carrie Dallmann and Kerrilyn Hayes
The, "La Crosse Tribune," has printed an article with praise
These graduate students are conducting a study
They want to mold your heart and not with silly-putty

They promote cardiac rehabilitation after a heart attack
They state the necessities and simple facts
Surveys show, men outnumber women three-to-one
Why should the males have all the fun!

The UWL women's program runs for ten weeks
Come In! Look Around! Take a Peek!
Thirty-five or older is the age
Cut this out of the newspaper and save this page

Documented heart disease or surgery is a must
That is why, we are having all this fuss
In the program you need faith and trust
Willing to exercise is also a must

You also will need a body fat test
Have your cholesterol checked, along with the rest
Stand still ... I think not, we run
Some days inside and others outside in the sun

This program will give you perception and glim
Well needed determination and discipline
Exercise .... Your never to late
Just look at it as fun and like out on a date

So Kerrilyn and Carrie Ann .....
The writer of this poem is your, "Number One Fan"
Maybe, one day we'll all see you on, "C-Span"
Or even in a science book along with the wise
To me that will be no big surprise ....
Because you two wonderful kids, have the skills to rise

So for the line in the song, "Carrie Ann"
What is your game?
Cardiac Rehabilitation will be your fame
And that everyone should know your name
We can only think, I'm sorry for those, if they can't see
That life could be as good for them, as it is for you and me

ACKNOWLEDGEMENTS

As I sit here and think back on all the hard work and frustration I have gone through this year, it is nice to finally close this chapter of my life. It has been a challenging yet rewarding year for myself and the many dear people who have supported and encouraged me throughout this past year. My family and friends, committee members, and subjects should all be acknowledged for being apart of this long process.

Dr. John Porcari, thank you for supporting me and providing the opportunity to continue the needed research on women and heart disease. The completion of my thesis would not have been possible without your guidance.

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Just mentioning the subjects that were involved in this study is not enough. Their diligence and open-mindedness throughout the 10 weeks of the program will always be

remembered. God bless you with happiness and good health throughout your lives.

To my dear friend Kerrilyn, all I can say is we did it! You were a great partner, much success in the future.

Finally I would like to thank Dawn, Steve, and Stephanie for keeping a roof over my head, my sister Vicki for her positive thoughts and encouragement, my mother and father for all their loving care, and my boyfriend Bruce for always being there for me. Thank you again, I love you all!

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INTRODUCTION

Cardiovascular disease is the leading cause of death in men and women. Of those with heart disease, 52.2% are male and 47.8% are females.[1] Several studies have found that mortality and morbidity rates are higher in women compared to men during surgery and during the first weeks after surgery.[2,3] Also, 39% of women who have heart attacks die within one year of the event compared to 31% of men.[1] Because of the increased incidence of heart disease in women and the higher chance of mortality, heart disease can no longer be considered primarily a man's disease.

Cardiac rehabilitation is an essential part of the healing process for individuals who suffer from a wide variety of cardiac-related illnesses. The primary focus of cardiac rehabilitation is to restore optimal health in individuals with heart disease relative to each patient's physical, mental, emotional, and vocational goals and limitations.[4]

The American Association of Cardiovascular and Pulmonary Rehabilitation recommends a supervised exercise program which starts with extensive ECG monitoring and eventually shifts to intermittent or self-monitoring. The ultimate goal of cardiac rehabilitation is to progress an

individual towards an independent self-managed program where the individual feels confident with all aspects of their disease.

A supervised cardiac rehabilitation program offers group support, professional monitoring and feedback, access to a variety of exercise modalities, and increased patient surveillance. However, not all patients will be able to, or wish to, participate in a supervised cardiac rehabilitation program because of expense, scheduling flexibility, and various other reasons.[5,6]

Some of the benefits of cardiac rehabilitation include improvement in functional capacity,[6-12] reduction in body weight,[12,13] improved psychosocial functioning,[14,15] and improved lipoprotein patterns.[13,16-18] A 20-25% lower mortality rate also has been reported in individuals who attended cardiac rehabilitation compared to individuals who did not.[19,20]

Cardiac rehabilitation seems to benefit men and women equally, however, less than 25% of participants are women. A primary determinant of why women are less likely to attend cardiac rehabilitation is the lack of physician referral. On the average, women are 25% less likely to be referred to cardiac rehabilitation compared to men.[6] A women's age, health status, family obligations, and lack of transportation are other major reasons why women are less likely than men to attend cardiac rehabilitation.[5,6,21]

Even when women do enroll in cardiac rehabilitation programs, typically they have higher dropout rates and lower attendance rates compared to men.[11,22] The major reason for women to dropout of cardiac rehabilitation is family obligations.[11,22] Women tend to be more oriented toward family commitments and want to return to their role as homemaker as soon as possible. Women are also much more likely to dropout of cardiac rehabilitation because they have a dependent spouse, have a diagnosis of arthritis, and do not own or drive a car.[11,22]

The cardiac risk factor profile differs considerably between men and women.[6,11,13,18,22,23] Women tend to have a lower functional capacity,[6,11,13,18,22] higher cholesterol levels,[11,13,18,24,25] higher percentage of body fat,[6,11,13,18] and higher incidence of diabetes compared to men.[11,26] Women also have a poorer psychological outlook compared to men.[27,28] Two recent studies found that women were psychosocially affected to a greater degree by their disease, and suffered greater psychosocial dysfunction, emotional instability, and reported a lower overall quality of life.[27,28] These studies suggest women would benefit the most from a cardiac rehabilitation program because of their poorer risk factor profile and psychological outlook.

Because women differ considerably with their risk factor profile and would benefit the most from a cardiac rehabilitation program, cardiac rehabilitation programs

should make every effort to meet the needs of women. Typically, cardiac rehabilitation program design has centered around the rehabilitation of the younger male population; however, changes in program design need to be considered to target the ever growing patient population of women over the age of 65. The purpose of this study was to pilot test a cardiac rehabilitation program designed specifically for women and to test the effectiveness and overall satisfaction with the program. Outcome measures investigated potential changes in functional capacity, body composition, blood lipids, and psychological functioning. Drop out rates and exercise adherence rates were also monitored and compared to national standards.

MATERIALS AND METHODS

Introduction

This study was part of a larger study which investigated the effectiveness and overall satisfaction of a pilot cardiac rehabilitation program designed especially for women. This study looked at changes in functional capacity and endurance, body composition, and blood lipids. A separate investigator measured the changes in psychological functioning.

Subjects

The original sample consisted of 12 women, 39-82 years of age, who were at least 3 months post cardiac event. Six of the subjects had a diagnoses of coronary artery bypass grafting (CABG), two had a diagnoses of stable angina, two had a diagnoses of a myocardial infarction (MI), one had a diagnoses of cardiomyopathy, and one had recently undergone a heart transplant. Subjects were identified by referrals from physicians at Lutheran-Gundersen and Franciscan Skemp Medical Centers in La Crosse, and through an article in the local La Crosse newspaper. These individuals were contacted by telephone to determine if they were appropriate candidates and if they were interested in participating in the study. They were interviewed on the phone and answered a preliminary questionnaire, designed specifically for this

study (see Appendix A). All interested subjects attended an information meeting which explained the purpose of the program and recruited potential participants into the program.

Testing

Prior to the beginning of the study, human subject approval was obtained from the Institutional Review Board at the University of Wisconsin-La Crosse. Subjects signed an informed consent document (see Appendix B), received written permission from their primary physician, and completed a health history form prior to undergoing testing or training procedures (see Appendix C).

Subjects underwent an identical battery of pre- and posttests. These tests measured functional capacity and endurance, body composition, and blood lipids. Psychological function was measured, but was tested by the other investigator involved in this study.

On the first day of testing, the subjects reported to the Human Performance Laboratory in Mitchell Hall for body composition analysis, to fill out the psychological questionnaires, and to perform a submaximal treadmill test. On the second day, all subjects reported to the laboratory in a 12 hour fasting state for the blood lipid analysis. During the first week of the program, all subjects also underwent a submaximal walking test.

Functional Capacity

All subjects completed a physician supervised, symptom-limited maximal exercise test prior to starting the program if they had not had one in the last 6 months. This test was conducted by a physician at the patient's respective clinic, and all testing was completed using the modified Bruce protocol. Throughout the test, the patient's ECG was monitored continuously and blood pressure was measured at the end of each 3 minute stage. If any abnormal signs or symptoms occurred a physician was present to stop the test. Based on the results of the test, the patient's primary physician determined if the individual could participate in the program.

Single Stage Treadmill Test

The single stage treadmill test is a submaximal test which predicts VO_2max and measures cardiorespiratory fitness.[29] This test required the subjects to walk on a treadmill at a self-selected speed and at a 5% grade for 4 minutes. Prior to the test, subjects were instructed on the purpose and procedures of the exercise test, and height and weight were measured in centimeters and kilograms, respectively. All subjects were hooked up to a Polar Vantage XL heart rate watch and monitor that monitored heart rate continuously throughout the test. The monitor was strapped across the subjects chest and the watch was placed on the side bar of the treadmill for easy viewing by the

experimenter. Stretching exercises and a 3 minute warm-up at a self-selected speed on the treadmill were completed before the test began. Once the warm-up was completed, the subject was encouraged to complete the protocol mentioned above. Heart rate, blood pressure, and RPE [30] were recorded every minute during the test. At the end of the 4 minute period, the treadmill speed was reduced to a lower level for the 3 minute cool-down phase. After the cool-down period, the subject stepped off the treadmill and rested in a chair until their heart rate came within 10 beats of their resting value. If at any point or for any reason the subject was unable to finish the test, trained personnel were present to terminate the test. A crash cart and trained personnel were present at all times during the testing. The following equation was used to predict VO_2max:

VO_2max ($ml \cdot kg^{-1} \cdot min^{-1}$) = 48.3502 + 10.0651 * gender (0 = female; 1 = male) - 0.2769 * age (years) - 0.2088 * weight (kg) + 10.1168 * speed (mph) - 0.1635 * submaximal heart rate (bpm)[29]

Body Composition Analysis

Subjects had their body fat determined using skinfold measurements. Skinfolds were measured on the right side of the body with a Lange caliper. The equation of Jackson, Pollock, and Ward was used to predict body fat and required skinfold measurements at the site of the triceps, suprailiac, and thigh regions.[31] The mean of three trials was used in the analysis. All skinfolds were taken by the

same investigator prior to and at the completion of the program.

Blood Lipid Analysis

Subjects reported to the Human Performance Laboratory in a 12 hour fasting state. A venipuncture blood sample was obtained by a trained phlebotomist who followed all necessary precautions required when handling blood. Total cholesterol, HDL cholesterol, and triglycerides were measured using a Kodak Ektachem DT-60 analyzer.

The formula below was used to calculate LDL cholesterol:

LDL = total cholesterol - (HDL + 1/5 triglycerides)

6 Minute Walk Test

All subjects completed a 6 minute submaximal walk test.[32] Subjects walked on a 80 meter track as far as they could in a 6 minute time period. Distance was measured in meters. Heart rate and blood pressure were recorded pre- and posttesting. At the completion of the program pre- and posttest distance were compared to determine changes in endurance.

Training

The training program was 10 weeks in duration. Actual exercise sessions were conducted by an exercise physiologist and a registered nurse. The emergency protocol of the La Crosse Exercise and Health Program phase III/IV Cardiac Rehabilitation program was followed which required a full

crash cart to be present at all times. Both staff members were certified in Advanced Cardiac Life Support (ACLS) and were present at all times.

All sessions were held either at the Mitchell or Wittich Hall track or pool areas on Mondays, Wednesdays, and Fridays from 10:00 - 11:00 a.m. All subjects were encouraged to attend at least 85% of the available sessions offered. The activities offered included indoor track walking, low impact aerobics, water aerobics, weight training with light handweights and dynabands, toning classes, and stationary bicycling.

An appropriate individualized program was prescribed according to the subject's current level of fitness, graded exercise test, and current health status. A target heart rate corresponding to 40-60% of the maximal heart rate achieved on the graded exercise test was calculated for each individual.[33] Each subject was taught to monitor their own heart rates and use the Borg rating of perceived exertion (RPE) scale to self-regulate exercise intensity.[30] Staff assisted individuals who were unable to monitor their heart rates accurately. Blood pressures and heart rates were taken at the beginning and end of each session, and recorded on an exercise card. Physiological abnormalities that occurred during the exercise session were promptly reported

to the subject's physician. In addition, patient education on various topics were conducted on a weekly basis.

Each exercise session included an appropriate warm-up for 5-10 minutes, a 30 minute aerobic phase, and a 5-10 minute cool-down. Warm-up and cool-down stretches were varied according to the activity offered and the fitness level of each individual. At various times during the class a 10-15 minute patient education topic was offered. Topics were presented according to feedback received from the education priority questionnaire (see Appendix D).

Program Evaluation

After the completion of the 10 week program, a three part questionnaire was completed by all subjects to evaluate the pilot program, to determine perceived satisfaction and adherence with the program, and to assess general preferences for participating in a cardiac rehabilitation program (see Appendix E).

Part one of the questionnaire used a modified version of the 35-item instrument, the Cardiac Rehabilitation Preference Form (CRPF), developed by Moore et al.,[34] to assess general cardiac exercise program preference. Parts two and three of the questionnaire used a combination of Likert-scale items and open-ended questions to evaluate the pilot program, and determine adherence and patient satisfaction. This questionnaire was developed especially for this study, and selection of the questions were based on

a review of literature on patient adherence and perceived satisfaction.[6,11,22,34-38] The results of these questionnaires were compared to recent studies conducted on women in this area.[5,10-12,21,22,34,35]

Statistical Analysis

Descriptive statistics (means and standard deviations) were calculated for age, height, and weight to define the study population. Pre and posttesting values for percentage of body fat, cholesterol levels, the 6 minute walk test, and the single stage treadmill test were compared using paired t-tests. Descriptive statistics were computed for part one and two of the three part questionnaire, and tally scores were computed for part three of the questionnaire. The alpha level needed for statistical significance was set at the $p < .05$ level.

RESULTS

Twelve female subjects initially agreed to participate in the study. However, two subjects dropped out, one because of family obligations and the other because of clinical depression. All remaining subjects attended at least 85% of the available sessions offered which were held 3 times per week for 10 weeks. The mean age, height, and weight of the group at the beginning of the study were 63.3 ± 3.0 years, 160.9 ± 5.5 centimeters, and 73.9 ± 12.8 kilograms, respectively.

The physiological responses to participating in the 10 week cardiac rehabilitation program are summarized in Table 1. There were significant ($p < .05$) improvements in percentage of body fat, predicted VO_2max, and distance walked in the 6 minute walk test over the course of the study period. Body fat decreased 7.9%, predicted VO_2max increased 12.2%, and 6 minute walk distance increased 5.8%. There were no significant ($p > .05$) differences in body weight, total cholesterol, HDL cholesterol, LDL cholesterol, and triglycerides, however small improvements were seen in all of the variables.

Table 1. Changes in physiological responses to a 10 week cardiac rehabilitation program

Variable	Pre	Post	% Change
Weight (kg)	73.9 ± 12.8	73.3 ± 13.2	(0.8%)
% Body fat	33.9 ± 7.3	31.2 ± 7.0*	(7.9%)
Total cholesterol (mg/dl)	244 ± 47.1	235 ± 42.0	(3.7%)
HDL (mg/dl)	52 ± 15.7	54 ± 15.1	(2.3%)
LDL (mg/dl)	147 ± 50.4	142 ± 44.7	(3.4%)
Triglycerides (mg/dl)	198 ± 61.9	191 ± 103.9	(3.5%)
6 minute walk (m)	448 ± 96.9	472 ± 109.3*	(5.8%)
Predicted VO_2 (ml/kg/min)	19.6 ± 5.2	22 ± 5.9*	(12.2%)

All values represent mean ± standard deviation.
*Significantly different from Pre ($p < .05$).

Part I of the questionnaire assessed what factors may play an important role in determining women's participation in a cardiac rehabilitation program. The questionnaire information revealed that transportation did not seem to be a major factor when joining a program. However cost, access to a variety of activities, knowledge of the staff, being part of a group, getting individualized attention, and receiving support and encouragement from family were extremely important.

Part II of the questionnaire determined perceived satisfaction of the pilot program offered. The subjects felt they were able to discuss their progress with the staff most of the time, and the staff provided encouragement and met educational needs often. Exercises were not at all boring, rarely interfered with other activities or caused subjects to be overly tired, and were rarely difficult to learn.

Part III of the questionnaire evaluated the overall program, and determined program adherence. The women attended the program because they enjoyed the variety of activities offered. They equally enjoyed walking and biking, but overwhelmingly enjoyed water aerobics. The time and location of the program were convenient for all participants, and all participants attended because they knew it was a research project. The only major reasons given for not attending the program were family obligations

and illness or medical procedures/surgery. They felt no significant changes should be made to the program, in fact, several participants wanted the program to continue.

DISCUSSION

The purpose of this study was to pilot test a cardiac rehabilitation program designed especially for women and test the effectiveness, overall satisfaction, and compliance with the program. These analyses tried to determine if a 10 week cardiac rehabilitation program could improve functional capacity, cholesterol levels, and body composition in a group of female cardiac patients. Overall satisfaction, exercise adherence and preference, and general evaluation of the pilot program were also measured to determine if the program design increased exercise adherence and met the needs of the women enrolled in the program. Limited data are available for comparison because to this author's knowledge, the majority of the research in this area has focused primarily on men.

In the current study, all baseline mean lipid levels, except HDLs, were classified as high or borderline high according to National Cholesterol Education Program (NCEP) guidelines.[39] This is in agreement with other research which studied baseline mean blood lipid levels in women who participated in cardiac rehabilitation.[11,13,18]

One of the potential benefits for women to participate in cardiac rehabilitation is to improve cholesterol

levels.[13,18] Warner et al.[18] found women who attended cardiac rehabilitation and had dietary goals established and monitored throughout the program had significantly greater changes in total cholesterol and HDLs compared to men. The percent increase in HDLs after 5 years was 20% for women compared to 5% in men, and total cholesterol decreased 38% in women and 14% in men over the same period of time.

Lavie and Milani[13] conducted a similar study that followed men and women enrolled in outpatient phase II cardiac rehabilitation over a 12 week period. Patients attended the program three times a week and exercised at an intensity of 75-85% of maximal heart rate for 30 to 40 minutes. All patients were instructed while hospitalized and again at the beginning of phase II to comply with the dietary guidelines of the NCEP and frequent encouragement was provided by the staff to follow the dietary portion of the program. Significant improvements were found in HDLs, LDLs, triglycerides, and total cholesterol. HDLs increased 7%, LDLs decreased 4%, triglycerides decreased 13%, and total cholesterol decreased 2%, respectively. Reduction in LDLs, triglerides, and total cholesterol were most strongly correlated to higher baseline values, whereas increases in HDLs were associated with low baseline levels, a reduction in triglycerides, and a reduction in body mass index.

In contrast to the above studies, this study found no significant improvements in the lipid parameters measured, however small improvements were seen in all of the variables. These differences may be due to the fact that the current study exercised individuals at a lower exercise intensity (40-60%), the program was only 10 weeks in duration, and data regarding dietary and exercise recall were not recorded.

The subjects in this study did not have a significant change in body weight, which is similar to findings by Cannistra et al.,[11]. However, they had a significant decrease in percentage of body fat from 33.9 to 31.2%, a change of 7.9% over the course of the 10 week study. The significant decrease in percentage of body fat is in agreement with the study conducted by Lavie and Melani[13] which followed women through 12 weeks of phase II cardiac rehabilitation and found a 5% change in body fat.

Controversy over whether to use skinfolds versus hydrostatic weighing has been a major concern in cardiac patients because of the potential risks of hydrostatic weighing, and the inaccuracy of skinfold measurements. The major threat of hydrostatic weighing is that it may precipitate the valsalva maneuver which could worsen a cardiac condition. Despite the claims that skinfold assessments are inaccurate, Hall and others [40] recommended using the Lange caliper with the Jackson, Pollock, and

Ward[31] three site measurement because it has been found to be highly correlated with hydrostatic weighing (r = 0.97, SEE = 3.9% in women).

Improvement in activities of daily living, endurance, and exercise capacity are other benefits of participating in an exercise program.[41-43] Three previous studies were conducted on improvement in walking distance in patients with cardiopulmonary disease who participated in a exercise program.[41-43] All three studies reported significant improvements in walking distance when using the 12 minute walk test.

McGavin et al.,[42] showed a 6.3% improvement in the 12 minute walking distance in a group of patients with chronic bronchitis who exercised daily at home, without supervision, for 3 months. This is comparable to the 5.8% improvement in walking distance found in the present study. However, two separate randomized controlled trials found significantly greater improvements in walking distance compared to McGavin et al. and the present study.[41,43]

Sinclair and Ingram[43] found a significant improvement in their walking distance, attaining an increase of 24% after 8 to 12 months of supervised rehabilitation in patients with chronic bronchitis. A similar improvement in walking distance of 23% was found by Cockcroft et al.,[41] who began with supervised exercise training for 6 weeks, and continued with home exercises for a 4 month period. These

studies suggest greater improvements in walking distance seem to be associated with longer periods of exercise training.

Although most investigators have used the 12 minute walking test, Butland and others[32] have recently shown that equivalent results may be obtained with a 6 minute walking test. Therefore, the current study used the 6 minute walking test to assess endurance and exercise capacity because it is a simple, reliable, and less time-consuming test. Furthermore, most of the studies have primarily used walking tests for assessing patients with pulmonary disease, however the current researcher felt the 6 minute walk test would be appropriate for this population because some individuals had a secondary diagnosis of congestive heart failure.

Since an improvement in walking distance has been associated with increased exercise tolerance,[41-43] it is not surprising that this study also found a significant increase in exercise tolerance as determined by the single stage treadmill test.

A significant increase in predicted VO_2max of 12.2% was reported in the present study, which is slightly lower than the 17-20% found in previous studies conducted on women attending cardiac rehabilitation.[6,11,13] The slightly higher increase in VO_2max in the other studies may be because the previous studies exercised subjects at a higher intensity

(75-90% of maximum heart rate), the program was longer in duration (12 weeks), and exercise was maintained for a longer period of time (40-50 minutes).

Even though women tend to do extremely well in cardiac rehabilitation, the dropout rates are much higher in women compared to men.[11,22] The major reasons for increased dropout rates in women were family obligations[11,22] and medical complications or illness.[11] In the present study, the overall dropout rate was 14% which is comparable to previous studies.[11,22,] Of the two subjects who dropped out in the present study, one dropped out because of family obligations and the other because of clinical depression. These reasons are similar to the findings of previous studies.[11,22]

Perceived satisfaction may be another reason why women tend to dropout of cardiac rehabilitation compared to men. In a study conducted by Moore[35], women preferred a program that provided social and emotional support and interaction from staff and other participants, offered a variety of exercises, and was medically-supervised by a professional caring staff. Utilizing joint goal setting, and offering activities that do not interfere with personal convenience factors or cause undue pain or fatigue were additional features women preferred in cardiac rehabilitation.[34] Similar preferences were expressed by the women in this study. They felt the variety of activities, knowledge of staff, being part of a group, getting individualized

attention, and receiving support and encouragement from family were extremely important.

The questionnaire on overall perceived satisfaction of the pilot program also found that subjects felt they were able to discuss their progress with the staff and that the staff provided encouragement and met education needs. These were additional preferences Moore and Kramer[34] determined to be important for women in cardiac rehabilitation.

The women attended the program because they enjoyed the variety of activities, the time and location were convenient, and the program was free. Interesting enough, the women felt no significant changes should be made to the program, however cost could be an issue for individuals on fixed incomes who wished to continue with the program. A previous study found financial concerns were only a major concern for younger male participants,[6] however this study focused on a phase II program rather than a phase III which is typically not covered by insurance. The current study also determined that transportation was not a major concern affecting attendance, which is contrary to previous studies that found transportation is a limiting factor for women wishing to participate in cardiac rehabilitation.[5,6]

In summary, a cardiac rehabilitation program that is designed especially for women can positively improve body composition, functional capacity, and blood lipids. These findings have been consistently confirmed by other

investigators. However, time, location, and activities offered should be major concerns when developing a program for women.

Women in this study enjoyed the variety of activities offered, felt the time and location of the progra were convenient, and felt no significant changes shoul e made to the pilot program. Despite the small sample size, the findings from this study indicate that a similarly designed program can improve outcome measures, and increase perceived satisfaction and compliance in women who participate in cardiac rehabilitation.

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APPENDIX A

PRELIMINARY QUESTIONNAIRE

PRELIMINARY QUESTIONNIARE

TODAY'S DATE _____ TELEPHONE # BEST TIME

NAME_____ HOME_____ _____

ADDRESS_____ WORK_____ _____

AGE/DOB_____ WT_____ HT_____ PHYSICIAN_____ _____

CARDIAC EVENT DATE MARITAL STATUS_____

____MI _____
____CABG _____
____PTCA _____
____STENT _____
____OTHER _____

MEDICAL PROBLEMS _____

_____

MEDS _____

_____

HEALTH HISTORY_____

_____

YES	NO	
___	___	Treated for past psychological/mental problems?
___	___	Any orthopedic problems/physical limitations?
___	___	Has your doctor ever said you shouldn't exercise?
___	___	GXT (last 6 months) When _____ Where _____
___	___	Transportation problems?
___	___	Smoking Years Quit _____
___	___	Arrhythmias
___	___	Did you attend a cardiac rehab phase II program?
___	___	Activity Level
___	___	Can you attend an information meeting on Feb 2nd?
___	___	Sent information in the mail.

APPENDIX B

INFORMED CONSENT

INFORMED CONSENT

CARDIAC REHABILITATION: NOT FOR MEN ONLY

I,_____,volunteer to be a subject in a research study which will investigate the effectiveness of a cardiac rehabilitation program designed especially for women. This study is limited to women over the age of 35 years who have had either a heart attack, bypass surgery, or any other type of known cardiovascular disease. Prior to being allowed to participate in this study, I must have completed a maximal exercise test and have a consent form signed by my personal physician giving his approval for me to be a subject in this study.

I realize that as a subject in this study, I will be required to participate in a 10 week exercise program which will meet on Mondays, Wednesdays, and Fridays from 10:00-11:00 a.m. The program will meet at various locations on the UWL campus and will include activities such as walking, stationary cycling, water aerobics, land aerobics, and muscle toning activities using light weights. An individualized exercise program will be designed for me by the staff, based upon the results of my exercise tests. In addition, I will be taught how to monitor my pulse rate and perceived exertion so that I may monitor my progress. My blood pressure will also be taken before and after every exercise session. In addition to the exercise program, lectures on cardiac-related health topics will be presented weekly.

Before and after the training program, I also realize that I will undergo a series of tests to determine my responses to the training program. These tests will include two submaximal walking tests (a 4 minute test to be completed on a treadmill and a 6 minute test to be completed on the track), measurement of my body fat, measurement of blood lipids, and assessment of my overall mood state and well-being.

The testing will be carried out on 2 days and will be held in the Human Performance Laboratory at the University. On one day I will be asked to complete two questionnaires which are designed to determine my overall mood status and to determine how well I am coping with my heart condition. These questionnaires will take approximately ½ hour to complete. On that day I will also have my body composition

determined using skinfold measurements. This involves taking a pinch of skin at three different sites on my body (triceps, back, and thigh) using specially designed calipers. After the determination of my body composition, I will complete a 4 minute bout of exercise on the treadmill. The test will be completed at a speed of my own choosing and will be at a slight grade (5%). During this test I will wear a portable heart rate monitor which consists of a strap which goes around my chest. My blood pressure will also be monitored during this test. If any abnormalities are noted in my heart rate or in my blood pressure, the test will be stopped immediately. A second walking test will also be completed on the first and second day of the training program. This test will simply assess how far I can walk in 6 minutes and will be held on the track in Wittich Hall. On the other day of testing I will report to the Human Performance Laboratory in a 12 hour fasted state. A trained technician will prick my finger to get a small sample of blood. This sample will be analyzed to determine my cholesterol and other blood fat levels.

None of the testing or training procedures used in the study should have any lasting adverse consequences. However, I am aware that if I am unaccustomed to exercise, I may experience some muscle soreness as a result of completing the walking tests or participating in the exercise sessions. Additionally, some localized bruising may result from having my finger pricked.

As with any physical exertion there exists the possibility of other abnormal events taking place (e.g., dizziness, difficulty in breathing, stroke, and even death). If any abnormal observations are noted at any time, either during the testing or during the training, the session will be terminated immediately and my physician will be notified. It is my responsibility to report abnormal feelings I may be having (e.g., shortness of breath, dizziness, pains in my chest, etc.) to the staff immediately. I realize that the staff supervising the training program are certified in Advanced Cardiac Life Support. This means that they are trained in handling heart-related emergencies. Equipment available to treat emergencies (e.g., defibrillator, oxygen, emergency drugs, etc.) will also be on site if the need arises.

The potential benefits of participating in this study may include an increase in my physical capacity, a decrease in my body fat and body weight, an improvement in my blood fat profile, and improvement in my overall mood. Studies have shown that regular participation in a cardiac rehabilitation program can also decrease the mortality and morbidity rates associated with my disease.

I realize that all of the data collected in this study will be kept confidential. The data may be used in a scientific article or presentation, but individual data will be identified by subject ID number only. I also realize that my participation in this study is voluntary. I may withdraw from the study at any time without penalty.

I understand what is expected of me as a subject in this study and all questions have been answered to my satisfaction. I hereby give my consent to participate in this study.

Signed: _____ Date: _____

Witness: _____ Date: _____

APPENDIX C

HEALTH HISTORY

MEDICAL/HEALTH HISTORY QUESTIONNAIRE

LA CROSSE EXERCISE AND HEALTH PROGRAM
UNIVERSITY OF WISCONSIN-LA CROSSE

IDENTIFICATION DATA: Please fill in the following information.

Name _____ Date _____

Address _____

City _____ State _____ Zip _____

Date of Birth _____ Age _____ Home phone: (___)___

Work phone: (___)___

Personal Physician _____ Clinic _____

Date of last check up _____

SEX
[ ] Male
[ ] Female

CURRENT MARITAL STATUS
[ ] Single
[ ] Married
[ ] Separated
[ ] Divorced
[ ] Widowed

RACE
[ ] White
[ ] Black
[ ] Hispanic
[ ] Asian
[ ] Other____

How many years of formal education have you completed?

[ ] No high school [ ]Some high school [ ] HS diploma
[ ] Some college [ ]College degree [ ] Graduate school

What is your usual occupation?

_____

Would you consider your job stressful? (Circle appropriate number)

1 = not at all stressful
10 = very stressful 1 2 3 4 5 6 7 8 9 10

MEDICATIONS:
What prescribed medicines do you presently take? Why do you take them?

What non-prescription medicines (over the counter) do you take and why?

ALLERGIES: Are you allergic to or have you had a "bad reaction" to any medicines or other substances?
[ ] Yes [ ] No

If yes, please list the medicine and reaction.

PERSONAL HISTORY: Have you ever had -	Yes	No	When?
Heart attack	[ ]	[ ]	_____
Open heart surgery (CABG, valve, other)	[ ]	[ ]	_____
Angioplasty	[ ]	[ ]	_____
Congenital heart problems	[ ]	[ ]	_____
Congestive heart failure (fluid in the lungs	[ ]	[ ]	_____
Angina/chest pain, pressure or discomfort	[ ]	[ ]	_____
Abnormal heart beats (palpitation)	[ ]	[ ]	_____
Heart murmurs	[ ]	[ ]	_____
Stroke	[ ]	[ ]	_____
Rheumatic fever	[ ]	[ ]	_____
Thyroid problems	[ ]	[ ]	_____
Diabetes (IDDM, NIDDM)	[ ]	[ ]	_____
High blood pressure	[ ]	[ ]	_____
Swelling of the feet or ankles	[ ]	[ ]	_____
Cramping in the lower legs/feet	[ ]	[ ]	_____
Blackouts/fainting spells	[ ]	[ ]	_____
Shortness of breath at rest or with exertion	[ ]	[ ]	_____
COPD	[ ]	[ ]	_____
Asthma	[ ]	[ ]	_____
Bronchitis	[ ]	[ ]	_____
Emphysema	[ ]	[ ]	_____
Arthritis	[ ]	[ ]	_____
Low back pain	[ ]	[ ]	_____
Joint pain or swelling	[ ]	[ ]	_____
Other orthopedic problems (bad knees etc.)	[ ]	[ ]	_____
Emotional disorders	[ ]	[ ]	_____
Anxiety	[ ]	[ ]	_____
Depression	[ ]	[ ]	_____
Other	[ ]	[ ]	_____

If you answered yes to any of the above questions, please elaborate:

Do you know your cholesterol level? _____

HDL _____ LDL _____ Triglycerides _____

HOSPITALIZATIONS: List all your hospitalizations as best as you can.

Type of illness/surgery (please be specific)	Year
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____

FAMILY HISTORY: Has any BLOOD RELATIVE had any of the following?

	Yes	No	Relation	Age
Diabetes (IDDM, NIDDM)	[ ]	[ ]	_____	____
High cholesterol	[ ]	[ ]	_____	____
High blood pressure	[ ]	[ ]	_____	____
Heart attack	[ ]	[ ]	_____	____
Open heart surgery	[ ]	[ ]	_____	____
Stroke	[ ]	[ ]	_____	____
Lung problems	[ ]	[ ]	_____	____
Cancer	[ ]	[ ]	_____	____
Obesity	[ ]	[ ]	_____	____

HEALTH HABITS:

Do you currently smoke cigarettes? Yes [ ] No [ ]

If you do not currently smoke cigarettes, have you ever smoked cigarettes? Yes [ ] No [ ]

If you currently smoke or have ever smoked:

How many packs per day? _____
For how many years? _____

If you are a former smoker, how long ago did you stop smoking? _____

On the average, how many drinks do you have per day on weekdays? _____ on weekends? _____

One drink = One 12 oz. beer
= One 4 oz. wine
= One 1 oz. liquor

On the average, how many cups/cans of the following beverages do you consume per day?

TEA _____ COFFEE _____ COLAS _____

How many times per week do you eat:

Cheese	___	Yogurt	___
Sweets (cookies/cake)	___	Eggs	___
Butter or shortening	___	Skim milk	___
Whole grain breads	___	Instant or frozen entrees	___
Fried fish or poultry	___	Red meats (beef or pork)	___
		Breakfast meats(saus/ham)	___
		Fish	___
		Salad	___

How many times do you dine out per week? ___

Of these, how many are fast food restaurants? ___

Overall, how would you rate your diet? (Circle appropriate number)

1 = unhealthy
10 = healthy 1 2 3 4 5 6 7 8 9 10

On the average, how many hours of sleep do you get per night? _____

PHYSICAL ACTIVITY HISTORY:

Have you ever had an exercise test? [ ] Yes [ ] No

If yes, please answer the following questions:

Location of test: _____

Date of test: _____ Results of test: [ ] Normal
[ ] Abnormal
[ ] Don't know

If the test was abnormal, please explain:

Are you aware of any physical limitation that would prevent you from exercising regularly? [ ] Yes [ ] No

If yes, please specify:

Do you currently exercise on a regular basis? [ ]Yes [ ]No

If yes, please answer the following questions:

How many times per week do you exercise? _____

How long do you exercise per session? _____

What types of exercise do you perform? _____

_____

If no, what types of exercise are you interested in?

_____

Did you participate in high school or college sports?
[ ] Yes [ ] No

If so,please specify: _____

How would you rate your level of fitness?
[ ] Poor
[ ] Fair
[ ] Average
[ ] Above average
[ ] Excellent

I hereby certify all statements provided by me in this questionnaire are complete and true to the best of my knowledge. Further, I give my permission to the La Crosse Exercise and Health Program staff to contact my personal physician or the program's medical director should there be questions or concerns about information in this medical history form.

Signature _____ Date _____

APPENDIX D

EDUCATION PRIORITY

Patient Education Priorities

Like most people with heart problems, you probably have many questions. During the next 10 weeks we want to address those concerns that are uppermost in your mind. We have compiled a list of topics based on your varying medical conditions and coronary risk factors. So, to help plan the best sequence for our discussions, please pick the top three topics that are most important to you at this time:

____ risk factors for heart disease
____ cholesterol and your heart
____ heart healthy eating
____ recovery from stroke
____ smoking cessation
____ common cardiac procedures
____ blood pressure
____ weight reduction techniques
____ recipes for low fat/low cholesterol diet
____ sex and heart disease
____ stress reduction/relaxation techniques
____ exercise and your heart
____ how to read food labels

____ chest pain
____ cardiac surgery
____ medications
____ heart failure
____ estrogen
____ CPR
____ heart rhythms

OTHER QUESTIONS YOU WOULD LIKE TO HAVE ANSWERED:

_____

_____

_____

APPENDIX E

PROGRAM EVALUATION

PROGRAM EVALUATION

Part I
Cardiac Exercise Program Preference

The following are reasons that people participate in a cardiac rehabilitation program. Please circle the response that bests describes the extent to which you agree with each statement.

0. Strongly Disagree (SDA)
1. Disagree (DA)
2. Undecided (U)
3. Agree (A)
4. Strongly Agree (SA)

	SDA	DA	U	A	SA
1. Transportation to a cardiac rehab program is a major factor when considering joining.	0	1	2	3	4
2. The cost of participating in a cardiac rehab program is a major factor when considering joining.	0	1	2	3	4
3. I would prefer to be able to choose among a variety of activities.	0	1	2	3	4
4. It is important to me to have qualified health care professionals and emergency equipment available when I exercise.	0	1	2	3	4
5. If I were to join an exercise program, I would prefer to be involved in an exercise program with only women participants.	0	1	2	3	4
6. It is important for me to feel a part of a group when exercising.	0	1	2	3	4

		SDA	DA	U	A	SA
7.	It is important for me to have individualized attention from health care professionals during my exercise session.	0	1	2	3	4
8.	It is important for me to have family support and encouragement concerning my participation in an exercise program.	0	1	2	3	4

Part II

Participant Satisfaction

People differ in the extent to which they feel their expectations are met when participating in cardiac rehabilitation. Please circle the response that best describes your experiences in cardiac rehabilitation.

0 not at all
1 rarely
2 some of the time
3 often
4 most of the time

1. To what extent were you able to discuss your progress in cardiac rehab with a health care professionals.

0 1 2 3 4 5

2. To what extent do you feel your educational needs were met.

0 1 2 3 4 5

3. How often did you get overly tired when exercising?

0 1 2 3 4 5

4. To what extent did you receive encouragement from your health care professionals in the exercise program.

0 1 2 3 4 5

5. To what extent were the exercises difficult to learn.

0 1 2 3 4 5

6. How boring were the exercises?

0 1 2 3 4 5

7. To what extent did your participation in the cardiac rehab program interfere with other activities in you life.

0 1 2 3 4 5

Part III

Program Adherence and Perceived Satisfaction of Pilot Program

Circle to what degree each item played a part in your program attendance on a daily basis.

1. All of the time.
2. Most of the time.
3. Some of the time.
4. A little of the time.
5. None of the time.

Reasons for returning to the program daily

Activities:

Walking	1	2	3	4	5
Biking	1	2	3	4	5
Low aerobics	1	2	3	4	5
Water aerobics	1	2	3	4	5
Time: 10:00 a.m - 11:00 a.m	1	2	3	4	5
Location: University of La Crosse	1	2	3	4	5
Because you knew it was a research project.	1	2	3	4	5

Reasons for being absent from the program on a daily basis.

Activities offered	1	2	3	4	5
Time offered	1	2	3	4	5
Location	1	2	3	4	5
Program Staff	1	2	3	4	5
Travel problems	1	2	3	4	5
Parking problems	1	2	3	4	5

Location	1	2	3	4	5
Illness/medical procedures	1	2	3	4	5
Family obligations	1	2	3	4	5

Part III (Continued)

Perceived Satisfaction

Recently, you participated in a cardiac rehabilitation program specifically designed for women. We want to know what you thought of the program. Please share with us you opinion of the program so we can have the feedback we need to "fine tune" this program.

1. What are the reasons you were not participating in a cardiac rehabilitation program prior to this?_____

_____

_____

2. What are the things you liked most about the cardiac rehabilitation program?_____

_____

_____

3. What did you dislike about the cardiac rehabilitation program?_____

_____

_____

4. What parts of the program would you like more of?_____

_____

_____

5. What features of the program would you change?_____

_____

_____

APPENDIX F

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Introduction

Since women are developing heart disease at younger ages and are dying as a result of this disease, heart disease can no longer be considered just a man's disease. Coronary artery disease is the leading cause of death in women, accounting for 48.4% of all deaths[1] and the risks increase as women reach menopause.[2] In fact, an estimated 21,000 females under the age of 65 die of heart disease each year and nearly 28% of them are under the age of 55.[1]

Due to the increased incidence of mortality and morbidity in women with heart disease, physicians need to be more aggressive throughout the entire disease process, especially when it comes to the diagnosis and treatment of this disease. Typically, when younger women present with the classic signs and symptoms of heart disease, the symptoms are often brushed off as being psychosomatic. As a result, there is a documented gender bias when it comes to the diagnosis and treatment in women, regardless of age.[3]

This gender bias continues when discussing the process of cardiac rehabilitation because physicians tend to refer women less often to cardiac rehabilitation compared to men.[4]

As a result, the lack of physician referrals to cardiac rehabilitation may prolong the healing process and increase the incidence of mortality in women with heart disease.

Mortality and Morbidity

Mortality and mobility rates are higher in women postinfarction,[5,6] with women being twice as likely to die within a few weeks compared to men.[1] According to a study conducted by Rankin[7], women also have higher rates of mortality during surgery and in the first week after surgery despite the fact that men and women typically do not differ on the number of vessels needing bypass or the type of surgery that is performed.[4,7] However, women who undergo coronary artery bypass surgery are typically older, have more severe angina, and are more likely to have had a recent myocardial infarction compared to men.[8]

These studies indicate both men and women are equally at risk for having the same type of surgery and diagnosis, but women have higher mortality and mobility rates compared to men. Since the preoperative and operative processes entail many more risks for women with heart disease than men, it is understandable why physicians may be more conservative when dealing with women preoperatively and postoperatively. However, this does not explain why physicians continue to be conservative with the rehabilitation process.

In 1990, coronary heart disease deaths increased 29.4% in women,[1] and women had a slightly higher chance of having a second heart attack within the first 4 years of their first event: compared to men.[1] Cardiac rehabilitation has been found to reduce mortality after a myocardial infarction.[9,10] Two randomized clinical trials studied the effectiveness of cardiac rehabilitation at reducing mortality after a myocardial infarction.[9,10] These studies followed approximately 4,000 patients for 3-4 years. At follow-up, cardiovascular mortality was reduced 20-25% in patients that attended cardiac rehabilitation compared to patients who did not. A limitation of this study, however was that less than 3% of the patients were women.

These data suggest that there may be a greater benefit for women in cardiac rehabilitation compared to men, because women have a higher mortality rate after a myocardial infarction, and cardiac rehabilitation has been found to be effective at reducing mortality post event. To help prevent increased mortality and morbidity rates in women after heart surgery and myocardial infarction it may be beneficial for physicians to refer more women to cardiac rehabilitation.

Exercise Capacity

Exercise capacity increases in cardiac patients who participate in an exercise program.[4,11-17] Several studies determined that upon entry into a cardiac rehabilitation program women have a lower exercise tolerance than

men.[4,13,15,17,18] However, by the completion of the cardiac rehabilitation program, exercise capacity increased similarly as a result of training in both sexes.[4,13,15,18] In a randomized controlled trial, Greenland and Chu[13] found the average difference in MET level capacity between program participants and nonparticipants was approximately 20-25%.

Other significant improvements that occurred as a result of training were decreases in submaximal heart rates,[12,19-21] rate pressure product,[19-21] and resting systolic blood pressure.[20,21] These studies indicate numerous improvements in physiological responses can be associated with cardiac rehabilitation attendance.

Even though most of the studies discussed above used maximal exercising testing to determine exercise capacity (VO_2 max), submaximal testing is becoming popular in individuals with a low ejection fraction (< 45%) and individuals with coronary heart disease who suffer from congestive heart failure.[22-24] One test which has been used is the 6 minute walk test.

Since the revision of the 6 minute walk test in 1982 by Butland et al.,[25] walking tests are becoming widely used as an outcome measure in clinical trials because they are easy to administer and are similar to activities of daily life.[26] Pashkow and colleagues[26] also recommended that the 6 minute walk test be used in individuals with pulmonary disease

because it is a safe and effective test to assess endurance and exercise capacity.

Lipken and others[23] assessed exercise capacity using the 6 minute walk test in a number of patients with congestive heart failure, cardiomyopathy, and mitral and aortic regurgitation. They found that subjects preferred performing the 6 minute walk test to the treadmill test, because it was more closely related to their daily activities. The distance walked in 6 minutes varied considerably with subjects who had low maximal oxygen consumption (< 12 ml/kg/min), but varied little in patients who had normal oxygen consumption (20 ml/kg/min) when compared to the maximal treadmill test. They concluded this test is an inexpensive, simple, and useful test for assessing exercise capacity in patients with congestive heart failure.

The potential usefulness of the 6 minute walk test was also studied in patients with left ventricular dysfunction.[22] Patients diagnosed with congestive heart failure and/or an ejection fraction of 45% or less were followed for 242 days after hospital discharge to determine if the 6 minute walk test could predict morbidity and mortality of these patients. This study found distance walked was inversely related to mortality. Individuals that walked less than 300 meters had a 3.7 fold risk of dying compared to those walking at least 450 meters.

Hospitalizations for any reason also increased significantly as distance walked decreased. This study demonstrates that the 6 minute walk test strongly and independently predicts long-term mortality and hospitalization rates for congestive heart failure patients.

All of these studies imply that patients who benefit the most from a exercise program in terms of exercise capacity and physiological responses are those who have a lower exercise tolerance (i.e., high rest or submaximal heart rate, low estimated oxygen consumption, and high resting systolic blood pressure). Unfortunately, women may fit into this group and they may in turn be excluded from cardiac rehabilitation for this reason.

Blood Lipids

Another benefit for women to participate in cardiac rehabilitation is to improve blood lipid levels.[17,18] Total cholesterol, HDL cholesterol, and LDL cholesterol are reported to be higher in postmenopausal women compared to men,[17,18,27,28] which may predispose them to heart disease. Elevation of triglycerides has also been found to predispose women to heart disease, and is directly associated with diabetes and obesity.[28] Therefore, controlling hyperlipidemia is of utmost importance in women with heart disease.

A study done by Castelli[28] determined elevated triglycerides are directly associated with body weight and

age in both sexes, but is an independent risk factor for heart disease in women. He concluded that women with triglycerides greater than 136 mg/dl and total cholesterol/HDL cholesterol ratios greater than 3.5 mg/dl are at a higher risk for premature heart disease.

Two similar studies found cardiac rehabilitation to be an effective factor at improving lipid values in men and women.[17,18] Warner et al.[18] concluded that women with heart disease who participate in a cardiac rehabilitation program may achieve greater lipid benefits over longer periods of time compared to men. This study compared sex differences in cholesterol levels over a period of 5 years where subjects exercised at an intensity of 70-85% of maximal heart rate reserve three times a week for 30-40 minutes. Significantly greater improvements were found in women's HDL and total cholesterol levels compared to men. The percent increase in HDL after 5 years was 20% for women compared to 5% in men, and the total cholesterol decreased 38% in women and 14% in men. No significant sex differences existed between changes in triglycerides and LDLs.

Lavie and Milani[17] also found significant improvements in HDLs, LDLs, triglycerides, and total cholesterol following a 12 week cardiac rehabilitation program in men and women. The patients attended cardiac rehabilitation three times a week and exercised at an intensity of 75-85% of maximal heart for 30 to 40 minutes. They concluded that

patients with the worst baseline lipid values had the most improvements in lipid values following a cardiac rehabilitation program.

Participation in Cardiac Rehabilitation

Most studies which have been conducted on participation in cardiac rehabilitation have focused on men, and characterize the typical participant as an older, married, wealthy, white collar worker.[15, 29-33] Conversely, women who participate in cardiac rehabilitation are typically characterized as nonwhite, unmarried, and unemployed.[15,16] Women also tend to have a higher percentage of body fat[15,17,18] and a higher incidence of diabetes when compared to men.[8,15]

The most powerful predictor of participation in cardiac rehabilitation was the strength of the physician's recommendation.[4] Physicians were less likely to refer older women (15%) compared to older men (25%) to cardiac rehabilitation.[4] When the patient's physician did not mention, or was moderately supportive of recommending cardiac rehabilitation for women, the entry rate was 2%. When the physician's recommendation was strong, the entry rate was 66%.[30] Furthermore, studies have indicated that women who were less likely to own or drive a car, had the responsibility of taking care of a dependent spouse, or who had a diagnosis of arthritis were also less likely to participate in cardiac rehabilitation.[4,30] McGee and Horgan[34] also studied why women are less likely to attend a cardiac

rehabilitation program and they found women where less likely to attend rehabilitation because of their age and gender.

Dropout Factors in Cardiac Rehabilitation

The literature on dropout rates in cardiac rehabilitation again have focused primarily on males. The most frequent reasons given for increased dropout rates in men were: medical complications,[15,32] transportation problems,[15] work conflicts,[15,35] job status,[29,32,35,36] smoking,[15,29,31,32,36] and financial concerns.[4,15,37] Of the various reasons for increased dropout rates in men, blue collar workers who smoked and were inactive in leisure time activities had the highest dropout rates.[29,32,36]

Perception of the program, personal convenience factors, and family lifestyle were also found to be major reasons for men to withdraw from cardiac rehabilitation programs.[35,38,39] Perception of the program was defined as the personalized attention and overall impression the staff exhibited towards the participants. A lack of personalized attention and a poor impression of the staff increased the dropout rate to approximately twice that of those who perceive a high level of attention.[35,38] Personal inconveniences such as lack of parking, poor access, and the inability to arrive punctually increased the dropout

rate two fold[35,38] Family lifestyle components (i.e., lack of spouse support) were also found to increase dropout rates.[35]

Most of the factors for increased dropout rates were similar in men and women, however there are some striking differences.[15] The most common factor given for a increased dropout rate in women was family obligations.[15,40] In a study conducted in Ireland, married women were found to have higher dropout rates and lower attendance rates compared to men.[40] This finding is compatible with that of Cannistra et al.,[16] who found unemployed and unmarried women are more compliant because they feel more responsible for their own future well-being compared to married women who have more family responsibilities. Financial concerns were only a major concern for younger male participants.[4] Actually, only 5% of the potential program candidates in the older age group were uninsured, therefore financial concerns are unlikely to be a reason for increased dropout rates in older women.

Other factors determined to predict increased dropout rates in women from exercise programs were the use of anginal medication before infarction, starting rehabilitation late, a high resting heart rate, increased ectopy during initial exercise test, lack of type A behavior, long daytime naps, and mood swings.[41]

Perceived satisfaction may be one of the biggest reasons for increased dropout rates in women but few studies have concentrated on women in this area.[42,43] Recently two separate studies investigated women's perceived satisfaction, views, and preferences of participating in cardiac rehabilitation.[42,43] Moore[43] found the features women disliked most about cardiac rehabilitation were the lack of social and emotional support and the lack of interaction they received from staff and other participants in the program. Furthermore, she determined that women preferred a program that was medically-supervised by a pleasant encouraging staff and one that offered a variety of activities.

In a similar study by the same author, women's and men's preferences and features desired in a cardiac rehabilitation program were compared.[42] This study found men and women both preferred a cardiac rehabilitation program that is responsive to client preferences of convenience factors (drive time, transportation, and noninterference with other activities), utilizes joint goal setting, and offers a variety of exercises that are medically-supervised by professional and motivating individuals.

Findings from Holm et al.[38] suggested that high satisfaction ratings could be attributed to patients having a positive relationship with program staff and a strong

social support network with other participants and their family members. Therefore, in order to increase compliance in cardiac rehabilitation for both men and women, the program staff should offer support and try to develop a positive relationship between the participant and their family members. In addition, the program should offer a variety of activities that are medically-supervised by pleasant encouraging professionals. These activities should not interfere with convenience factors or cause pain or fatigue.

In conclusion, cardiac rehabilitation is a safe and effective method to improve physiological and psychological responses to exercise, and decrease mortality and morbidity rates associated with cardiac events. Since there appears to be a gender bias whereby physicians refer women less frequently to cardiac rehabilitation programs, strategies need to be formulated to address this issue. It also appears that programs for women should be designed to offer emotional and social support with a group, be responsive to preferences of convenience factors, and provide a variety of activities that are medically-supervised by a professional and motivating staff.

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