CHANGES IN PATIENTS' FUNCTIONAL STATUS AND QUALITY OF LIFE THROUGH PARTICIPATION IN A CARDIAC REHABILITATION PROGRAM

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ABSTRACT

Changes in Patients' Functional Status and Quality of Life Through Participation in a Cardiac Rehabilitation Program

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Cardiac rehabilitation has been shown to have many physical and psychological benefits for patients with heart disease, but only about half of those starting a cardiac rehabilitation program are compliant. The purpose of this study was twofold: 1) to examine the influence of cardiac rehabilitation on functional status, and 2) to examine the influence of cardiac rehabilitation on physical and mental quality of life.

The study sample comprised 236 patients (179 males, 57 females). The participants completed the Duke Activity Status Index and the SF-12 pre/post cardiac rehabilitation. Age, gender, and diagnosis were used as covariates in all analyses.

Participants demonstrated consistent, positive changes in functional status, physical quality of life, and mental quality of life over the 12 weeks of the study. There were no differences between age groups in any of the areas. Females had a lower functional ability and physical quality of life than men, but showed similar rates of improvement over time. Females also had a lower pre-program mental quality of life mean score but had a higher post-program mental quality of life mean score, although there was no significant difference.

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CHAPTER I

INTRODUCTION

Rationale

Cardiovascular disease (CVD) is a worldwide concern of patients as well as health care agencies. At the present time, there are more fatalities among individuals suffering from circulatory diseases such as myocardial infarction (MI) and strokes than any other disease. In the United States, more than 13.5 million Americans have a history of MI, or experience angina pectoris (Wenger, Froechlicher, & Smith, 1995).

As one of the CVD conditions, coronary heart disease (CHD) is the leading cause of death among men and women in the United States. It is also a major cause of physical disability, particularly in the rapidly growing population of elderly persons. In 1997, acute myocardial infarction was diagnosed in 1.1 million Americans. Coronary revascularization, which includes coronary artery bypass grafting (CABG) and percutaneous transluminal coronary angioplasty (PTCA), is the commonly accepted treatment for coronary heart disease.

Because one goal of health care is to minimize the progression of disease by helping patients optimally live and function (Brazier, Harper, Jones, O'Cathain, Thomas, Westlake, & Usherwood, 1992), policy makers, cost-conscious providers, and patients can all benefit from research that identifies optimal ways of providing care with quality of life as an outcome criterion to allocate scarce resources (Avis, Smith, Hambleton, Feldman, Selwyn, & Jacobs, 1996). Patients, families, and third-party payers, including

the federal government, seek assurance that health care interventions are necessary and effective (Wolinsky, Wan, & Tierney, 1998). The ideal outcome of treatment is a return to normal or usual quality of life. Improved functional status and well-being are major goals for patients undergoing treatment for CHD (McHorney, Ware, & Raczek, 1993). McHorney (1997) suggested that the best method of measuring outcomes from the patients' point of view is self-reported measures of functioning and well-being and using them to monitor outcomes. However, at this time, there is little research to prove that improvements in functional status (i.e. ability to perform daily activities) and quality of life (QOL) occur after CHD treatment procedures (Papadantonaki, Stotts, & Paul, 1994).

As a complement to CHD medical interventions (i.e surgery or other cardiac treatment), cardiac rehabilitation programs provide follow-up care to assure more positive treatment outcomes. One of the goals of cardiac rehabilitation is to improve the patients' functional abilities and quality of life (Guadagnoli, Ayanian, & Cleary, 1992). Typically, a cardiac rehabilitation program consists of a medically prescribed and supervised program of physical exercise, diet modification, weight reduction, smoking cessation, and stress management. Cardiac rehabilitation programs provide risk factor assessment and modifications to help make lifestyle changes a part of everyday life and improve the patients' functional status to an optimal clinically significant degree (Hannan, 1999).

Cardiac rehabilitation has been shown to have a positive effect on the psychosocial stability that enables the patient to develop a feeling of well-being (Oldridge, LaSalle, & Jones, 1980). The concept of quality of life is the patients' perception of their health status, which can influence reduction of risk factors for

coronary artery disease through education, counseling, and an exercise program (Jue & Cunningham, 1998). Improvement in exercise tolerance often contributes to the patients' ability to improve their functional status, which lessens anxiety and depression while enhancing confidence, self-esteem, and feeling of well-being (Smith, Cardillo, Smith, & Amezaga, 1998).

Exercise has also been adopted as a cardiac rehabilitation component after CABG or PTCI have been performed on a CHD patient. As recently as 1992, standard patient education recommended the restriction of physical activity should be considered early in the treatment of congestive heart failure. More recently, many studies have suggested just the opposite; exercise programs can actually improve cardiovascular recovery in these patients. However, these studies were often uncontrolled and generally enrolled young and relatively healthy patients. The impact of exercise on sicker patients has received little research attention. Most evaluations of exercise programs use changes in maximum exercise as the outcome measure. Thus, documentation of increases in peak oxygen consumption or maximal exercise tolerance have been used as proof of the efficacy of such programs (Gottlieb, Fisher, Freudenberger, Robinson, Zietowski, & Alves 1999). However, it is unknown whether an increase in maximal exercise reflects improved quality of life or ability to perform daily activities (Gottlieb et al. 1999).

Purpose of the Study

The purpose of this study was to examine of changes in cardiac rehabilitation patients' functional status and physical and mental quality of life. After CABG surgery, artherosclerosis forms in the venous grafts so that 10 years after the CABG only one-third of the grafts will be intact (Engblom, Korpilahti, Hamalaninen, Puukka & Ronnemaa,

1997). Elevated serum lipids, hypertension, poor exercise habits, and smoking are the greatest risk factors for coronary artery disease and have a role in the formation of venous graft arteriosclerosis (Oldridge, 1991). Improvement in functional status and the reduction of modifiable coronary artery disease risk factors are the therapeutic outcomes of outpatient cardiac rehabilitation for CABG patients (Kumar, Zehr, Chang, Cameron, & Baumgartner, 1995; Merz & Rozanski, 1996). However, patient adherence to this risk factor reduction often lapses, and long term behavior changes such as diet and exercise rarely become integrated into the patient's lifestyle (Merz & Rozanski, 1996). This study examined whether cardiac rehabilitation programs have a significant impact on functional status and quality of life measures in CHD patients.

Hypotheses

For this study, 12 null hypotheses were tested:

Null Hypothesis 1: There is no difference in coronary heart disease patients' functional status after participating in an outpatient cardiac rehabilitation program.

Null Hypothesis 2: There is no difference in coronary heart disease patients' functional status by age group after participating in an outpatient cardiac rehabilitation program.

Null Hypothesis 3: There is no difference in coronary heart disease patients' functional status by gender after participating in an outpatient cardiac rehabilitation program.

Null Hypothesis 4: There is no difference in coronary heart disease patients' functional status by diagnosis group after participating in an outpatient cardiac rehabilitation program.

Null Hypothesis 5: There is no difference in coronary heart disease patients' physical quality of life after participating in an outpatient cardiac rehabilitation program.

Null Hypothesis 6: There is no difference in coronary heart disease patients' physical quality of life by age group after participating in an outpatient cardiac rehabilitation program

Null Hypothesis 7: There is no difference in coronary heart disease patients' physical quality of life by gender after participating in an outpatient cardiac rehabilitation program

Null Hypothesis 8: There is no difference in coronary heart disease patients' physical quality of life by diagnosis group after participating in an outpatient cardiac rehabilitation program.

Null Hypothesis 9: There is no difference in coronary heart disease patients' mental quality of life after participating in an outpatient cardiac rehabilitation program.

Null Hypothesis 10: There is no difference in coronary heart disease patients' mental quality of life by age group after participating in an outpatient cardiac rehabilitation program.

Null Hypothesis 11: There is no difference in coronary heart disease patients' mental quality of life by gender after participating in an outpatient cardiac rehabilitation program.

Null Hypothesis 12: There is no difference in coronary heart disease patients' mental quality of life by diagnosis group after participating in an outpatient cardiac rehabilitation program.

Definition of Terms

1. Quality of life (QOL)-An individual's satisfaction or happiness with life in domains he/she considers important (American Thoracic Society, n.d.).

2. Functional status-An individual's ability to perform normal daily activities required for meeting basic needs, fulfilling usual roles, and maintaining health and well-being (American Thoracic Society, n.d.).

3. Cardiac rehabilitation-According to the World Health Organization (WHO), the sum of activities required to ensure cardiac patients the best possible physical, mental, and social conditions, so that they may, by their own efforts, regain a normal place in the community and lead an active productive life (Oldridge, 1991).

4. Cardiovascular exercise program-This is an exercise program consisting a of 10-minute warm-up, 35 minutes of cardiovascular exercise, and a 5-minute cool-down (Balady, Ades, Comoss, Limacher, Pina, & Southard 2000).

5. Resistive training program- A resistive training program consisting of 5 upper body exercises, each with one set of 10 repetitions (Balady et al., 2000).

6. Patient education sessions-Education sessions for cardiac rehabilitation patients, which are usually 45-minute sessions, scheduled two times per week covering topics such as: smoking cessation, lipid management, hypertension control, weight management, and sexual activity (Yoshida, Kohzuki, Yoshida, Hiwatare, & Kamimito, 1999).

7. Coronary artery bypass grafting (CABG)-Surgical grafting of the vein or artery to permit blood to travel from the aorta to a branch of the coronary artery at a point past an obstruction (United States National Library of Medicine, n.d.).

8. Percutaneous transluminal coronary angioplasty (PTCA)-Compression of an athromatous lesion by inflating an intracoronary balloon catheter to dilate the vessel (United States National Library of Medicine, n.d.).

9. Angina-A clinical syndrome typically characterized by a deep, poorly localized chest or arm discomfort that is reproducibly associated with physical exertion or emotional stress and relieved promptly by rest or sublingual NTG (United States National Library of Medicine, n.d.).

10. Coronary revascularization-Restoration, to the extent possible, of normal blood flow to the myocardium by surgical or percutaneous means or with removal or reduction of an obstruction that occurs when CABG or PTCA is performed (United States National Library of Medicine, n.d.).

11. Congestive heart failure (CHF)-A disorder in which the heart loses its ability to pump blood efficiently. The result is that the body does not get as much oxygen and nutrients as it needs, leading to problems like fatigue and shortness of breath. Heart failure is almost always a chronic, long-term condition that is managed with medications and lifestyle changes (although it can sometimes develop suddenly). The most common causes for heart failure are hypertension and coronary artery disease (United States National Library of Medicine, n.d.).

12. Metabolic equivalent (MET)- Unit of measurement that refers to the relative energy demands of an activity in comparison to the energy demands in a resting state. A MET is a multiple of the resting metabolic rate. If an individual exercises at a 6-MET level, he/she is exercising at a rate that expends six times the amount of oxygen as would be expended in his/her resting state. A MET is estimated to be equal to 3.5 milliliters of

oxygen per kilogram of body weight per minute. MET levels can be used to define the energy cost and relative intensity level of any exercise activity (American College of Sports Medicine, 1995).

13. Coronary Artery Disease- Also knows as coronary heart disease or coronary atherosclerosis, refers to the build-up of plaque (composed of fibrous connective tissue, smooth muscle cells, and cholesterol) on the inside of coronary blood vessels. This plaque creates a narrowing of the vessel diameter, reducing or completely obstructing blood flow to the heart (Jeng & Braun 1997).

14. Myocardial Infarction (MI)-Cellular death in the heart muscle resulting from a sudden insufficiency of oxygen-carrying blood to the heart (Conn, Taylor, & Abele, 1992).

15. Self-efficacy-A person's belief in his/her capability to perform a behavior successfully (Jeng & Braun ,1997).

Delimitations

The delimitations for this study are as follows:

1. Selection/referral bias could be present since the study group may not be representative of all patients who have had a major cardiac event, but rather those selected for referral and those deciding to participate in a structured cardiac rehabilitation program.

2. All data were collected from patients of a single medical facility in the Dallas-Fort Worth, Texas area, which could lead to additional selection bias.

Limitations

The limitations for this study are as follows:

1. As a result of the nature of the cardiac rehabilitation program and the presence of pre-existing medical conditions, patients could not be randomly assigned into experimental and control groups.

2. This study was limited to self-reported data and perceptions in order to examine differences in quality of life prior to and following cardiac rehabilitation

3. The population used was selected from patients of one hospital. Therefore, the findings may not be generalizable to other groups of cardiac rehabilitation patients.

CHAPTER II

REVIEW OF LITERATURE

This review of literature covers four areas related to heart disease and cardiac rehabilitation. First, a brief review of cardiac risk factors will be presented. Second, an overview of cardiac rehabilitation and its different components will be discussed. Third, relevant motivational theories will be reviewed. Finally, factors affecting cardiac rehabilitation patient motivation and compliance will be presented. A summary of the review of literature will be provided at the end of this chapter.

Risk Factors of Cardiovascular Disease

The risk factors for heart disease have been known for a long period of time. Risk factors fall into two categories: uncontrollable and modifiable. Gender, age, and family history of premature heart disease are the risk factors that cannot be controlled. Risk factors that can be modified by changes in lifestyle include elevated cholesterol, hypertension, smoking, diabetes, obesity, sedentary lifestyle, and stress. Generally, the more risk factors a person has, the greater the risk of developing heart disease (American Heart Association, 1993).

Over the last several years, it has been proven that reduction or modification of these risk factors can significantly reduce the chance of developing coronary artery disease. Blood cholesterol levels below 200 mg/dl have been accepted as the indicator for relatively low risk of coronary artery disease (American Heart Association, 1993). A low-fat, low-cholesterol diet to reduce blood cholesterol levels is recommended by the

American Heart Association. The AHA diet proposes that only 30% of total calories come from fat and that the saturated fats should be limited to only 10% of the total fat intake. In order to reduce the major risk factor of elevated blood cholesterol as well as the minor risk factors of diabetes, obesity, and elevated triglycerides, one should limit the amount of dietary cholesterol and fat intake.

Physical inactivity related to a sedentary lifestyle is another risk factor for coronary artery disease (CAD). A regular exercise routine of 30 – 60 minutes of continuous aerobic activity three to four times per week is recommended by the American Heart Association. Examples of aerobic exercise include walking, cycling, jogging, jumping rope, dancing, and swimming (AHA, 1993).

Smoking is directly related to approximately one-fifth of deaths from cardiovascular disease (AHA, 1993). Smokers are twice as likely to suffer a heart attack. After suffering a heart attack, smokers are more likely to die within an hour of the attack. In addition, the risk of sudden cardiac death is two to four times greater for a smoker than that of a nonsmoker. The good news, however, is that the risk for heart disease will rapidly decline when the patient stops smoking, regardless of the length of time or the amount smoked. In addition to decreasing the risk for CAD, smoking cessation will also assist in lowering elevated blood pressure (AHA, 1993).

Cardiovascular Disease and Cardiac Rehabilitation

One person in four suffers from some form of cardiovascular disease, costing approximately $117 billion annually in the U.S. and $19 billion in Canada in medical services, hospitalization expenses, loss of income, and loss of productivity (Heart & Stroke Foundation, 1999). Technological advances in cardiac care have prevented many

deaths, but have increased the number of patients who have survived a cardiac event such as myocardial infarction (MI), or who have had common surgical procedures such as percutaneous transluminal coronary angioplasty (PTCI) or coronary artery bypass grafting (CABG). For those with heart disease, adopting healthy lifestyle behaviors is essential to maintaining good health, and to preventing secondary events and physical disabilities. Using a lifestyle-focuses approach, cardiac rehabilitation programs are designed to improve long-term physical and psychological measures. One of the primary goals of cardiac rehabilitation programs is to improve daily functioning and enhance the well-being of those who have experienced a cardiac event or surgery, as well as for those with coronary artery disease who wish to reduce their risk of experiencing such an event (Denollet, 1993).

Cardiac rehabilitation combines prescriptive exercise training with coronary risk factor modification in patients with established heart disease. Cardiac rehabilitation goals are to improve functional capacity, alleviate or lessen activity-related symptoms, and identify and modify coronary risk factors in an attempt to reduce subsequent morbidity and mortality due to cardiovascular illness. The ultimate goal of cardiac rehabilitation is to restore and maintain an individual's optimum physiological, psychological, social, and vocational status (Balady et al., 2000).

Among the few studies that have been conducted, the reported benefits of cardiac rehabilitation and secondary prevention are vast and commanding. Controlled trials of exercise after myocardial infarction, reported in the 1980's, have supported the benefit of exercise. These trials demonstrated reduction in mortality from cardiovascular causes as well as reduction in overall mortality (Ades, Huang, & Weaver, 1992). Nutritional

counseling combined with exercise have demonstrated a slowing of the atherosclerotic process and a decrease in the rates of subsequent coronary events and hospitalization (Haskell, Alderman, Fair, Maron, Mackey, et al., 1994).

Maines, Lavie, Milani, Cassidy, Gilliland, and Murgo (1997) were interested in the effects of cardiac rehabilitation on exercise capacity, obesity, plasma lipid values, and quality-of-life parameters. They studied 591 patients with coronary artery disease before and after completion of a cardiac rehabilitation program. All patients in the study were referred after having a major cardiac event-MI (45%), CABG (30%), and PTCI (25%). Patients taking lipid-lowering mediations were excluded from the study. The patients completed an outpatient cardiac rehabilitation program that usually lasted about 12 weeks and consisted of 36 educational and exercise sessions. Patients entered the program 3 to 8 weeks following their event. The duration of the program was adjusted according to the patients' ability to improve their risk factors and to do the prescribed exercise portion of the program. All patients were encouraged to exercise one to three times a week at home in addition to the formal program.

Results suggested that well-known risk factors are significantly reduced after formal cardiac rehabilitation. These findings further support the ability of cardiac rehabilitation and exercise training programs to improve exercise capacity, plasma lipid values, obesity indices, behavioral characteristics and quality-of-life parameters in a large group of patients who have had major coronary artery events.

Numerous studies have examined the effects of cardiac rehabilitation on various groups of heart patients. Oldridge (1991) stated that the benefits of cardiac rehabilitation included a decrease in activity-induced angina and cardiac risk factors. An increase was

noted in functional capacity. Levya, Fernandez de la Vaga, and Camacho (1989) discovered that a comprehensive prevention program that includes control of hypertension and diabetes and smoking cessation is helpful in reducing the rate of restenosis post coronary angioplasty. Another study of coronary patients demonstrated more significant improvements in functional capacity among participants of a supervised exercise training program than among those who were unsupervised (Sanderson, 1991).

The outcomes of cardiac rehabilitation have been extensively studied, with many resulting benefits firmly established in the literature. Cardiac rehabilitation has been shown to improve functional ability (Fridlund, Hogstedt, Lidell, & Larsson 1991; Kugler, Dimsdale, Hartley, & Sherwood 1990), increase exercise capacity, produce favorable changes in blood lipid profiles, reduce body weight (Franklin, Gordon, & Timmis 1992; Lavie & Miliani, 1995), and increase psychological well-being (Denollet, 1993; Engebretson, Clark, Miaura, Phillips, & Albrecht 1999; Fridlund et al, 1991., Taylor, Houston-Miller, Ahn, Haskell, & DeBusk 1986). Furthermore, cardiac rehabilitation can result in favorable changes in quality of life (Engebretson et al., 1999; Lavie. Milani, Cassidy, & Gilliland 1999), depression and anxiety (Maines et al., 1997; Milani & Lavie, 1998), and social situations (Fridlund et al., 1991).

A study by Dugmore. Tipson, Phillips, Stentiford, Bone and Littler (1999) examined improvements in cardiac rehabilitation fitness, vocational status, quality of life, and psychological well-being in post-myocardial infarction patients during and after a 12-month exercise rehabilitation program. The sample was comprised of 124 patients with a clinical diagnosis of myocardial infarction. The sample was randomly assigned to either the treatment group or a matched control group. The treatment group (n=62) received a

regular aerobic training program 3 times per week for 12 months. The treatment group was compared with 62 matched controls who did not receive any formal exercise training. The population was subdivided into groups with good and bad prognosis, based on certain criteria. Patients within each group were matched on the basis of the site and severity of their infarcts, age, gender, morbidity rating, and whether they were taking beta blockers. Maximum testing to end points limited by signs or symptoms, or by volitional exhaustion, was subsequently applied to the whole research population at four, eight, and 12 months.

A five-year follow-up survey was also conducted on this sample to determine if selected lifestyle changes had occurred. Differences in cardiorespiratory, psychological, and quality-of-life scores were compared between good and poor prognosis patients and their matched controls over 12 months. At the five-year follow-up, differences in vocational status and lifestyle changes when comparing the total exercising populations (good and poor prognosis combined) with their matched controls were considered. The results of the study indicated that the treatment group had greater improvements in psychological profiles, cardio-respiratory fitness, and quality-of-life scores when compared with the control group. A larger percentage of the regular exercisers resumed full time employment and returned to work earlier than the controls. Controls took lighter jobs, lost more time from work, and suffered more non-fatal re-infarctions.

Frequent ventricular ectopic beats constitute a risk factor for sudden death after MI. However, Lavie (1995) suggested that these are less prevalent in post-MI patients who undertake exercise training. This is reinforced by McSherry (1999) who, in a review of the benefits and risks of cardiac rehabilitation, highlighted the need for a well-

structured exercise protocol. Thompson, Bowman, Kitson,and DeBono (1995) found that patients who exercise post-MI achieve optimum functioning more rapidly than those who do not.

The benefits of cardiac rehabilitation on coronary risk factors, behavioral characteristics, exercise capacity, and quality of life in older patients was studied by Lavie (1995). Benefits of therapy were compared between 199 patients aged 65 and over, and 259 younger patients (< 65 years). The study suggested that mortality was greatly reduced with increasing exercise in older persons. Results indicated that elderly patients had greater improvements than younger patients in both exercise capacity and mental health after cardiac rehabilitation. It was recommended older cardiac patients should pursue formal outpatient cardiac rehabilitation and exercise training programs after major cardiac events.

Bondestam, Breikss, and Hartford (1995) examined the use of health care in patients aged 65 and over who had a myocardial infarction and the effectiveness of outpatient rehabilitation for patients aged 65 and over who had a myocardial infarction in reducing health care for at least the first year. A total of 190 patients participated in the study, with 99 rehabilitation patients as the treatment group and 91 patients receiving standard medical care as the control group. The findings indicated significantly fewer emergency visits (p=.005) and significantly fewer days of re-hospitalizations (p=0.05) among the treatment group compared to the control group. Results of this study show an association between participation in comprehensive cardiac rehabilitation and lower rates of cardiac re-hospitalization.

The benefits of outpatient cardiac rehabilitation, such as reduction in subsequent

hospitalization costs, become indicators of the quality of medical care, and, as such, are applied to both clinical and policy decision making. Ades et al. (1992) completed a retrospective review of computerized billing data to determine total hospitalization charges for cardiac re-admissions following hospital discharge after bypass surgery or after myocardial infarction. The sample included 230 patients referred to cardiac rehabilitation compared with 350 patients not referred. The study indicated that the rehabilitation patients had significantly lower ($p=.022$) cardiac re-hospitalization charges during the three year follow-up period. The researchers concluded that there is an association between participation in comprehensive cardiac rehabilitation and lowered cardiac re-hospitalization costs in the three years after an acute coronary event.

Oldridge, Furlong, Feeney, Torrance, Guyatt, Crowe et al. (1993) studied the cost effectiveness of cardiac rehabilitation initiated soon after acute myocardial infarction for patients with moderate levels of anxiety and depression. Of the 102 patients involved in the study, 99 patients were randomly assigned to the rehabilitation group. They underwent an eight-week program of low-level exercise, risk factor management, and group behavioral counseling that focused on coping strategies. The one-year follow-up indicated that the rehabilitation patients utilized fewer healthcare services ($p=.0001$) compared to the control group. The results suggested that a cardiac rehabilitation program initiated within six weeks of the myocardial infarction was an efficient use of health care resources and may be economically justified.

According to Thompson, Meadows, and Lewin (1998), the assessment of patients' perceptions of well-being, quality of life, and physical outcomes are important indicators for outcome measurement. They determined that quality-of-life assessments

must include areas most important to the patient and the family in order to evaluate the efficacy of medical interventions, including cardiac rehabilitation. In addition to measuring provider-established standards, they proposed that a focus on patient satisfaction should be an essential dimension in cardiac rehabilitation.

Historically, the emphasis of cardiac rehabilitation programs has been placed on physical rehabilitation and the subsequent reduction of morbidity and mortality. However, research has demonstrated that emotional stress and distress also has an impact on morbidity and mortality. For example, negative emotion, including anger, depression, and anxiety, has been shown to be a risk factor for ischemic heart disease and sudden cardiac death (Kawachi. Sparrow, Vokonas, & Weiss, 1994). The management of the psychological well-being of patients who have suffered a MI is vital, as depression, low morale, and distress are significant predictors of morbidity among post-MI patients (Pashkow, Ades, & Emery 1995). Thus, there is an increasing recognition that improvement in negative affect and well-being is important (Denollet, 1993).

In a study of the impact of cardiac rehabilitation exercise programs on physical and psychological status of the patients (Lavie et al., 1999), the data indicated that depression is fairly common in women with coronary artery disease. This study demonstrated that women with depression had significant improvement in exercise capacity, obesity indexes, behavioral characteristics, and quality of life following formal cardiac rehabilitation programs. In a major meta-analysis study (Byrne & Byrne, 1993), a positive relationship was found between exercise status and mood state, especially depression.

Additionally, patients' perception of their health is also important, as perceived

health is related to life satisfaction and seeking further medical care, and is predictive of adjustment to illness, return to work, and adherence to exercise (Engebretson et al., 1999). As a result, the current efforts toward returning patients with cardiac disease to their optimal physical, psychological, social, emotional, vocational, and economic status (Gattiker, Goines, & Dennis 1992) now more closely approximates the 1964 World Health Organization's statement (WHO, 1964) that comprehensive cardiac rehabilitation should assist cardiac patients toward achieving the overall goals of reestablishing active and productive lives.

For several years, patient self-report data have been used as outcome measures in evaluating the health status of a clinically defined population (McCarthy, Shroyer, Sethi, Moritz, Henderson, Grover et al., 1995). McCarthy et al. (1995) reported on a comparison study of CABG patients in the Department of Veterans Affairs hospital system and a multi-site Health Services Research Cooperative. The study, which utilized the SF-36 health survey and Life Satisfaction forms, showed consistency with reliability scores for the SF-36 self-reported measures.

In a study by Stewart, Greenfield, and Hayes (1989), the functional status and well-being of patients with chronic illnesses (n=9,385) was compared to that of a sample representing the U.S. population (n=2,008), using the SF-36 survey questionnaire. The differences in physical functioning, role functioning status, and health perception of well-being health scores for the two comparison groups were significant (p=.01). Functional status and well-being are essential to patients and are highly valuable to health care providers in order to monitor patients' progress, quality of life, and the effects of medical interventions.

Defining and measuring quality of life is the first step to improve patient care and achieve better patient outcomes (Marshall, Shroyer, Grover, & Hammermeister 1998). Evaluation of health constructs through the patients' self-reporting of functional status, emotional well-being, and perception of increased health benefits are intended to assist physicians to better understand the effectiveness of treatment as well as health care decisions. Previously, important decisions narrowly focused on morbidity and mortality to measure health status as a measure of quality care (Marshall et al., 1998).

Advances in health care have made available a variety of therapeutic options (Gulanick, 1998). However, functional status issues are often the determining factor in treatment choice (Oldridge, 1991). A large quantity of health care resources can be utilized by patients, yet they may still find unsatisfactory outcomes in their quality of life (Oldridge, et al., 1993). Increasingly, patients expect to participate as partners in therapeutic decisions (Warner, Weintraub, Craver, Jones, Gott, & Guyton, 1997). Both patients and payers, such as health maintenance organizations, are demanding outcomes measurement to make informed decisions about where to seek care and spend their limited healthcare dollars (Paone, Higgins, Spencer, & Silverman 1995). Quality of life is an important aspect in assessing the outcome of any therapeutic intervention and becomes a pertinent issue when benefits from expensive medical and surgical interventions are debatable (Kinney, 1995).

Coronary heart disease patients continue to benefit from the re-emphasis on exercise. More ailing sufferers, such as those with congestive heart failure, are also showing improvement. Some of the benefits include increased muscular strength, decreased heart rate, increased stroke volume, and increased maximum working capacity.

Even though exercise is one of the few non-surgical interventions that results in both mental and physical improvement in heart disease patients, exercise-based cardiac rehabilitation remains underused. Despite the well-established benefits of exercise as part of cardiac rehabilitation protocol, only about 15% of eligible coronary artery disease patients are referred to an exercise-based cardiac rehabilitation program (Balady et al., 2000). The reasons for low participation rates include the geographic maldistribution of available programs and the failure of physicians to refer patients to the programs, particularly elderly persons and women (Ades et al., 1992).

Motivational Theories

Many motivational theories for heart disease risk reduction have been offered. Two of the most commonly cited theories include the Health Belief Model (HBM) and the Self-Efficacy Theory (Derenowski-Fleury, 1991; Fleury, 1992; Ringel, 1991).

Health Belief Model (HBM)

Fleury (1992) surveyed studies that had applied the Health Belief Model- and-identified 10 studies over the past 20 years that had used the HBM to explain and predict individual health behavior. These studies focused on different health behaviors, including anti-hypertension regimen adherence, exercise, smoking cessation, and participation in outpatient cardiac rehabilitation. The perceived barriers were noted to be the strongest HBM factor associated with health behaviors of persons with cardiovascular disease. However, Fleury stated that further study was needed to improve the predictive ability of the HBM .

Ringel (1991) developed a model that blended the paradigms from the Health Belief Model and the Health Promotion Model to illustrate patient experiences following

a cardiac event. In this model, Ringel stated the client with coronary artery disease (CAD) presents with their general health status, various cardiac risk factors, and previous medical history. The author noted the cause of the CAD can be identified from a medical interview and an assessment of cardiac risk factors. Ringel also expressed the past history and length of time the client has had the risk factors and any other medical conditions will have an effect on the client's ability to adjust to CAD and proceed with health restorative actions that will promote health and avoid illness.

In the hospital, after a cardiac event, a person will receive educational information regarding certain lifestyle changes that are necessary to promote health. In Ringel's model, these lifestyle changes are identified as "Health Restorative Measures." The client will strive to improve or maintain health and avoid illness. The model identifies "outcomes" of health restorative measures as obvious lifestyle changes and different levels of psychosocial adjustment. One other factor influencing the health restoration of the client is participation in a structured cardiac rehabilitation program (Ringel, 1991).

Self Efficacy Theory

The self-efficacy theory is a component of Bandura's social leaning theory (Bandura, 1986). Self-efficacy is defined as a person's belief in their capability to successfully perform a specific behavior. If a person has confidence in their ability to perform, they are more likely to act (Bandura, 1977). Efficacy expectations also help people determine how much effort to consume and how long they will persist in light of obstacles or barriers faced daily (Bandura, 1977). Essentially, self-efficacy is a mediator between knowledge and action, acting as a bridge between knowing what to do, and actually doing it (Berducci & Lengacher, 1998).

In addition, a person must expect that performing the behavior will lead to certain results. Because the expected outcomes are filtered through the person's expectations of their ability to perform the behavior in the first place, self-efficacy is thought to be the single most important characteristic that determines a person's behavior change (Bandura, 1986).

The self-efficacy theory has been used in several studies observing motivation and adherence to cardiovascular risk reduction (Derenowski-Fleury, 1991; Fleury, 1992; Gulanick, 1998). Self-efficacy perceptions appear to be the most powerful determinants of changes in behavior. Various sources reveal information about self-efficacy: verbal persuasion, performance experiences, vicarious experiences, and emotional or physiological arousal. Verbal persuasion and emotional arousal are less potent sources of self-efficacy. Verbal persuasion is provided through praise and encouragement and is used frequently in health promotion programs to convince people that they can, indeed, perform certain behaviors (Berarduci & Lenagacher, 1998). Performance experiences, especially clear successes or failures, have the most powerful effect on self-efficacy. Conversely, failures lower self-efficacy, especially if failures occur before an individual has established a sense of efficacy (Bandura, 1994). If the persuader is someone in authority with special knowledge, expertness and trustworthiness have an especially strong effect. (Jeng & Braun, 1997). Emotional and physiological arousal affects self-efficacy in a negative way through feelings of anxiety, fear, fatigue, and pain. High arousal may weaken performance because of increased stress and tension. When people become aware of these aversive feelings, especially when they are associated with poor behavioral performance, incompetence, or failure, they are likely to doubt their

behavioral competence (Maddux & Stanley, 1988). Reducing stress reaction and moderating emotional responses are the fourth way to influence self-efficacy (Bandura, 1994).

Self-efficacy is a "dynamic process that is continually adjusted as a function of behavioral, cognitive, and environmental information" (McAuley, 1992). According to Bandura (1994), the self-efficacy sources are also the keys to influencing and changing self-efficacy perceptions. Cardiac rehabilitation exercise programs provide the opportunity to increase patients' exercise self-efficacy perceptions by having patients perform activity in gradually increasing doses (performance experiences), allowing them to see others similar to themselves performing the activities (vicarious experiences), and having health care professionals provide information and positive feedback (verbal persuasion) (Denollet, 1993). Cardiac rehabilitation has also been shown to diminish emotional arousal by lessening anxiety in participants (Denollet, 1993; Maines et al., 1997), thus providing positive reinforcement to all sources of self-efficacy.

Oldridge and Rogowski (1990) tested the hypothesis that cardiac rehabilitation can have a positive influence on self-efficacy. These authors proved that two in-patient rehabilitation programs were able to increase cardiac patients' self-efficacy at hospital discharge and seven days later. Further testing at 28 days after discharge found that the patients exercising at a rehabilitation center had significantly higher self-efficacy scores for walking time and overall exertion, suggesting that the benefits from the dedicated exercise program may be retained longer, or more easily transferred to the home environment.

Bandura's theory of self-efficacy includes the principle of specificity. Self-perceived ability varies greatly according to the specific behavior that is to be performed (Bandura, 1982). Subsequent studies in cardiac populations have supported this principle. Ewart, Stewart, Kelemen, Gillilan, Valenti, Manley et al., (1984) found that jogging self-efficacy predicted how long patients were able to work on the treadmill, but not how much weight they could lift with their upper and lower body. Correspondingly, self-efficacy estimates for arm activities predicted how much weight the patients could lift, but not how long they could walk on the treadmill. In a second study, self-efficacy estimates for activities such as stair climbing, lifting, pushing, and engaging in sexual activity were not related to overexertion or underexertion while jogging (Gillian, Chopra, Kelemen, Stewart, Ewart, Kelemen, et al., 1984). In a subsequent review, Ewart & Taylor (1985) concluded that self-efficacy estimates are predictive of only those activities that involve similar muscle groups, cardiovascular response, and amount of effort required. Thus, any instrument designed to measure self-efficacy must tap the perceived efficacy for the specific behavior being studied.

There is a sufficient amount of evidence in the literature to support the idea that self-efficacy perceptions are significantly related to physical activity behaviors. Allen, Becker, & Swank (1990) found that self-efficacy was a better predictor of functional status in 125 men who had undergone a coronary artery bypass graft procedure than any other psychosocial or physical measure. Ewart (1989) found that exercise self-efficacy had a greater influence on the return to normal activities after an MI than actual medical status. Self-efficacy predicted physical function in 198 coronary artery disease patients six months after coronary catheterization (Sullivan, LaCroix, Russo, & Katon 1998), but

was not related to treadmill results after discharge from the hospital following coronary artery bypass graft in a small study of 21 men (Brown et al., 1992).

A series of studies with cardiac populations has provided evidence for the predictive value of self-efficacy perceptions in the performance of exercise behaviors. Ewart, Taylor, Reese, & DeBusk (1983) examined the correspondence between self-efficacy perceptions and physical exertion in two groups: low-risk men who had suffered an uncomplicated MI, and men of comparable age with a history of coronary artery disease who participated regularly in a group jogging program. Self-efficacy scores for jogging obtained before treadmill testing predicted the maximum heart rate and MET level achieved during treadmill testing for the MI patients (Ewart et al., 1983) and the duration of the treadmill test in the joggers (Gillilan et al., 1984). In addition, self-efficacy scores obtained after the treadmill test predicted the intensity and duration of home exercise during the following week (Ewart et al., 1983). Similarly, self-efficacy scores for lifting and pushing tasks predicted the amount of weight patients subsequently lifted during circuit weight training and jogging self-efficacy scores predicted the patient's exercise heart rate curing the group jogging program (Gillilan et al., 1984).

In two similar, subsequent studies, self-efficacy proved to be a better predictor of adherence to a prescribed heart rate range during exercise than did previous treadmill performance (Ewart et al., 1986), and pre-training self-efficacy judgements predicted post-test strength gains even after controlling for baseline strength, type of training, and frequency of participation (Ewart et al., 1986). An interesting finding of three of Ewart and colleagues' studies (Ewart et al., 1983, Ewart et al., 1986; Taylor et al, 1986) was that self-efficacy scores predicted subsequent activity better than actual treadmill

performance. This supports Bandura's notion that confidence in one's ability to perform a task is more important than a person's actual physical capabilities (Bandura, 1986).

Ewart and Taylor (1985) conclude that "the amount of correspondence between self-efficacy perceptions and behavior increases in direct proportion to the extent to which the patient has recently experienced a behavior similar to the activity in question, p. 166." Therefore, just as self-efficacy influences behavior, performance of the behavior influences self-efficacy. The specific behavior that will influence self-efficacy in a cardiac rehabilitation setting is compliance to the exercise prescription and, in particular, the frequency portion of the exercise prescription. Thus, the more often the patient exercises, the more their exercise self-efficacy is enhanced.

Cardiac Rehabilitation Patient Motivation and Compliance

While many sources have identified the need for patient compliance in the rehabilitation program, few studies have addressed the long-term effectiveness of the rehabilitation program's efforts to instill risk factor modification habits (AACVPR, 1991). Some studies have examined patient motivation to aid in increased development of long lasting lifestyle changes.

Gaw (1992) studied the motivation of post-PTCI patients to change their lifestyle. These patients often considered themselves to be "cured of coronary artery disease" following PTCI. Consequently, they were not motivated to change their risk factors after returning home. The interviews conducted by Gaw revealed that less than half of the patients undergoing PTCI appeared to have any motivation to make lifestyle changes to reduce cardiac risk factors. Gaw, therefore, recommended that the therapist identify motivational levels and assist patients and families, through education and rehabilitation,

in moving toward achieving lifestyle modifications following PTCI.

Charlton (1993) developed a tool to facilitate compliance among cardiac rehabilitation patients. This instrument helped to identify clients who were at risk of dropping out of the program. If these potential dropouts can be identified, Charlton contended, the therapist can formulate an individualized motivational care plan to help the patient attain their maximum benefit from the cardiac rehabilitation program.

Oldridge (1991) reviewed the literature pertaining to compliance with cardiac rehabilitation services of several facilities and raised the question of whether poor compliance to lifestyle management of risk factors resulted from poor communication by the health professional. The author suggested the need for further study to determine if an emphasis on patient self-responsibility would result in increased long-term compliance. Oldridge identified the challenge to the health care provider as having two components: 1) motivate the client to take the first action to modify cardiac risk factors and, 2) provide strategies designed to assist patients in maintaining long-term compliance to their risk factor modifications.

Conn, Taylor, and Abele (1991) studied MI survivors to determine if gender and age differences existed in psychosocial condition, health state and therapeutic regimen adherence. Their findings revealed no gender differences in adherence to the exercise, diet, medication, stress-modification and smoking reduction components of the cardiac therapeutic regimen. Also, the extent of participation in cardiac rehabilitation related to gender differences showed no statistical significance. An inverse relationship between age and cardiac rehabilitation attendance and adherence to the exercise component of the therapeutic regimen was noted.

Despite the many benefits of Cardiac Rehabilitation programs, only an estimated 11-34% of CHD patients participate in cardiac rehabilitation after a MI or CABG (Ades, Meachum, Handy, Nedde, & Hanson 1986; DeBusk, Blomauist, Kouchoukos, Luepker, Miller, Moss et al., 1986; Vidmar & Rubinson, 1994) and only about half of those on long-term regimens are compliant (Oldridge, 1982; Sacket & Snow, 1979). Compliance is defined as the "extent to which a person's behavior...coincides with medical or health advice" (Haynes, 1979, p. 7). Haynes points out that an individual has the right to refuse to follow health advice in our society, but that active refusal is not the main problem in noncompliance. Many people seem to have difficulty sticking with a prescribed treatment, but the reasons for this difficulty are not fully understood. Although there are many theories that explore compliance problems, Haynes comments that "noncompliance is simply one of the prices to be paid for free will and as such is an integral part of the human condition p. 10"

In order to gain the health benefits of a prescribed regimen such as cardiac rehabilitation, one must be compliant with attendance and participation requirements. This was confirmed by the findings of Conn et al. (1991) in their study of 197 post-MI patients. Patients who participated more often in cardiac rehabilitation reported significantly better health, fewer days of reduced activity, greater self-esteem, greater quality of life, less anxiety, and less depression. Similarly, compliance was the most significant predictor of changes in exercise endurance in a group of 57 patients with chronic obstructive pulmonary disease (Eakin, Sassu-Dambron, Kaplan, & Ries, 1992).

Interestingly, fewer female cardiac patients are referred to, or enroll in, cardiac rehabilitation programs, and females tend to have lower tolerance for physical activity,

lower self-efficacy, are more anxious, and miss a greater number of sessions than males (Schuster & Waldron, 1991). However, because of their lower scores at baseline, the improvements after cardiac rehabilitation may be of even greater clinical benefit to women than to men (Lavie & Milani, 1995).

Ewart and Taylor (1985) assert that cardiac patients often delay or avoid adopting and maintaining healthy lifestyle changes for psychosocial reasons. Distorted self-perceptions, especially the perception that one's physical impairment is more severe than is actually the case, and excessive fear of precipitating a subsequent cardiac event may result in restriction of activity and reduction in normal functioning. This, in turn, can result in a reduced quality of life by undermining a patient's self-esteem and self-confidence. According to Bandura (1982), the most powerful way to change inaccurate self-perceptions is through gradual exposure to a behavior, allowing one to experience and to see others have positive experiences. Since attendance in a cardiac rehabilitation program provides the opportunity to experience exercise in a safe, supervised setting, exercise compliance is a good way to increase cardiac patients' confidence in their physical capabilities.

Summary

The review of literature examined retrospective studies that consistently produced higher estimates of the benefits of treatment. Studies on outcomes of cardiac rehabilitation by Engblom et al. (1997) and Lavie and Milani (1995) indicated long-term impact on coronary risk factors and improvement in exercise capacity. Quality of life studies revealed improved functional status and well-being are goals of cardiac rehabilitation. McHorney (1997) suggests the best method to measure patients' quality of

life is to monitor outcomes from the patients' point of view by measures of functioning and well-being.

The literature generally concurred that there is the need for further study on the effects of rehabilitation programs on adherence to lifestyle modifications (Derenowski-Fleury, 1991; Oldridge, 1991). All authors agreed that additional longitudinal studies are needed to evaluate long-term compliance to coronary risk factor modification. It is, therefore, important to evaluate the effectiveness of cardiac rehabilitation programs in assisting cardiac patients to choose and maintain healthier lifestyles and improve their quality of life.

CHAPTER III

METHODOLOGY

In this chapter, a description of the methodology used in this retrospective study will be presented. This includes the study sample, instrumentation, research procedures, and the treatment of the data.

Study Sample

For this study, a convenience sample of 236 cardiac rehabilitation patients who had completed a phase II cardiac rehabilitation program, including the exercise protocol, at a community hospital rehabilitation unit located in Dallas, Texas was used. The sample was drawn from an anonymous database (no names or other unique identifiers were included) provided by the hospital to the researcher. Code numbers were used instead of names to identify the patients' data in order to protect confidentiality.

The study was conducted in compliance with the current rules and regulations of the Human Research Review Committee of Medical City Dallas Hospital. The study complied with the hospital's ethical guidelines for research involving human participants, and had written approval from the hospital's review board (Appendix A). The use of retrospective secondary data in the study was also reviewed and approved by the Institutional Review Board of Texas Woman's University (Appendix B).

Characteristics of the sample are presented in Table 1. Of the 236 subjects, 179 subjects were male (75.8%) and 57 were female (24.2%). Their ages ranged from 31 to

Table 1. Subject Characteristics

Characteristic		N	%
Gender	Male	179	75.8
	Female	57	24.2
Age	30-49	35	14.8
	50-59	57	24.2
	60-69	129	54.7
	70 and over	15	6.4
Diagnosis	CABG	111	47.0
	PTCI	65	27.5
	Valve	14	14.0
	Other (MI, CHF)	46	19.5

CABG: Coronary Artery Bypass Graft; PTCI: Percutaneous Transluminal Coronary Intervention; MI: Myocardial Infarction; CHF: Congestive Heart Failure.

84 years, with a mean age of 61.66 years. The mean age of males was 61.52, while the mean age of females was 62.09. Age was divided into four groups: 35 subjects were between the ages of 30 – 49 (14.8%), 57 subjects were between the ages of 50 – 59 (24.2%), 129 subjects were between the ages of 60 – 69 (54.6%), and 15 were between the ages of 70 – 79 (6.4%). The sample consisted of 111 coronary artery bypass (CABG) patients (47%), 65 percutaneous transluminal coronary intervention (PTCI) patients (27.5%), 14 valve replacement patients (5.9%), and 46 (19.5%) other. Coronary artery bypass refers to any patient who received surgical grafting of the vein or artery to permit increased blood flow to the heart. Percutaneous transluminal coronary intervention refers to any patient who had an artery or arteries inflated with an intracoronary balloon in order to dilate the blood vessels therefore increasing blood flow to the heart. Valve replacement

refers to replacement of the aortic and/or mitral valve. The "other" heart conditions noted by the subjects on the demographic tool included myocardial infarction (MI), congestive heart failure (CHF), heart transplant, angina, and cardiomyopathy. Subjects who responded to the demographic data question on heart condition with two or three heart conditions marked were treated as coronary artery bypass subjects if coronary artery bypass surgery was one of the conditions marked.

Instrumentation

The database used in this study contained responses from patients who had completed two questionnaires upon admission to the Phase II Cardiac Rehabilitation Program: the Duke Activity Index (DASI), which measured self-report functional status, and the Medical Outcomes Study Short Form (SF-12), which measured perceived quality of life.

Duke Activity Status Index (DASI)

The Duke Activity Status Index (DASI) measures an individual's ability to complete certain activities, and was used in this study to assess pre-and post-rehabilitation functional status (Appendix C). The instrument, developed by Hlatky, Boineau, Higginbotham, Lee, Mark, and Cailiff (1989), contains 12 questions regarding specific activities. Respondents are asked if they are able to perform certain activities and are required to give a simple yes or no response. The activities listed on the DASI include: activities of daily living, walking a block, running a short distance, climbing stairs, moderate housework (i.e. vacuuming, sweeping, etc.), heavy housework (i.e. scrubbing floors, lifting heavy furniture, etc.), yard work, sexual activity, recreational activities (i.e. golf, bowling, dancing), and strenuous sports (i.e. tennis, football, skiing).

Each activity is assigned a certain "weight". The "yes" answers are assigned the given weight. All of the "yes" answers are added together and calculated through a mathematical formula for the DASI score. The DASI score is recorded as a metabolic equivalent value (MET).

Jaeger, Hlatky, Paul, and Gortner (1994) indicated that when administered preoperatively, the DASI predicted status of angina, congestive heart failure, and other comorbidities. These authors suggested that the DASI could also be used postoperatively to assess recovery. Nelson, Herndon, Mark, Pryor, Califf, and Hlatky (1991) discovered the DASI discriminated between the functional status of patients with varying severity of heart disease. Mark, Lam, Lee, Clapp-Channing, Williams, Pryor et al. (1994) reported that the DASI was the single most important predictor of employment status one year after cardiac catheterization. These results suggest that the DASI is a brief, valid, and reliable subjective measure of functional ability.

Medical Outcomes Study Short Form (SF-12)

SF-12. The quality-of-life variables were measured using the Medical Outcomes Study 12-item short form (SF-12) health survey. The SF-12 was used as a measure to assess physical and mental quality of life before and after participation in the rehabilitation program (Appendix D). The SF-12 includes one multi-item scale that measures each of eight health constructs: physical functioning, social functioning, role-physical, role-emotional, bodily pain, general mental health, vitality, and general health perceptions (Ware, 1993). The SF-12 (Stewart, 1989) is a 12-item general quality of life instrument that has good validity and reliability and has been extensively used in healthy medical populations.

This tool was designed for use in clinical practice and research, health policy evaluations, and general population surveys. The SF-12 was developed by Ware (1993) as a subset of the SF-36. Respondents indicate on Likert-type scales the degree or frequency of a variety of potentially problematic health, pain, behavioral, and emotional events difficulties, social functioning, mental health, vigor, health perceptions, and pain. It has been shown to distinguish patients with different chronic medical conditions and quantify their divergences from healthy populations (Stewart, 1989). The SF-12 has been justified in studies with large sample sizes having several constraints on questionnaire length and in studies focusing on patient-based assessments of physical and mental health (Ware, 1992). The participants were asked to determine if they were limited by certain physical activities ("some of the time"; "most of the time"; "all of the time"). They were also asked to complete the same instrument for the mental health section. The SF-12 was used in this study as a measure to assess general quality of life before and after participating in the rehabilitation program.

The 12-item short-form achieved multiple R squares of 0.911 and 0.918 in predictions of the SF-36 Physical Component Summary and SF-36 Mental Component Summary scores, respectively (Ware, 1993). Raw scores are summed across questions in the same scale, and transformed to a 0 to 100 scale, with a higher score indicating a better health state.

Research Procedures

Cardiac Rehabilitation Program

In the cardiac rehabilitation program, exercise starts as soon as possible after myocardial infarction (MI) or intervention. Post-MI and post-PTCI patients whose conditions are uncomplicated can begin moderate exertion within a week of discharge and post bypass graft patients can begin within three weeks of discharge.

In addition to the exercise component, disease-specific patient education sessions in a hospital education classroom are offered two times per week and cover a variety of health-related, dietary and psychosocial topics. All patients meet with the staff dietician for a one-hour dietary assessment. Program participants are referred to the program psychologist as necessary.

Exercise Prescription

Patients participating in the cardiac rehabilitation program were given an exercise prescription based on the American College of Sports Medicine (ACSM) guidelines for frequency, intensity, time, and type of exercise (ACSM, 1995). The ACSM recommends three to five exercise sessions per week for this population. Patients were encouraged to attend the cardiac rehabilitation program three times per week and they were given a home exercise prescription for two days per week. Home exercise should consist of aerobic exercise such as: walking, biking, swimming, or any other activity that elevates heart rate into their target heart rate range. They should perform the activity for 30 minutes per session to meet the requirements of the program.

Patients were also instructed to monitor intensity through their heart rate. For the first four weeks of the program, target heart rate was calculated as resting heart rate plus

20- 30 beats per minute (ACSM, 1995). After four weeks of participating in the program, they were assigned a target heart rate using the heart rate reserve method. The reserve was calculated by subtracting the resting heart rate from the age predicted maximum heart rate.

In addition to monitoring heart rate, patients were taught how to subjectively rate the intensity of their exercise sessions using Borg's Rating of Perceived Exertion (RPE) scale (Borg & Linderholm, 1967). Borg used a 15-point scale where a rating of "6" means no exertion at all, and "20" means maximal exertion. Patients were advised to stay between ratings of 11 (Fairly light) and 13 (Somewhat hard). Patients were asked to rate each day's session as well as their home exercise (Appendix E).

The ACSM and the American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) advise that each exercise session should be at least 20 minutes in length to obtain improvements in functional outcomes (AACVPR, 1999; ACSM, 1995). Each session of the cardiac exercise program consisted of a 10 minute group warm-up, 35 minutes of aerobic exercise, 5 minute cool-down, and 10 minutes of resistive training exercises. The patients exercised three times a week for a maximum of 12 weeks. They were monitored with electrocardiography continuously during exercise.

Resistive training is also an important component of the cardiac rehabilitation program. Strength training is designed to help the patient more adequately meet the demands of daily household tasks. Exercises include: modified push-ups, bicep curls, tricep extension, one-arm rows, leg extensions and curls.

Data Collection

The subjects were asked to complete two questionnaires upon admission to the

Phase II Cardiac Rehabilitation Program. The same questionnaires were administered upon discharge from the rehabilitation program. An explanation of the questionnaires was provided to the patient by the therapist. The protection of the individual's rights and privacy were explained. Completion and return of the questionnaire and a signed informed consent signified agreement to participate in the study. The data were collected from January 2001 – December 2001. The questionnaire required approximately 10 minutes to complete.

Treatment of Data

Data were provided by the hospital in the form of Microsoft Excel database files, and were then converted by the researcher into SPSS datafiles for analysis using the SPSS statistical software package. Descriptive statistics were used to describe the sample characteristics, and a paired-samples t-test and univariate analysis of variance (ANOVA) were used to test the study hypotheses. The results of the data analyses are presented in Chapter IV.

CHAPTER IV

RESULTS

In this chapter, the results of the data analyses for this study are presented. The results of the analysis of differences in the cardiac rehabilitation patient pre- and post-program scores for functional status, physical quality of life, and mental quality of life are provided, as well as a comparison of these differences by age group, gender, and diagnosis. A summary of these results is presented at the end of the chapter.

Differences in Functional Status

An analysis of the pre/post differences in functional status scores was conducted for the total sample using paired-samples t-tests. Differences in these scores by age, gender, and diagnosis groups were examined using univariate analysis of variance (ANOVA).

Differences in Functional Status for Total Sample

Using the pre- and post-program functional status scores on the Duke Activity Index (DASI) for the 236 study participants, a paired-samples t-test was performed. The mean scores and the results of the t-test are presented in the Table 2.

These results indicate that there was a substantial increase of 2.163 in the mean score for functional status for the total sample increased from pre- to post-program. This difference in pre/post score is statistically significant at the p=.05 level of significance.

Table 2. Differences in Pre/Post Functional Status (DASI) Scores.

	Mean Score	N	St Dev
Pre	5.864	236	1.9001
Post	8.027	236	1.777
Difference	2.163		

t=19.502, df=235, p<.001

Differences in Functional Status by Age Group, Gender, and Diagnosis

Using the pre- and post-program functional status scores on the Duke Activity Index (DASI) for the 236 study participants, a univariate analysis of variance (ANOVA) was performed to examine pre/post differences for age group, gender, and diagnosis, and allowing for interactions. The mean scores and the results of the ANOVA are presented in Table 3.

By age group, the 50–59 age group had the highest pre-program functional status mean score, with a mean of 6.540, followed by the 30 – 49, 60 – 69, 70+ age groups, with means of 5.801, 5.692, and 4.962 respectively. The difference in the pre-to post-program means was greatest for the 30-49 age group, with an increase of 2.596, followed by the 60-69, 50-59, and 70+ age groups, with increases of 2.231, 1.994, and 1.207, respectively. However, using Tukey's multiple comparison procedure, an ANOVA comparison of the differences in pre/post functional status mean scores among the four age groups were not statistically significant at the p=.05 level.

Table 3. Differences by Age Group, Gender, and Diagnosis in Pre/Post Functional Status (DASI) Scores

		Pre	Post	Difference
Age Group				
30-49	Mean	5.801	8.397	2.596
	N	35	35	
	St Dev	1.937	1.752	
50-59	Mean	6.540	8.534	1.994
	N	57	57	
	St Dev	2.086	1.647	
60-69	Mean	5.692	7.923	2.231
	N	129	129	
	St Dev	1.724	1.732	
70+	Mean	4.962	6.124	1.207
	N	15	15	
	St Dev	1.955	1.365	
F=2.201, df=3, p=.089				
Gender				
Males	Mean	6.057	8.385	2.328
	N	179	179	
	St Dev	1.938	1.650	
Females	Mean	5.258	6.902	1.644
	N	57	57	
	St Dev	1.647	1.699	
F=2.817, df=1, p=.095				
Diagnosis				
CABG	Mean	5.156	8.005	2.849
	N	111	111	
	St Dev	1.507	1.798	
PTCI	Mean	7.058	8.424	1.366
	N	65	65	
	St Dev	2.036	1.667	
Valve	Mean	5.469	7.629	2.160
	N	14	14	
	St Dev	1.156	1.864	
Other	Mean	6.005	7.638	1.633
	N	46	46	
	St Dev	1.912	1.787	
F=8.453, df=3, p<.001				

By gender, the males showed a higher pre-program functional status mean score

(8.385) when compared with the mean score for females (6.902). There was also a larger increase in pre/post means for males, with an increase of 2.328 compared to 1.644 for females. However, using Tukey's multiple comparison procedure, an ANOVA comparison of the differences in pre/post functional status mean scores between the genders were not statistically significant at the p=.05 level.

By diagnosis group, the PTCI group had the highest pre-program functional status mean score, with a mean of 7.058, followed by the Other, Valve, and CABG groups, with means of 6.005, 5.469, and 5.156, respectively. The difference in the pre-to post-program means was greatest for the CABG group, with an increase of 2.849, followed by the Valve, Other, and PTCI groups, with increases of 2.160, 1.633, and 1.366, respectively. Using Tukey's multiple comparison procedure, an ANOVA comparison of the differences in pre/post functional status mean scores among the four diagnosis groups indicated that the increase in CABG patients' mean score compared to the increase in mean scores for PTCI and Other patients, and the increase in PTCI patients' mean score compared to the increase in mean score for Valve patients, were statistically significant at the p=.05 level. No other statistically significant main effects or interactions were found by diagnosis group.

Differences in Physical Quality of Life

An analysis of the pre/post differences in physical quality of life scores was conducted for the total sample using paired-samples t-tests. Differences in these scores by age, gender, and diagnosis groups were examined using univariate analysis of variance (ANOVA).

Differences in Physical Quality of Life for Total Sample

Using the pre- and post-program physical quality of life scores on the Medical Outcomes Study Short Form (SF-12) for the 236 study participants, a paired-samples t-test was performed. The mean scores and the results of the t-test are presented in Table 4. These results indicate that there was a substantial increase of 10.68 in the mean score for physical quality of life for the total sample increased from pre- to post-program. This difference in pre/post score is statistically significant at the p=.05 level of significance.

Differences in Physical Quality of Life by Age Group, Gender, and Diagnosis

Using the pre- and post-program physical quality of life scores on the Medical Outcomes Study Short Form (SF-12) for the 236 study participants, a univariate analysis of variance (ANOVA) was performed to examine pre/post differences by age, gender, and diagnosis, and allowing for interactions. The mean scores and the results of the ANOVA are presented in Table 5.

Table 4. Differences in Pre/Post Physical Quality of Life (SF-12) Scores.

	Mean Score	N	St Dev
Pre	37.30	236	9.903
Post	47.98	236	8.534
Difference	10.68		

t=18.028, df=235, p<.001

Table 5. Differences by Age Group, Gender, and Diagnosis in Pre/Post Physical Quality of Life (SF-12) Scores

		Pre	Post	Difference
Age Group				
30-49	Mean	38.267	48.499	10.232
	N	35	35	
	St Dev	11.291	8.736	
50-59	Mean	37.951	49.819	11.868
	N	57	57	
	St Dev	9.896	7.497	
60-69	Mean	37.129	47.853	10.725
	N	129	129	
	St Dev	9.507	8.435	
70+	Mean	34.034	40.839	6.805
	N	15	15	
	St Dev	9.626	8.089	
F=.260, df=4, p=.903				
Gender				
Males	Mean	38.297	49.195	10.898
	N	179	179	
	St Dev	10.214	7.872	
Females	Mean	34.168	44.156	9.988
	N	57	57	
	St Dev	8.171	9.437	
F=.586, df=1, p=.445				
Diagnosis				
CABG	Mean	33.858	47.724	13.866
	N	111	111	
	St Dev	9.157	8.129	
PTCI	Mean	43.350	49.899	6.549
	N	65	65	
	St Dev	9.423	8.296	
Valve	Mean	36.339	46.562	10.223
	N	14	14	
	St Dev	6.953	7.512	
Other	Mean	37.347	46.306	8.959
	N	46	46	
	St Dev	9.198	9.781	
F=3.729, df=3, p=.012				

By age group, the 30 – 49 age group had the highest pre-program physical quality of life mean score, with a mean of 38.23, followed by the 50 – 59, 60-69, 70+ age groups, with means of 37.95, 37.13, and 34.03, respectively. However, using Tukey's multiple comparison procedure, an ANOVA comparison of these differences in pre/post quality of life mean scores among the four age groups were not statistically significant at the p=.05 level.

By gender, the males showed a higher pre-program physical quality of life mean score (38.27) when compared with the mean score for females (34.17). There was also a larger increase in pre/post means for males. However, using Tukey's multiple comparison procedure, an ANOVA comparison of these differences in pre/post physical quality of life mean scores between the genders were not statistically significant at the p=.05 level.

By diagnosis group, the PTCI group had the highest pre-program physical quality of life mean score, with a mean of 43.35, followed by the Other, Valve, and CABG groups, with means of 37.35, 36.34, 33.86, respectively. The difference in the pre-to post-program means was greatest for the CABG group, with an increase of 13.86, followed by Valve, Other, and PTCI groups, with increases of 10.22, 8.96, 6.55, respectively. Using Tukey's multiple comparison procedure, an ANOVA comparison of the differences in pre/post physical quality of life mean scores among the four diagnosis groups indicated that the increase in CABG patients' mean score compared to increase the mean scores for PTCI and Other patients was statistically significant at the p=.05 level. No other statistically significant main effects or interactions were found by diagnosis group.

Differences in Mental Quality of Life

An analysis of the pre/post differences in mental quality of life scores was conducted for the total sample using paired-samples t-tests. Differences in these scores by age, gender, and diagnosis groups were examined using univariate analysis of variance (ANOVA).

Differences in Mental Quality of Life for Total Sample

Using the pre- and post-program mental quality of life scores on the Medical Outcomes Study Short Form (SF-12) for the 236 study participants, a paired-samples t-test was performed. The mean scores and the results of the t-test are presented in Table 6. These results indicate that there was a substantial increase of 8.45 in the mean score for mental quality of life for the total sample increased from pre- to post-program. This difference in pre/post score is statistically significant at the p=.05 level of significance.

Table 6. Differences in Pre/Post Mental Quality of Life (SF-12) Scores.

	Mean Score	N	St Dev
Pre	46.42	236	9.456
Post	54.87	236	7.392
Difference	8.45		

t=15.826, df=235, p<.001

Differences in Mental Quality of Life by Age Group, Gender, and Diagnosis

Using the pre- and post-program mental quality of life scores on the Medical Outcomes Study Short Form (SF-12) for the 236 study participants, a univariate analysis of variance (ANOVA) was performed to examine pre/post differences by age, gender, and diagnosis, and allowing for interactions. The mean scores and the results of the ANOVA are presented in Table 7.

By age group, the 60-69 age group had the highest pre-program mental quality of life mean score, with a mean of 48.063, followed by the 70+, 50-59, 30-49 age groups, with means of 46.086, 45.667, 41.738, respectively. The difference in the pre-to post-program means was greatest for the 70+ age group, with an increase of 12.028, followed by the 30-49, 50-59, 60-69 age groups, with increases of 9.695, 8.488, 7.684, respectively. However, using Tukey's multiple comparison procedure, an ANOVA comparison of the differences in pre/post mental quality of life mean scores among the four age groups were not statistically significant at the p=.05 level.

By gender, the males showed a higher pre-program mental quality of life mean score (48.070) when compared with the mean score for females (41.240). There was a larger increase in pre/post means for females, with an increase of 10.566 compared to 7.78 for males. However, using Tukey's multiple comparison procedure, an ANOVA comparison of the differences in mental quality of life mean scores between genders there were not statistically significant at the p=.05 level.

By diagnosis group, the CABG group had the highest pre-program mental quality of life mean score, with a mean of 47.267, followed by the Other, Valve, and PTCI groups, with means of 46.940, 44.946, 44.925, respectively. The difference in the pre- to

Table 7. Differences by Age Group, Gender, and Diagnosis in Pre/Post Mental Quality of Life (SF-12) Scores

		Pre	Post	Difference
Age Group				
30-49	Mean	41.738	51.433	9.695
	N	35	35	
	St Dev	8.626	7.845	
50-59	Mean	45.667	54.155	8.488
	N	57	57	
	St Dev	9.493	7.443	
60-69	Mean	48.062	55.746	7.684
	N	129	129	
	St Dev	9.426	7.037	
70+	Mean	46.086	58.114	12.028
	N	15	15	
	St Dev	8.089	6.595	
F=.647, df=3, p=.585				
Gender				
Males	Mean	48.070	55.849	7.779
	N	179	179	
	St Dev	9.102	6.713	
Females	Mean	41.240	51.806	10.566
	N	57	57	
	St Dev	8.712	8.571	
F=.001, df=1, p=.974				
Diagnosis				
CABG	Mean	47.267	56.272	9.005
	N	111	111	
	St Dev	8.638	6.381	
PTCI	Mean	44.925	52.705	7.780
	N	65	65	
	St Dev	10.585	8.795	
Valve	Mean	44.946	55.711	10.765
	N	14	14	
	St Dev	10.391	7.004	
Other	Mean	46.940	54.303	7.363
	N	46	46	
	St Dev	9.388	7.034	
F=.846, df=3, p=.470				

post-program means was greatest for the Valve group, with an increase of 10.765, followed by the CABG, Other, and PTCI groups, with increases of 9.005, 7.780, and 7.363, respectively. However, using Tukey's multiple comparison procedure, an ANOVA comparison of the differences in pre/post mental quality of life mean scores among the four diagnosis were not a statistically significant at the p=.05 level.

Summary

An analysis of the pre/post differences in functional status and physical and mental quality of life scores was conducted for the total sample using paired-samples t-tests. Differences in these scores by age, gender, and diagnosis groups were examined using univariate analysis of variance (ANOVA). Statistical significance was determined at the p=.05 level. The results indicated that there were significant differences in the pre- to post-program scores for the sample overall, with improvement the scores for all three study measures. The results also showed that these improvements in the scores varied significantly by diagnosis.

CHAPTER V

SUMMARY

The purpose of this study was to examine changes in cardiac rehabilitation patients' functional status and physical and mental quality of life. In this chapter, a summary of the study, conclusions, a discussion of the results, implications from the study, and recommendations for further research are presented.

The review of the literature covers four areas related to cardiac rehabilitation and heart disease. Risk factors of cardiovascular disease have been extensively reviewed. Studies on outcomes of cardiac rehabilitation by Engblom et.al. (1997) and Lavie and Milani (1995) indicated long-term impact on coronary risk factors and improvement in exercise capacity. Improvements in functional status and the reduction of modifiable coronary artery disease risk factors are the therapeutic outcomes of outpatient cardiac rehabilitation for CABG patients (Kumar et al. 1995; Merz & Rozanski, 1996). However, patient adherence to risk factor reduction often lapses, and long-term behavior changes such as diet and exercise rarely become integrated into the patient's lifestyle (Merz & Rozanski, 1996).

Coronary heart disease is the leading cause of death in the United States among men and women. It is also a major cause of physical disability, particularly in the rapidly growing population of elderly persons. There are a couple of options available to treat coronary heart disease. One option is medical management. Depending on the condition of the patient, some physicians may choose to manage the disease with medication, diet,

and exercise. Surgical treatment is the more common option. CABG, PTCI, or Valve replacement are among the most frequently performed surgical procedures. The postoperative goals for patients undergoing these operations include a restored or improved coronary circulation, symptom-free tolerance for daily functional activities, and an improved exercise tolerance.

Many post-surgical patients and many post-myocardial infarction (MI) patients are reluctant to resume normal activity or activity that was previously intolerable. Patients fear that activity-limiting symptoms such as shortness of breath, chest pain, or extreme fatigue will recur post-surgically. Rehabilitation for these patients has demonstrated that early mobilization and exercise instruction improves independent functional activity and decreases the fear of normal activity. Thompson et al. (1995) found that patients who exercise post-MI achieve optimum functioning more rapidly than those who do not.

The management of the psychological well-being of patients who have suffered a MI is vital, as depression, low morale and distress are significant predictors of morbidity among post-MI patients (Pashkow et al. 1995). Other psychological factors cannot be ignored, such as loneliness, lack of self-awareness and control, and the need for reassurance. The effects can be related to anxiety about recurrence and depression caused by lack of self-confidence and awareness. Certain lifestyle changes can reduce long-term morbidity, and can be facilitated by a cardiac rehabilitation program.

Cardiac rehabilitation programs are offered nationwide; however, there is controversy among physicians, insurance companies and health care workers concerning the benefits versus the costs to the participants. Cardiac rehabilitation programs were

developed in the mid 1960's (Pashkow & Defoe, 1993) but there are a limited number of studies evaluating their outcomes. Patients' perceptions of quality of life and functional status may influence their overall outcomes as a result of their participation in a cardiac rehabilitation program. The literature suggests that a better quality of life and a feeling of well-being can be expected after CABG and a comprehensive, medically supervised cardiac rehabilitation program.

In the present study, based on this evidence in the review of literature regarding the need for further research on the impact of cardiac rehabilitation programs, the researcher examined the influence of cardiac rehabilitation on functional status and quality of life in cardiac patients. A convenience sample of 236 cardiac rehabilitation patients who completed a phase II cardiac rehabilitation program, including the exercise protocol, at a community hospital rehabilitation unit located in Dallas, Texas was used. The sample was drawn from an anonymous database (no names or other unique identifiers were included) provided by the hospital to the researcher. This study used retrospective secondary data. Functional status was measured using the Duke Activity Status Index (DASI) questionnaire and quality of life (physical and mental) was measured using the SF-12 questionnaire. The surveys were administered pre and post cardiac rehabilitation.

The survey data were analyzed using descriptive statistics, and paired t-tests were used to determine pre/post differences in functional status, physical quality of life, and mental quality of life scores. Differences in pre/post scores by age group, gender, and diagnosis were analyzed using univariate analysis of variance (ANOVA) procedures. The results showed a statistically significant difference at the p=.05 level when

comparing pre-program to post-program mean scores. There was also a statistically significant difference in means when comparing functional status and physical quality of life. The CABG group showed this significance when compared with PTCI, Valve, and Other patients. However, there were no statistical difference seen between age groups or gender. Although, mental quality of life mean scores were statistically significant comparing pre-program to post-program mean scores, there was no significance difference between age groups, gender, or diagnosis noted.

Conclusions

For this study, the 12 null hypotheses established for the investigation were tested, and accepted or rejected based on the findings of the study, as follows:

Null Hypothesis 1: There is no difference in coronary heart disease patients' functional status after participating in an outpatient cardiac rehabilitation program. Based on the results of this study, this null hypothesis was rejected.

Null Hypothesis 2: There is no difference in coronary heart disease patients' functional status by age group after participating in an outpatient cardiac rehabilitation program. Based on the results of this study, this null hypothesis was not rejected.

Null Hypothesis 3: There is no difference in coronary heart disease patients' functional status by gender after participating in an outpatient cardiac rehabilitation program. Based on the results of this study, this null hypothesis was not rejected.

Null Hypothesis 4: There is no difference in coronary heart disease patients' functional status by diagnosis group after participating in an outpatient cardiac rehabilitation program. Based on the results of this study, this null hypothesis was rejected.

Null Hypothesis 5: There is no difference in coronary heart disease patients' physical quality of life after participating in an outpatient cardiac rehabilitation program. Based on the results of this study, this null hypothesis was rejected.

Null Hypothesis 6: There is no difference in coronary heart disease patients' physical quality of life by age group after participating in an outpatient cardiac rehabilitation program. Based on the results of this study, this null hypothesis was not rejected.

Null Hypothesis 7: There is no difference in coronary heart disease patients' physical quality of life by gender after participating in an outpatient cardiac rehabilitation program. Based on the results of this study, this null hypothesis was not rejected.

Null Hypothesis 8: There is no difference in coronary heart disease patients' physical quality of life by diagnosis group after participating in an outpatient cardiac rehabilitation program. Based on the results of this study, this null hypothesis was rejected.

Null Hypothesis 9: There is no difference in coronary heart disease patients' mental quality of life after participating in an outpatient cardiac rehabilitation program. Based on the results of this study, this null hypothesis was rejected.

Null Hypothesis 10: There is no difference in coronary heart disease patients' mental quality of life by age group after participating in an outpatient cardiac rehabilitation program. Based on the results of this study, this null hypothesis was not rejected.

Null Hypothesis 11: There is no difference in coronary heart disease patients' mental quality of life by gender after participating in an outpatient cardiac rehabilitation

program. Based on the results of this study, this null hypothesis was not rejected.

Null Hypothesis 12: There is no difference in coronary heart disease patients' mental quality of life by diagnosis group after participating in an outpatient cardiac rehabilitation program. Based on the results of this study, this null hypothesis was not rejected.

Discussion

The findings from this study indicate that cardiac rehabilitation is beneficial in helping cardiac rehabilitation patients to return to pre-event functionality and physical and mental quality of life. A possible explanation might be that exercise helps reduce depression or that interacting with patients that have similar conditions could be therapeutic.

Although each diagnosis group showed improvement in functional status and quality of life, the CABG patients had the greatest improvement. A possible explanation for this positive change is the CABG patients had many physical restrictions at the beginning of the program. This group of patients had a chest incision that needed to heal before they could proceed with their normal activities. By the end of the program, the incision had healed and the soreness had decreased, therefore, they were able to complete all activities.

Although women exhibited a lower functional ability and physical quality of life at pre-program than men, they demonstrated post-program rates of improvement that were similar to those of the men. The pre-scores could have been lower because women are generally not as strong as men, therefore, unable to complete physical activities as well. Additionally, the sample size of the women was also quite small.

There were no significant differences in age groups for functional status or physical or mental quality of life. However, an interesting note is that the 70+ age groups scored the highest on the pre-program mental quality of life. The youngest age group, 30-49, scored the lowest in this area. A possible explanation for this might be that the older population "expects" to have heart disease whereas the younger group is usually quite surprised with the diagnosis and, therefore, is sometimes more depressed.

Additional possible explanations for no significant change in mental quality of life may be the short length of the cardiac rehabilitation program, difficulty in implementing and adapting to lifestyle changes (diet, exercise, and medications), or pre-existing conditions such as co-morbidities which may make goals difficult to achieve. Patients have high expectations for improved functional status and overall general health post heart surgery but with a chronic illness (CAD) it may be difficult to maintain on-going motivation. Patients may experience distress and depression after a cardiovascular event such as CABG surgery that may alter the patients' perception of their general health.

Implications

One implication of the findings is that cardiac rehabilitation programs are beneficial to patients. Although there was no control group, the results of this study add a considerable body of evidence attesting to the beneficial effects of participation in cardiac rehabilitation exercise programs.

The importance of participation in cardiac rehabilitation should be emphasized by all members of the healthcare team. Providing accessible and affordable rehabilitation is also important. Although cardiac rehabilitation is common in urban areas, more access is

needed in rural areas. Third-party payment for cardiac rehabilitation would also contribute to rehabilitation participation by many.

Cardiac rehabilitation programs should continue recommending additional behavior changes beyond exercise. For example, stress management, smoking cessation, and diet are important components of risk factor reduction.

Cardiac rehabilitation can help individuals with recent cardiac events to reestablish physical, psychological, and social well-being while minimizing the negative consequences of this major life event. The significant associations found between rehabilitation participation and health variables; quality of life; self-esteem; and exercise, diet, and medication self-care behaviors show that cardiac rehabilitation is associated with positive outcomes for heart patients.

Recommendations for Future Research

Several recommendations are offered for future studies in this area. A similar study should be conducted using both an intervention group and a control group, in which cardiac rehabilitation program participants are compared to those who never attended such a program. This study should be repeated in other Phase II cardiac rehabilitation facilities with different designs to determine both differences and similarities in outcome measures.

Further research is recommended to evaluate the relationships between exercise, functional status, quality of life, and outcomes in a population of cardiac rehabilitation patients. Future studies of this nature should investigate the relationship between self-efficacy, compliance, and exercise, taking into account all the components of compliance (i.e. frequency, intensity, duration, and type of exercise). In order to complete such a

study, a valid and reliable method of tracking compliance would be needed. Previous exercise experience should be documented since this could affect a patient's efficacy expectations for exercise.

Although short-term studies of typical cardiac rehabilitation programs are useful to investigate the immediate relationship between self-efficacy and compliance, a full exploration of the relationships between self-efficacy, compliance, functional status, quality of life, and outcomes over the long-term would add to the understanding of the dynamics between these variables. In addition, the optimal duration of a cardiac rehabilitation program is not known, and could be better examined in a long-term study.

If a relationship is found to exist between self-efficacy and compliance, then this knowledge could be used to find ways to change the long-term activity habits of that increasing section of the population who have, or are risk of having heart disease. While the health benefits of exercise are well known, compliance rates to long-term activity regimens are typically in the range of 50% or less. Many ways of increasing compliance have been investigated, with varying measures of success. However, if self-efficacy can be proven to increase compliance, then cardiac rehabilitation programs can focus efforts on increasing their patient's self-efficacy for exercise, both while they are participating, and after they have completed the exercise program. This increased self-efficacy could be what is needed to increase long-term commitment to regular physical activity.

Future studies should also be conducted to explore physiological outcome measures such as blood pressure, heart rate, serum triglycerides, cholesterol, lipid profile, blood sugar levels, weight loss and behavioral outcome measures such as smoking cessation, stress levels, dietary changes, and overall lifestyle changes. Another of

research needs to be conducted concerning the involvement of physicians and their "buy in" of cardiac rehabilitation programs.

Additional studies should be repeated to include a wider variety of ethnic groups to determine the impact of cultural and ethnic differences. Research regarding the patient's ability to pay for the cost of rehabilitation programs and the effect it has on patient participation and success in Phase II cardiac rehabilitation is also recommended. Finally, an investigation regarding subsequent cardiac events and return-to-work rates among patients who have experienced outpatient cardiac rehabilitation is suggested for another area of study.

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APPENDIX A: HOSPITAL APPROVAL OF THE STUDY

Medical City Dallas Hospital
Institutional Review Board
7777 Forest Lane, C-740 Dallas, TX 75230 972/566-6060 Phone 972/566-4715 Fax

December 20, 2001

Valerie Bishop, B.S., M.S.
College of Health Sciences
Texas Women's University
Denton, TX

Re: #02.027, Exempt Study Approval, "Changes in Patients' Quality of Life and Functional Status Through Participation in a Cardiac Rehabilitation Exercise Program"

Dear Ms. Bishop:

In accordance with Federal Register Guidelines and our Institutional Review policies, Dr. Allan Naarden, IRB Chairman approved your request to implement the above-referenced protocol as an exempt clinical research study.

You must forward any amendments or revisions to my office for appropriate review and approval. Also, you are required to submit a final report to the committee upon completion.

If you need further assistance, please contact Yvette King at (972) 566-6060.

Sincerely,

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To protect individuals we have covered their signatures.

APPENDIX B: UNIVERSITY APPROVAL OF THE STUDY

[redacted]

TEXAS WOMAN'S UNIVERSITY

INSTITUTIONAL REVIEW BOARD
P.O. Box 425619
Denton, TX 76204-5619
Phone: (940) 898-3375
Fax: (940) 898-3416
e-mail: IRB@twu.edu

May 21, 2002

Ms. Valerie Bishop

Dear Ms. Bishop:

Re: *Changes in Patients' Quality of Life and Functional Status Through Participation in a Cardiac Rehabilitation Exercise Program*

The above referenced study has been reviewed by a committee of the Institutional Review Board (IRB) and was determined to be exempt from further TWU IRB review.

If applicable, agency approval letters obtained should be submitted to the IRB upon receipt prior to any data collection at that agency. Because you do not utilize a signed consent form for your study, the filing of signatures of subjects with the IRB is not required.

Another review by the IRB is required if your project changes. If you have any questions, please feel free to call the Institutional Review Board at the phone number listed above.

Sincerely,

Dissertation/Theses signature page is here.

To protect individuals we have covered their signatures.

APPENDIX C: DUKE ACTIVITY STATUS INDEX (DASI)

THE DUKE ACTIVITY STATUS INDEX

Unit # _____

Name _____

Circle Yes or No to the questions.

Activity	Yes / No	Weight
1.) Can you take care of yourself, that is, eating, dressing, bathing, or using the toilet?	Y N	2.75
2.) Can you walk indoors, such as around your house?	Y N	1.75
3.) Can you walk a block or 2 on level ground?	Y N	2.75
4.) Can you climb a flight of stairs or walk up a hill?	Y N	5.50
5.) Can you run a short distance?	Y N	8.00
6.) Can you do light work around the house like dusting or washing dishes?	Y N	2.70
7.) Can you do moderate work around the house like vacuuming, sweeping floors, or carrying in the groceries?	Y N	3.50
8.) Can you do heavy work around the house like scrubbing floors, or lifting or moving heavy furniture?	Y N	8.00
9.) Can you do yardwork like raking leaves, weeding or pushing a power mower?	Y N	4.50
10.) Can you have sexual relations?	Y N	5.25
11.) Can you participate in moderate recreational activities like golf, bowling, dancing, doubles tennis, or throwing a baseball or football?	Y N	6.00
12.) Can you participate in strenuous sports like swimming, singles tennis, football, basketball or skiing?	Y N	7.50
Total the weights for each YES answer given.		

Scoring the Duke Activity Status Index:

Add up the total weight for questions that were answered YES. This gives you your DASI score.

$VO2 = \underset{\text{(DASI score)}}{\_\_\_\_\_} \times 0.43 + 9.6$

$VO2 = \_\_\_\_\_$

$\text{Functional Capacity in METS} = \frac{VO2}{\_\_\_\_\_} \div 3.5$

Functional Capacity = _____ METS.

APPENDIX D: MEDICAL OUTCOMES STUDY (SF-12) FORM

The SF-12™ Health Survey

Instructions for Completing the Questionnaire

Please answer every question. Some questions may look like others, but each one is different. Please take the time to read and answer each question carefully by filling in the bubble that best represents your response.

EXAMPLE

This is for your review. Do not answer this question. The questionnaire begins with the section *Your Health in General* below.

For each question you will be asked to fill in a bubble in each line:

1. How strongly do you agree or disagree with each of the following statements?

	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree
a) I enjoy listening to music.	○	●	○	○	○
b) I enjoy reading magazines.	●	○	○	○	○

Please begin answering the questions now.

Your Health in General

1. In general, would you say your health is:

Excellent	Very good	Good	Fair	Poor
○	○	○	○	○

2. The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

	Yes, Limited A Lot	Yes, Limited A Little	No, Not Limited At All
a. Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	○	○	○
b. Climbing several flights of stairs	○	○	○

Please turn the page to continue.

3. During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

		YES	NO
a.	Accomplished less than you would like	O	O
b.	Were limited in the kind of work or other activities	O	O

4. During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

		YES	NO
a.	Accomplished less than you would like	O	O
b.	Didn't do work or other activities as carefully as usual	O	O

5. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

Not at all	A little bit	Moderately	Quite a bit	Extremely
O	O	O	O	O

6. These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the past 4 weeks . . .

		All of the Time	Most of the Time	A Good Bit of the Time	Some of the Time	A Little of the Time	None of the Time
a.	Have you felt calm and peaceful?	O	O	O	O	O	O
b.	Did you have a lot of energy?	O	O	O	O	O	O
c.	Have you felt downhearted and blue?	O	O	O	O	O	O

7. During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting with friends, relatives, etc.)?

All of the time	Most of the time	Some of the time	A little of the time	None of the time
O	O	O	O	O

***THANK YOU* FOR COMPLETING THIS QUESTIONNAIRE!**