PREDICTION OF LONG-TERM EXERCISE COMPLIANCE IN CARDIAC REHABILITATION PATIENTS

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CHAPTER I

INTRODUCTION

PREDICTION OF LONG-TERM EXERCISE COMPLIANCE IN CARDIAC REHABILITATION PATIENTS

Introduction

Cardiac rehabilitation is defined as "the process by which persons with cardiovascular disease are restored to and maintained at their optimal physiological, psychological, social, vocational and emotional status" (AACVPR Guidelines for Cardiac Rehabilitation Programs, 1995). Cardiac rehabilitation programs combine prescriptive exercise training with risk factor modification in patients with established Coronary Artery Disease (CAD), (Gordon, Haskell, 1997). The following positive risk factors (ACSM, 2000) increase the chances of developing CAD:

- *Family History*: Myocardial infarction, coronary revascularization, or sudden death before 55 years of age in father or other male first-degree relative (e.g., brother or son), or before 65 years of age in mother or other female first-degree relative (e.g., sister or daughter)

- *Cigarette Smoking*: Current cigarette smoker or those who quit within the previous 6 months

- *Hypertension*: Systolic blood pressure of greater than or equal to 140 mm Hg or diastolic greater than or equal to 90 mm Hg, confirmed by measurements on at least two separate occasions, or on antihypertensive medication

- *Hypercholesterolemia*: Total serum cholesterol of greater than 200 mg/dL or high-density lipoprotein cholesterol less than 35 mg/dL, or on lipid-lowering medication. If low-density lipoprotein is available, use greater than 130 mg/dL rather than total cholesterol of greater than 200 mg/dL

- *Impaired Fasting Glucose*: Fasting blood glucose greater than or equal to 110 mg/dL confirmed by measurements on at least two separate occasions

- *Obesity*: Body mass index of greater than or equal to 30 kg/m2 OR waist girth of over 100 cm

- *Sedentary Lifestyle/Physical Inactivity*: Persons not participating in a regular exercise program or meeting the minimal physical activity recommendations from the U.S. Surgeon General's report

Negative CAD risk factors (ACSM, 2000) are those factors that decrease the risk for CAD.

- *High Serum HDL Cholesterol*: Over 60 mg/dL

Risk factors accumulate exponentially. Based on research (ACSM, 1993) that shows an inverse relationship between elevated HDL cholesterol and CAD, a negative risk factor "cancels" or negates one positive risk factor.

The educational components of a cardiac rehabilitation program include diet modification by means of nutritional counseling, stress management counseling, weight management, and a smoking cessation program when applicable. Cardiac rehabilitation programs are generally divided into four phases; Phase I is a hospital inpatient program, while Phase II (up to 12 weeks of continuous ECG monitoring after discharge), Phase III (variable length program of intermittent or no ECG monitoring), and Phase IV (no ECG monitoring with limited supervision) are all outpatient programs (ACSM Guidelines, 2000).

Compliance to exercise prescription generally follows a negatively accelerating curve among cardiac rehabilitation patients (Oldridge, 1991). Relatively large drop out

rates occur early in the program and drop out rates decrease over time. Within 6 months after release from Phase II rehab, approximately 30-40 percent of patients drop out, and approximately 90 percent drop out by 12 months post-rehab. This study was performed to determine if a protocol for patients who are less likely to adhere to a maintenance exercise program following participation in cardiac rehabilitation could be identified. These characteristics or patterns were based on patients' answers to the MOS SF-36 Health Survey, with the four additional follow-up questions. The subjective questionnaire was designed to determine changes in attitude and physical condition as perceived by the patient due to participation in a cardiac rehabilitation program. The benefits derived from this study may be used to encourage patients to continue an exercise program.

Statement of the Problem

The problem of this study was to determine the relationship between cardiac patients' quality of life, as determined by the MOS SF-36 survey, and long-term compliance to an exercise program following release from Phase II rehabilitation.

Hypotheses

1. There will be no difference in the quality of life scores on the MOS SF-36 survey by post-rehabilitation patients who adhere to an exercise program following release from Phase II cardiac rehabilitation.
2. There will be no differences between exercise program adherence rates in those patients released from Phase II cardiac rehabilitation one year ago (1999), two years ago (1998), and three years ago (1997).

Delimitations

1) The sample subjects were all from the same mid-western U.S. community.

2) Subjects filled out the subjective SF-36 survey on their last day of monitored cardiac rehabilitation (Phase II).

3) Subjects exercised under the supervision of a mid-western, university based wellness center three days a week, generally for twelve weeks.

4) Subjects must have completed at least half of the monitored Phase II rehabilitation program (6 weeks or 18 visits) before being released.

Limitations

1) Quality of life measurements are subjective. Thus, there is no fixed scale of measurement.

2) There is no control over regular attendance or completion of the Phase II program.

3) The study included patients who had undergone bypass surgery, angioplasty, heart transplant, valve replacement/ repair, pacemaker or defibrillator implants, patients who had suffered heart attacks or stable angina, and patients that had been diagnosed with cardiovascular disease, including congestive heart failure. All patients had been referred to the rehabilitation program by their physician.

4) The study uses a self-reporting instrument and there is no control over whether the patient answers honestly or gives the answer he/she believes is desired.

Assumptions

1) It is assumed that each subject answered the SF-36 survey truthfully and to the best of his/her ability.

2) It is assumed that the subjects performed the exercises correctly.

3) It is assumed that patients did not perform strength-training exercises outside the study, although walking at home was encouraged.

Definition of Terms

- **Adherence** The process in which a person follows rules, guidelines, or standards, especially as a patient follows prescription and recommendations for a regimen of care. (Mosby, 1994)
- **Body Composition** Relative amounts of muscle, bone, and fat in the body; often taken as the relative amounts of fat (fat mass) and fat-free mass. (ACSM, 1993)
- **Cardiac Rehabilitation** The process by which persons with cardiovascular disease (including but limited to patients with coronary heart disease) are restored to and maintained at their optimal physiological, psychological, social, vocational, and emotional status. (AACVPR, 1995)
- **Compliance** Fulfillment by the patient of the caregiver's prescribed course of treatment. (Mosby, 1994)
- **Quality of Life** The ways in which a patient's life is affected by both an illness and its therapies—the resultant comfort, sense of well-being, and life satisfaction

and the ability to participate in valued activities in the home, workplace, and the community. (Pollock, Schmidt, 1995)

- **Risk Factor** An aspect of personal behavior or lifestyle, an environmental exposure, or inherited characteristic, which on the basis of epidemiological evidence is known to be associated with health-related condition(s) considered to be important to prevent. (ACSM, 1993)
- **Self-efficacy** A person's judgment to organize and execute a course of action to attain a designated type of performance. (Pollock & Schmidt, 1995)
- **Stroke Volume** The volume of blood pumped from the heart with each beat. (ACSM, 2000)

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

More than six million Americans have clinical CAD, making this the leading cause of morbidity and mortality in the United States (Evenson, Rosamond, Luepker, 1998). Sedentary lifestyle is recognized as an independent risk factor for the development of cardiovascular disease, by contributing to an estimated 250,000 deaths each year (Blair et al., 1993; Fletcher et al., 1992). Because of its importance to the treatment and management of cardiovascular disease, educating patients about the role of regular exercise has become a key component of cardiac rehabilitation programs. Analyses of clinical trials show that exercise prescription with supervision can lower mortality rates among patients with cardiovascular disease as well as improve their psychosocial functioning. Meta-analyses researchers have reported reductions of 20 to 25 percent in overall mortality for cardiac rehabilitation participants compared to those who did not participate in the program (Suter, Suter, Perkins, Bona, Kendrick, 1996).

However, the continuation of a newly acquired behavior, such as exercise as a lifestyle following release from Phase II rehabilitation, remains a problem. Attrition rates are as high as 25% in the first 3 months following release from rehabilitation and up to 50% in just the first 6 months. This behavior pattern is similar to the behaviors of the

general population beginning an exercise program (Bock, Albrecht, Traficante, Clark, Pinto, Tilkemeier, Marcus, 1997).

There are substantial data involving morbidity and mortality studies that support the benefits of cardiac rehabilitation programs. The role of cardiac rehabilitation programs is to promote the benefits of a healthy lifestyle including regular exercise as a means of secondary prevention of coronary artery disease (Fletcher, 1998). Analysis has shown that cardiac rehabilitation participants lower their risk of death by 20 – 25% compared to control groups and reap many health benefits from participation (Miller, Balady, Fletcher, 1997). Patients who participated in endurance exercise during cardiac rehabilitation programs have reported improved measurements in blood pressure, body composition, lipid levels, glucose control, and stress levels (Wilmore & Costill, 1994). They have also accomplished improved work capacity and increased return-to-work rates (Pashkow, Ades, Emery, Frid, Miller, Peske, Reardon, Schiffert, Southard, & ZuWallack, 1995).

Research has suggested significant improvements in quality of life measures when patients participate in cardiac rehabilitation programs (Williams, Hardy, Ryschon, & Esterbrooks, 1998). These programs are designed to improve quality of life by helping to "...diminish feelings of anxiety and disability and to improve vigor" (Hujibrechts, 1997).

Cardiac Rehabilitation and Risk Factor Reduction

Cardiac rehabilitation goals include modification of the patient's coronary risk profile (blood pressure, lipid profile, body mass index, and physical activity level) and improvement in quality of life (Morrin & Black, 1998). Participation in a cardiac

rehabilitation program improves patients' functional capacity as well as improves risk factor profiles (Rosenow, 1998). Blood lipid levels have been shown to improve while body weight and body fat reductions are documented. Decreases in total and LDL cholesterol are about 5-10 mg/dL and increases in HDL approximate 2 mg/dL while reductions in systolic and diastolic blood pressure readings average 6-9 mm Hg, (Miller, Balady, & Fletcher, 1997). Increases in exercise endurance, higher resting and exercise stroke volumes, increased capillary density and oxidative enzyme capacity in skeletal muscle, and lower resting and sub-maximal exercise heart rates are also notable benefits (Miller, Balady, Fletcher, 1997).

Furthermore, lifestyle modification of risk factors for CAD has been shown to reduce subsequent cardiac events (Rutledge, Hyson, Garduno, Cort, Paumer, Kappagoda, 1999). The most important contribution of cardiac rehabilitation may be the lifelong adoption of health-promoting behaviors (Pashkow, Ades, Emery, Frid, Miller, Peske, Reardon, Schiffert, Southard, ZuWallack, 1995). One study showed that participation in a structured Phase II program (when compared to a home program) increased exercise adherence for both males and females (Schuster, Wright, Tomich, 1995). The study also noted increased knowledge about the cardiac condition for both males and females, as well as increased stress control for females. Return-to-work rates and self-efficacy were not significantly different between the home program and Phase II participants in this study.

Benefits of Exercise. Studies indicate that a physically inactive lifestyle is associated with twice the risk of developing coronary artery disease. The American Heart Association recognizes physical inactivity as "one of the four major modifiable risk

factors" (Miller, Balady, Fletcher, 1997). Recognized benefits of regular exercise include improvement in cardiac and respiratory function, reduced coronary artery disease risk factors, decreased morbidity and mortality, decreased anxiety and depression, enhanced feelings of well-being, and enhanced performance at work, recreation, and sport (ACSM, 1995).

Exercise has been shown to improve psychosocial well-being, as well. "Functional recovery after heart attack is influenced by social support and acute emotional responses, whereas stress management techniques may be beneficial during cardiac rehabilitation" (Steptoe, 1998). Marked psychological improvements in anxiety and depression have also been documented (Burns, Camaione, Froman, & Clark, 1998). Adherent cardiac rehab patients have shown lower anxiety scores than non-adherent patients at both the 6-week and 12-week assessment periods (Fielding, 1989).

Exercise programs for cardiac rehab patients are individualized according to the abilities and limitations of the individual. A formal exercise session consists of a warm-up period, an endurance phase to raise the patient's heart rate to a pre-determined target heart rate based on his/her age (usually 60 to 85 percent of the patient's age predicted maximum heart rate), and a cool-down period. The cardiovascular conditioning that occurs during the endurance phase "...increases in parallel with the intensity, duration, and frequency of exercise," (Murray, Beller, 1983). It is not necessary for patients to reach an exhaustive intensity to achieve a substantial training response, and it would be difficult to sustain this intensity long enough to develop enhanced endurance. The patient's vulnerability to provoked cardiac complications must be considered, as well.

Fortunately, the risk of such complications remains low and the benefits generally outweigh the risks.

Psychosocial Issues, Personality and Adherence

Psychosocial problems include issues such as fear, anxiety, sadness, depression, loneliness, poor quality of life, anger and Type A personality. These problems are common among patients in Phase II cardiac rehab. As many 20% of patients who have had heart attacks suffer from moderate to severe depression and social isolation becomes common (Taylor, Berra, 1993). Factors such as these affect one's quality of life and may even affect morbidity and mortality.

In one study, personality traits and attitude had the greatest impact on predicting the outcome of the health of coronary care unit patients in a 1984 study (Steptoe, Matthews, 1984). Research has demonstrated that factors such as decisional balance (the comparison of benefits and costs or pros and cons of making the behavior change), self-efficacy, and a number of behavioral and cognitive processes of change can be associated with stages of motivational readiness for behavior change (Bock, Albrecht, Traficante, Clark, Pinto, Tilkemeier, 1997).

Patient optimism at the onset of cardiac rehabilitation has been positively associated with greater success in achieving goals to lower CAD risk factors while in Phase II rehab (Shepperd, Maroto, Pbert, 1996). Positive emotions have been found to "block the panic, foreboding, and depression" which take a damaging toll on the body. These positive emotions "serve a specific and definite purpose in protecting the human

body both in illness and in health" (Cousins, 1983). Dispositional optimism (the belief the one's outcome will be positive, not negative) plays an important role in recovery for cardiac patients. Optimists are more likely to believe that desired outcomes are attainable, and therefore put forth greater effort toward reaching the goal. Optimistic patients are more likely than pessimistic patients to take an active role in their recovery, using coping strategies that involve planning and taking direct steps toward finding a solution. Pessimistic patients tend to mentally or behaviorally withdraw as a coping mechanism and eventually abandon goals. Studies show that optimism not only significantly predicts success in making health changes to reduce risk factors, but also correlates positively with a feeling of satisfaction and improved quality of life 6 months after release from rehab (Shepperd, Maroto, Pbert, 1996). For patients with optimistic outlooks, a cardiovascular event may lead to reassessment of values, life goals, and personal growth (Taylor, Berra, 1993).

Type A Personality. According to Stoudemire, psychological and behavioral factors may adversely affect the course of medical conditions in cardiovascular disease. "There has been no convincing evidence that any specific type of personality trait alone can account for the development of a particular physical illness, with the possible exception of CAD" (Stoudemire, 1995). This "coronary prone" or "Type A" personality has been defined by Mosby as "a behavior pattern... associated with individuals who are highly competitive and work compulsively to meet deadlines. The behavior also is associated with a higher than usual incidence of coronary heart disease" (Mosby, 1994). Data suggests that stress-relieving interventions initiated during periods of elevated stress

led to significant drops in stress levels and that these decreased levels of stress positively correlated with a significantly lower cardiac death rate in the following years (Oldridge, 1991).

However, some researchers dispute the theory that coronary prone personality factors such as hostility and anxiety predict outcome. One group of researchers studied these variables, but found they were not significant predictors of 1-year outcomes. Still self-reported symptoms of depression (but not anxiety or hostility) were found to be significant in predicting these outcomes (Allison, Black, Williams, Squires, Johnson, Gau, 1998).

Stress and Negative Emotions. Many patients suffer emotional stresses including "profound anxiety and/or depression and believe no further therapeutic modalities are available" (Murray, Beller, 1983). This is especially true for patients who have had bypass surgery, and have had physical limitations imposed by angina or sternal pain at the site of their incisions. Depression may also adversely affect patient prognosis after myocardial infarction. "A complex relationship between depression and heart disease in particular has increasingly drawn the attention of researchers" (Croog & Levine, 1982).

Those patients who see the outcome of events to be in their control are generally comforted by the opportunity to participate in self-care (Steptoe, Mathews, 1984). But persons suffering an MI may perceive a sudden sense of loss of control, which, in turn, produces higher levels of cortisol (a stress hormone) activity in the body. In one study. differences in early cortisol levels following admission for myocardial infarction "...differentiated adherent from non-adherent subjects at 6 to 12 weeks post-MI."

(Fielding, 1989). "Data indicated a reciprocal relationship between baseline 9:30 a.m. cortisol following admission and later adherence to a rehabilitation programme." However, emphatic denial after myocardial infarction may result in unrealistically low anxiety levels that may initially be protective from complications, but may later result in poor adaptation and low adherence to medical recommendations following discharge.

While higher rates of functional disability have been established in depressed patients, cardiac rehabilitation provides the progressive exercise prescription needed to improve physical conditioning, increase the symptom threshold, and may help lessen symptoms of anxiety and depression. A recent study demonstrated that patients who completed cardiac rehab and complied with suggested lifestyle changes for 2 years had lower levels of psychological distress and greater ability and resources to cope with the distress than those who did not comply (Garduno, Cort, Harner, Rutledge, Kappagoda, 1998). Another study found patients who had participated in Phase II cardiac rehab experienced significant increases in HDL levels and decreases in their cholesterol/HDL ratio, and significant decreases in levels of norepinephrine, a stress hormone which causes peripheral vasoconstriction, which in turn increases blood pressure and cardiac workload (Birney, Matukaitus, Hardie, Ednie, 1998).

Motivational Factors. Despite the positive benefits that may be derived while in rehab, long-term adherence to health promoting behaviors such as exercise is low among cardiac rehabilitation patients (Ice, 1985). One reason for this lack of compliance may be the failure to address individuals' differences in health behavior motivation (Fleury, 1991). Different intervention strategies may need to be used to assist in motivating

cardiac patients who need to lower their risk factors via lifestyle modification. Reducing risk factors is essential in reducing repeat myocardial infarction (Stegman, Miller, Hageman, Irby, Kositzky-Klutman, Rajek, 1987). Results of a recent study found "...no evidence of gender, age, or employment/ educational status influencing attendance", but found that motivational factors and access were most important to patients (Bunker, McBurney, Aikman, 1998). The main reasons given by patients in this study for their non-compliance were "too busy" or "not interested", or because of "ongoing medical problems". Rosenow (1998) reports that for subjects in her recent study, "internal resources of inner strength and self-confidence were reported... to be the salient factor of promoting cardiovascular health".

Motivational readiness for exercise can be characterized by current exercise behaviors as well as the intention to exercise. One of the most studied models of motivational readiness is Prochaska and DiClemente's Transtheoretical Model of behavior change. The Transtheoretical Model uses the concept of the behavior change process with a system of progressive stages of readiness (Bock, Albrecht, Traficante, Clark, Pinto, Tilkemeier, 1997). This model hypothesizes that individuals go through a sequence of stages when adopting a new behavior. When applied to patterns of behavior change, such as the adoption of exercise, these stages include pre-contemplation (not yet considering exercise participation), contemplation (considering adopting exercise), preparation (making small changes in activity level), action (exercising regularly), and maintenance (exercising regularly for at least 6 months). Regular exercise, in this instance, is defined as "meeting or exceeding criteria set by the American Heart Association, and both the Centers for Disease Control and Prevention and the American

College of Sports Medicine for minimal adequate physical activity" (Fletcher, 1998). The minimum guidelines set forth to achieve improved cardiorespiratory fitness include exercising for 20 to 60 minutes per session at an intensity of 55-90 percent of maximum age-predicted heart rate, three to five days per week (American College of Sports Medicine, 2001).

Compliance Concerns

The effectiveness of risk reduction interventions may depend upon adherence (Burke, Dunbarjacob, Hill, 1997). Unfortunately, poor adherence to cardiac rehab practices limits the effectiveness of the intervention. It is estimated that less than 20 percent of CAD patients initiate comprehensive treatment aimed at risk reduction and remain compliant for longer than 6 months (Gordon, Haskell, 1997). Studies have shown that a multi-factorial approach (i.e.- the patient signs a commitment, family is involved, recreational activities are included, weekly CAD talks, etc.) significantly improves compliance rates (Huerin, Rosario, Bergman, Belardi, Trivi, Guzman, Rubinstein, 1998). In a controlled study of cardiac rehabilitation practices, participants had an improved understanding of heart disease and thus, better compliance with their recommended treatment, (Pollock, Schmidt, 1995). Adherence to these practices influences the clinical outcomes that ultimately affect quality of life and reduces the risk of subsequent morbidity and mortality (Pashkow, Ades, Emery, Frid, Miller, Peske, Reardon, Schiffert, Southard, ZuWallack, 1995).

It has been suggested that a strong sense of understanding CAD by the patient would correlate with a high rate of post-rehabilitation adherence, though studies have

failed to demonstrate this (Kamwendo, Hansson, Hjerpe, 1998). However, patients who showed a good understanding of their disease did have a significant, positive correlation with patients' cardiac rehabilitation program-related knowledge. The high level of knowledge and the increase in desired behaviors may be a product of the effectiveness of the cardiac rehab program.

Researchers have found that patients' adherence to exercise was strongly related to improvement in their exercise capacity. While the initial exercise capacity was related to post-treatment exercise capacity, initial fitness levels were not related to adherence rates (Hershberger, Robertson, Markert, 1999). However, a sedentary lifestyle preceding the coronary event has also been associated with non-adherence to the exercise program.

Self-efficacy. The importance of patient self-care (taking responsibility for one's own health) is emphasized in multidisciplinary lifestyle modification programs (Rutledge, Hyson, Garduno, Cort, Paumer, Kappagoda, 1999). Self-efficacy, a patient's perceived ability to take on this responsibility, is derived from four sources: performance accomplishment or actual success at a particular behavior, vicarious experience or witnessing another person's success, verbal persuasion, and one's physiologic state (Burns, Camaione, Froman, Clark, 1998). This sense of self-efficacy that mediates behavior change has been noted as a predictor of desirable outcomes (lifestyle changes and maintenance of these changes). Those patients with high self-efficacy can be expected to adhere to the exercise program and risk-reduction behaviors.

Although cardiac rehabilitation has been shown to increase patients' self-efficacy for physical activity (Hershberger, Robertson, Markert, 1999), the continuous ECG

monitoring during Phase II rehabilitation may reduce patients' self-efficacy for *independent* exercise (Carlson, Feltz, Johnson, Franklin, 1998). Modified protocols that used only one month of continuous ECG monitoring instead of the usual three months showed higher self-efficacy levels for patients' independent exercise. However, this would not be recommended for high-risk patients.

Possible Barriers. Barriers to cardiac rehabilitation compliance and dropout before the end of Phase II rehab include lack of patient motivation and commitment, the individual's perception of exertion and degree of discomfort experienced when exercising, lack of family support, or perceived lack of physician support. A number of reasons have been identified for a patient to perceive the healthcare provider as unsupportive. These include lack of interest in the patient's problems, disagreement regarding the possible solutions for the health problem, and poor communication concerning the treatment plan and anticipated outcome (Evenson, Fleury, 2000).

Study results suggest that the cardiac patient's belief in the benefits of participation in a home exercise program after completing Phase II, combined with the perception of few barriers to participation at this transitional period, predict adherence to the exercise program six months after discharge from rehab (Johnson, Heller, 1998). However, six weeks after discharge from rehab, patients' perception of enjoyment and well-being are predictive of compliance. In this same study, patients listed lack of time as the top reason for non-adherence to their exercise programs and for sedentary lifestyles in general. These perceived time barriers may reflect a lack of interest in or commitment to

physical activity by patients. Thus, it is likely that barriers may be excuses for non-adherence, and not causes of it (Johnson, Heller, 1998).

Research regarding suggestions for improved adherence. Gordon and Haskell recommend including a CAD risk factor assessment during initial evaluation, setting specific goals targeting each risk factor, and formulating and implementing an individualized plan for patient lifestyle modification and pharmacological intervention. They also recommend long-term follow-up to enhance compliance and make revisions as needed, and long-term outcomes assessment for each patient (Gordon, Haskell, 1997). The patients in their study who used these risk reduction methods showed 47 percent less narrowing in diseased coronary artery segments than "usual care" group, along with significant improvements in lipid levels.

Greater attention may need to be devoted to patients who score high in pessimism, as they were shown to have the least success in making positive health changes. Shepperd, Maroto, and Pbert (1996) recommend greater awareness of the patient's expectations regarding recovery by the health care staff, and thus facilitating greater methods of intervention for those pessimistic patients.

Taylor and Barr (1993) agree that patients should be screened for depression, anxiety, and other psychosocial disorders. Patients with identified problems should be referred for psychological help and monitored to determine how well they are coping with problems.

Perhaps patients find it desirable to still give account for their physical activity after their release from Phase II cardiac rehab. Analysis has indicated a significantly

higher attendance/adherence rate for cardiac patients when they log their exercise on a computer-based feedback system that provided enhanced tracking, goal-setting, and feedback (Annesi, 1998).

Moreover, it has been suggested that periodic, long-term follow-up should be incorporated after Phase II cardiac rehabilitation to help patients maintain their goals (Einerson, Vitcenda, Ward, McBride, 1999). Adherent myocardial infarction patients may have gained "...considerable reassurance from continued contact with hospital after discharge" (Fielding, 1989). However, these patients' anxiety levels changed little over time.

Quality of Life

The American Association of Cardiovascular and Pulmonary Rehabilitation Outcomes Committee recommends that all programs measure quality of life. "Measurement of quality of life requires input from the patient, an accurate assessment of personal well-being, and overall satisfaction in life" (Pashkow, Ades, Emery, Frid, Miller, Peske, Reardon, Schiffert, Southard, ZuWallack, 1995). Patient-perceived health-related quality of life incorporates physical, psychological and social domains of health (Oldridge, 1997) and has become one of the fundamental outcomes measured in cardiac rehabilitation.

Significant improvements in quality of life have been reported by MOS SF-36 studies after participation in cardiac rehabilitation programs (Williams, Hardy, Ryschon, Esterbrooks, 1998). Participants have shown lower re-hospitalization rates and a significant reduction in subsequent fatal myocardial infarction (Bock, Albrecht,

Traficante, Clark, Pinto, Tilkemeier, & Marcus, 1997). Exercise training has been effective in reducing symptoms of angina and congestive heart failure in patients with established coronary artery / heart disease (Miller, Balady, Fletcher, 1997).

Improvements in health-related quality of life are reported to be "accelerated with cardiac rehabilitation and secondary prevention educational activities" for MI patients (Oldridge, Gottlieb, Guyatt, Jones, Streiner, Feeny, 1998). Those patients who participated in a cardiac rehab program enjoyed less restriction in physical mobility and subjectively perceived overall life satisfaction. "A tendency toward alleviation of depression was observed in the rehabilitation group" (Engbloom, Korpilahti, Hamalainen, Ronnemaa, & Puukka, 1997). Studies have shown that cardiac rehabilitation participants also derive more positive self-perception, decreased employment-related stress, more enjoyment of leisure time, and more physical and sexual activity (Pollock, Schmidt, 1995).

Summary of Literature Review

The goals of cardiac rehab are to reduce patients' coronary risk factors and to improve patients' overall quality of life. Patients experience numerous health benefits while enrolled in an outpatient cardiac rehabilitation program, but inclusion of health-promoting behaviors such as exercise on a *long-term* basis remains an issue. A comprehensive program with a multi-factorial approach has been suggested to maximize long-term compliance. It is also essential to address patients' individual differences in health behavior motivation. Follow-up after discharge from Phase II cardiac rehab seems to be another important variable in patient adherence rates to exercise.

CHAPTER III

METHODS AND PROCEDURES

Subject Selection

Subject selection included 45 patients, both male and female, who had participated in and completed at least 18 Phase II cardiac rehabilitation visits at a mid-western university based wellness center within the three-year range, 1997 –1999. All patients must have completed the post-rehabilitation MOS SF-36 health survey upon exiting the program. Forty-five follow-up surveys were mailed out, with 30 of these returned, for a 67% return rate. Only one subject was reported deceased since the completion on Phase II rehab.

Instrument Description

The MOS SF-36 health survey is a subjective survey that measures eight different health-related areas. The survey was prepared with additional follow-up questions concerning the maintenance of exercise behaviors.

When measuring quality of life, "one of the most widely used general instruments in the cardiac population is the Medical Outcomes Study Short Form (MOS SF-36)" (Pashkow, Ades, Emery, Frid, Miller, Peske, Reardon, Schiffert, Southard, ZuWallack, 1995). The MOS SF-36 health survey is a comprehensive short-form with 36 items, which measures health-related quality of life from the patients' point of view. This

instrument provides an 8-scale health profile and is self-administered by persons over the age of 14 (Ware, Sherbourne, 1992).

The eight health areas measured are as follows:

1. Limitations in physical activities because of health problems
2. Limitations in usual role activities because of physical health problems
3. Bodily pain
4. General health perceptions
5. Vitality (energy and fatigue)
6. Limitations in social activities because of physical or emotional problems
7. Limitations in usual role activities because of emotional problems
8. Mental health (psychological distress and well-being).

This survey has been documented as a useful tool in comparing and contrasting the quality of life in different populations in more than 750 publications. Studies have concluded that this survey "fulfills stringent criteria of reliability and validity" (Brazier, Harper, Jones, O'Cathain, Thomas, Usherwood, Westlake, 1992). The reliability coefficient was greater than 0.80 for all areas except social functioning, which had a median reliability of 0.76. The MOS SF-36 scales have demonstrated an empirical validity of 80-90 percent, in studies involving physical and mental health (Ware, Sherbourne, 1992).

Four additional questions were included regarding patients' cardiac health (symptoms, events, or procedures) since discharge and current exercise habits. The researcher developed these questions to determine patients' adherence to exercise since

the cardiac rehabilitation program, and to get and idea of patients' health since discharge. The additional questions included in the survey were questions 12 through 15:

12. Since being released from the monitored cardiac rehabilitation program, have you had any coronary events?
13. In a typical week, how much exercise do you get?
14. In a typical week, what type(s) of exercise do you perform?
15. Based on Borg's Scale of Perceived Exertion, which was used in cardiac rehab, at what intensity do you generally exercise, not including the warm-up and cool-down periods?

Procedures

To test the hypotheses, a causal comparative approach was used. The survey was given to Phase II cardiac rehabilitation patients upon exit from the program and was later distributed again in an effort to conduct a post-rehabilitation follow-up study. The MOS SF-36 health survey was re-administered to patients who had completed Phase II rehab within a 3-year period. The researcher compared the data from immediate post-rehab MOS SF-36 health surveys (taken directly from cardiac rehabilitation patients' files) and new data from the follow-up MOS SF-36 surveys. This data was obtained in a manner approved by the Institutional Review Board (See Appendix A).

Cardiac rehabilitation patients' telephone numbers and addresses were obtained from the wellness center records. Permission to obtain this information was granted by the wellness center's assistant director. Telephone calls were made to the patients to encourage them to complete and return the surveys and sign informed consent

documents. The MOS SF-36 survey, the informed consent form, and a letter explaining the study, (See Appendices B, C, and D) were sent along with a self-addressed, stamped envelope to each of the cardiac patients who met the criteria for this study. Patients were given a deadline of approximately 2 weeks after the surveys would reach them by mail to return them. Patients' answers were kept strictly confidential as only a code number could be used to identify the patient. It was necessary to identify the patient in order to correlate his/her answers from the follow-up survey with the immediate post-rehab survey answers for comparison. Only the researcher had access to the code number. This list and the returned surveys were kept in the researcher's private residence in a locked cabinet until all statistical analyses were completed. Upon conclusion of the research, the list that identifies patients and their code numbers was destroyed by the researcher.

Statistical Analyses of Data

Scores from each of the eight health concept areas were analyzed as dependent variables, with program adherence being the independent variable. Paired t-tests with an alpha level of .05 were used for analysis of patients' scores in each of these areas for both the immediate post-rehab period and the follow-up period.

CHAPTER FOUR

RESULTS & DISCUSSION

Results

The purpose of this research was to compare answers to a survey given at two different points in cardiac patients' maintenance exercise program to determine if there was a relationship between patients' perceived quality of life and the adoption of exercise as a lifestyle. The areas included in the subjective health survey were limitations in physical activity, limitations in usual role activities due to physical health problems, bodily pain, general health perceptions, vitality, limitations in social activities, limitations in usual role activities due to emotional problems, and mental health. Two hypotheses were tested:

> **Hypothesis 1.** There will be no difference in the quality of life scores on the MOS SF-36 survey by post-rehabilitation patients who adhere to the exercise program following release from Phase II cardiac rehabilitation.

This hypothesis was accepted, as all patients who completed the survey reported that they are still involved in an exercise program.

> **Hypothesis 2.** There will be no differences between exercise program adherence rates in those patients released from Phase II cardiac rehabilitation one year ago (1999), two years ago (1998), and three years ago (1997).

This hypothesis was also accepted, since all patients who returned the self-reported surveys did report current exercise adherence, regardless of the year they were released from Phase II cardiac rehabilitation.

No patients had experienced a subsequent heart attack or coronary artery bypass graft surgery since their release from rehab, and relatively few (only 7% of those patients surveyed) had undergone angioplasty. Less than a third of the patients reported experiencing symptoms such as chest pain or shortness of breath.

It is interesting to note that all who responded to these questions reported that they are still involved in some sort of physical activity, and only one of these patients reports the amount of exercise performed in a typical week to be less than 30 minutes. The most common type of exercise reportedly performed is slow-to-moderate walking (under 3.5 mph), and over 1/3 of the patients report that they include weight training with their cardiovascular exercise. The average reported rate of perceived exertion was 13, or "somewhat hard".

Following are the results and interpretations of the analyses of each individual item on the survey:

The results of the analyses of **questions 1 through 3** are shown in Table I.

Table I. Questions 1-3

	IMMEDIATE POST MEAN	SD	FOLLOW-UP MEAN	SD	t- value
Q. 1 (GH)	2.79	0.68	2.66	0.77	0.94
Q. 2 (GH)	2.45	1.96	2.24	0.87	0.84
Q. 3A (PF)	1.76	0.69	1.76	0.74	0.00
Q. 3B (PF)	2.37	0.76	2.47	0.73	0.65
Q. 3C-J (PF)	21.3	3.49	19.9	4.86	1.56

* SD= Standard Deviation; GH= General Health; PF= Physical Function; SF= Social Function; PN= Pain; VT= Vitality; MH= Mental Health. (Data for questions 4, "Role due to Physical Problems", and 5, "Role due to Emotional Problems", follow.)

Question #1 (General health perceptions)

In general, would you say your health is: excellent, very good, good, fair, or poor?

The mean score for immediate post rehab was 2.79, with a score of 1 being "excellent", and a score of 5 being "poor". The standard deviation was 0.68. The mean score for the follow-up survey was 2.66, with a standard deviation of 0.77.

Therefore, no significant difference between the two means was found.

Question #2 (General health perceptions)

Compared to one year ago, how would you rate your health now: much better, better, about the same, worse, or much worse?

The mean score for immediate post-rehab was 2.45, with a score of 1 being "much better" and a score of 5 being "much worse". The standard deviation was 1.06. The mean score for the follow-up survey was 2.24, with a standard deviation of 0.87.

Therefore, there was no significant difference between the two means.

Question #3 (Limitations in physical activities because of health problems)

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?

Limited a lot, a little, or not at all?

a. Vigorous activities

The mean score for immediate post-rehab was 1.76, with a score of 1 being "limited a lot" and a score of 3 being "not at all limited". The standard deviation was 0.69. The mean score for the follow-up survey was 1.76, with a standard deviation of 0.69. Therefore, no significant difference between the two means was found.

b. Moderate activities

The mean score for immediate post-rehab was 2.37, with a score of 1 being "limited a lot" and a score of 3 being "not at all limited". The standard deviation was 0.76. The mean score for the follow-up was 2.47, with a standard deviation of 0.73. Therefore, no significant different between the two means was found.

Sum of parts c through j were added together on question 3 to simplify analysis for everyday activities:

c. Lifting of carrying groceries

d. Climbing several flights of stairs

e. Climbing one flight of stairs

f. Bending, kneeling, or stooping

g. Walking more than one mile

h. Walking several blocks

i. Walking one block

j. Bathing or dressing yourself

The mean score for immediate post-rehab surveys was 2.13, with a score of 1 being "limited a lot" and a score of 3 being "not at all limited". The standard deviation was 3.49. The mean score for follow-up surveys was 1.99, with a standard deviation of 4.86. Therefore, no significant difference between the two means was found.

The results of the analyses of **questions 4 and 5** are shown in Table II.

Table II. Questions 4-5

		IMMEDIATE POST	FOLLOW-UP
Q.4 A	**YES**	23 %	21 %
	NO	77 %	79 %
Q.4 B	**YES**	47 %	36 %
	NO	53 %	64 %
Q.4 C	**YES**	67 %	34 %
	NO	33 %	66 %
Q.4 D	**YES**	45 %	24 %
	NO	55 %	76 %
Q.5 A	**YES**	10 %	7%
	NO	90 %	93 %
Q.5 B	**YES**	23 %	28 %
	NO	77 %	72%
Q.5 C	**YES**	14 %	14 %
	NO	87 %	86 %

* SD= Standard Deviation; GH= General Health; PF= Physical Function; SF= Social Function; PN= Pain; VT= Vitality; MH= Mental Health. (Data for questions 4, "Role due to Physical Problems", and 5, "Role due to Emotional Problems", follow.)

Question #4 (Limitations in usual role activities because of physical health problems)

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:

a. Cut down on the amount of time you spend on work or other activities?

23% patients said "yes" immediately after discharge from rehab, while 77% said "no". 21% of patients said "yes" at discharge, with 79% saying "no".

b. Accomplished less than you would like?

47% of patients reported they had accomplished less than would like, and 53% reported this wasn't a problem upon discharge. At follow-up, 36% of patients reported that they had accomplished less than they would like, and 64% said "no", they hadn't accomplished less than they would like.

c. Were limited in the kind of work or other activities?

Upon discharge, 67% of patients reported they were limited in work and activities while 33% said they were not limited. However, at follow-up only 34% reported these limitations and 66% reported that they were not limited. This is a significant difference in improvement.

d. Had difficulty performing the work or other activity?

45% reported having difficulty performing these activities upon discharge, while 55% reported no difficulty. At follow-up, only 24% of patients reported difficulty and 76% reported they had no difficulty.

Therefore, subjects experienced fewer problems with their work in the last few weeks, than at the immediate post-rehab period.

Question #5 (Limitations in usual role activities because of emotional problems)

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 emotional health?

a. Cut down on the amount of time you spend on work or other activities?

Only 10% of patients reported they had cut down the amount of time spent on work or other activities, and 90% reported they had not cut down. Similarly, at follow-up 7% of patients reported cutting back, while 93% said they had not.

b. Accomplished less than you would like?

Of patients surveyed, 23% reported accomplishing less than they would have liked, and 77% reported they'd not experienced this. At follow-up, 28% said they had accomplished less than they would have liked, and 72% said they had not. This is a small but insignificant increase since release from rehab.

c. Didn't do work or other activities as carefully as usual?

At both survey periods (immediate post-rehab and follow-up), 14% of patients reported they didn't do work or other activities as carefully as usual, while 87% denied this at discharge and 86% denied it at follow-up.

Therefore, there were no changes in their emotional problems, compared to the immediate post-rehab period.

The results of **questions 6 through 11** are shown in Table III.

Table III. Questions 6-11

	IMMEDIATE POST MEAN	SD	FOLLOW-UP MEAN	SD	t- value
Q. 6 (SF)	1.68	0.86	1.43	0.84	1.27
Q. 7 (PN)	2.28	1.03	2.03	0.98	1.32
Q. 8 (PN)	1.57	0.79	1.57	0.88	0.00
Q. 9ADEGI Sum (VT)	18.31	2.33	17.35	2.08	1.48
Q. 9BCFH sum (MH)	18.59	1.24	18.90	1.23	1.36
Q. 10 (SF)	4.48	0.78	4.59	0.78	0.65
Q. 11A (GH)	3.93	0.84	4.28	0.88	1.98
Q. 11B (GH)	2.86	1.06	2.62	1.15	1.16
Q. 11C (GH)	3.76	1.06	3.83	1.10	0.31
Q. 11D (GH)	2.52	0.99	2.86	1.16	1.58

* SD= Standard Deviation; GH= General Health; PF= Physical Function; SF= Social Function; PN= Pain; VT= Vitality; MH= Mental Health. (Data for questions 4, "Role due to Physical Problems", and 5, "Role due to Emotional Problems", follow.)

Question #6 (Limitations in social activities because of physical or emotional problems)

During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?

The mean score for the immediate post-rehab surveys was 1.68, with 1 being "not at all" and 5 being "extremely". The standard deviation was 0.86. The mean score for the

follow-up surveys was 1.43, with a standard deviation of 0.84.

Therefore, no significant difference between the two means was found.

Question #7 (Bodily pain)

How much bodily pain have you had during the past 4 weeks? None, a little bit, moderate, quite a bit, extreme?

The mean score for the immediate post-rehab surveys was 2.28, with 1 being "none" and 6 being "very severe". The standard deviation for the immediate post-rehab answers was 1.03. The mean score for follow-up surveys was 2.03, with a standard deviation of 0.98.

Therefore, there was no significant difference between the two means.

Question #8 (Bodily pain)

During the past 4 weeks, how much did pain interfere with your normal work? None, a little bit, moderately, quite a bit, or extremely?

The mean score for the immediate post-rehab surveys was 1.57, with 1 being "not at all" and 5 being "extremely", and standard deviation was 0.79. The mean score for the follow-up surveys was 1.57, with a standard deviation of 0.88.

Therefore, no significant difference between the two means was found.

Question #9 (Vitality; Mental health)

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, or none of the time?)

a. **Did you feel full of pep?**

b. **Have you been a very nervous person?**

c. **Have you felt so down in the dump that nothing could cheer you up?**

d. **Have you felt calm and peaceful?**

e. **Did you have a lot of energy?**

f. **Have you felt downhearted and blue?**

g. **Did you feel worn out?**

h. **Have you been a happy person?**

i. **Did you feel tired?**

Sum of vitality items – (a, d, e, g, i)

The mean score for the immediate post-rehab surveys was 18.31, with a standard deviation of 2.33. The mean score for the follow-up surveys was 17.35, with a standard deviation of 2.08.

Therefore, no significant difference was found between the two means.

Sum of mental health items – (b, c, f ,h)

The mean score for the mental health items on the immediate post-rehab surveys was 18.59, with a standard deviation of 1.24. The mean score for the follow-up surveys was 18.90 with a standard deviation of 1.23.

Therefore, no significant difference between the two means was found.

Question #10 (Limitations in social activities because of physical or emotional problems)

During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities? (All of the time, most of

the time, some of the time, a little of the time, or none of the time?)

The mean score for the immediate post-rehab results was 4.48, with a score of 1 being "all of the time" and a score of 5 being "none of the time". The standard deviation was 0.78 for immediate post-rehab results. The mean score for the follow-up results was 4.59, with a standard deviation of 0.78.

Therefore, no significant difference between the two means was found.

Question #11 (General health perceptions)

How TRUE or FALSE is each of the following statements for you? Definitely true, mostly true, don't know, mostly false, or definitely false?

a. I seem to get sick a little easier than other people.

The mean score for the immediate post-rehab survey results was 3.93, with a score of 1 being "definitely true" and a score of 5 being "definitely false". The standard deviation was 0.84. The mean score for the follow-up surveys was 4.28 with a standard deviation of 0.88.

Therefore, there was no significant difference between the two means.

b. I am as healthy as anybody I know.

The mean score for the immediate post-rehab results was 2.86, with a score of 1 being "definitely true" and a score of 5 being "definitely false". The standard deviation was 1.06. The mean score for the follow-up surveys was 2.62, with a standard deviation of 1.15.

Therefore, there was no significant difference between the two means.

c. I expect my health to get worse.

The mean score for the immediate post-rehab results was 3.76, with a score of 1 being "definitely true" and a score of 5 being "definitely false". The standard deviation was 1.06. The mean score for the follow-up surveys was 3.83, with a standard deviation was 1.10.

Therefore, no significant difference between the two means was found.

d. My health is excellent.

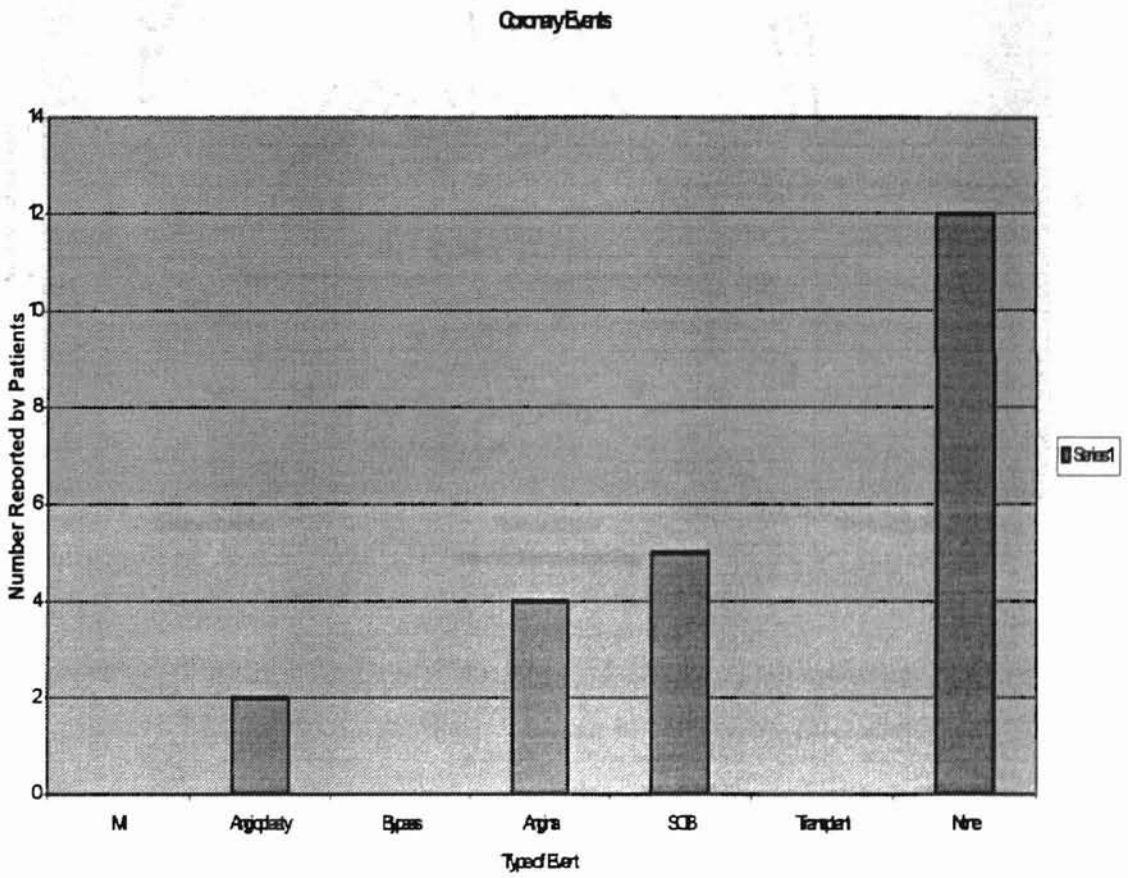
The mean score for the immediate post-rehab results was 2.52, with a score of 1 being "definitely true" and a score of 5 being "definitely false". The standard deviation was 0.99. The mean for the follow-up surveys was 2.86, with a standard deviation of 1.16. Therefore, no significant difference was found between the two means.

This concludes the data from the MOS SF-36 survey. The patients' answers to the questions regarding current exercise habits and cardiac health since their release from the Phase II program are on the following pages.

12. Since being released from the monitored cardiac rehabilitation program, have you had any coronary events? (See Figure 1.)

No patients reported any heart attacks or bypass surgery since their release from Phase II cardiac rehabilitation. Two patients reported having angioplasty; four patients reported having angina (chest-pain); five reported experiencing unusual shortness of breath; and twelve patients report that they have had no symptoms.

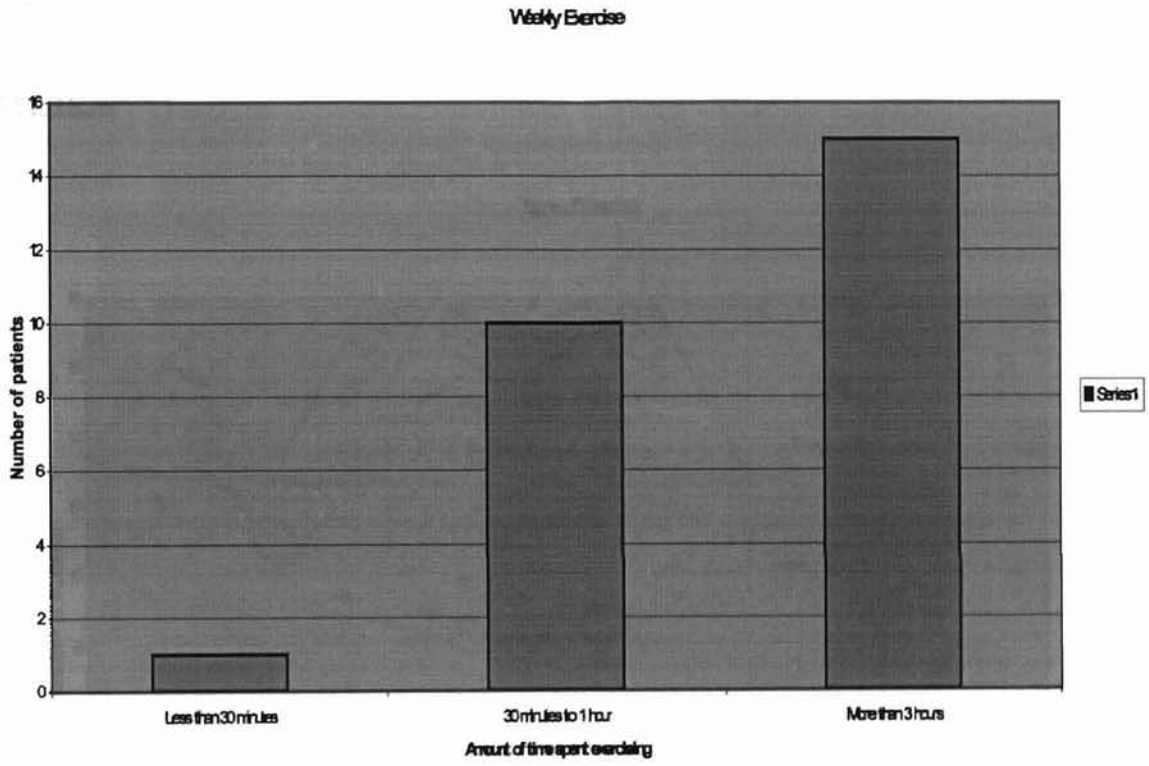
Figure 1.



13. In a typical week, how much exercise do you get? (See Figure 2.)

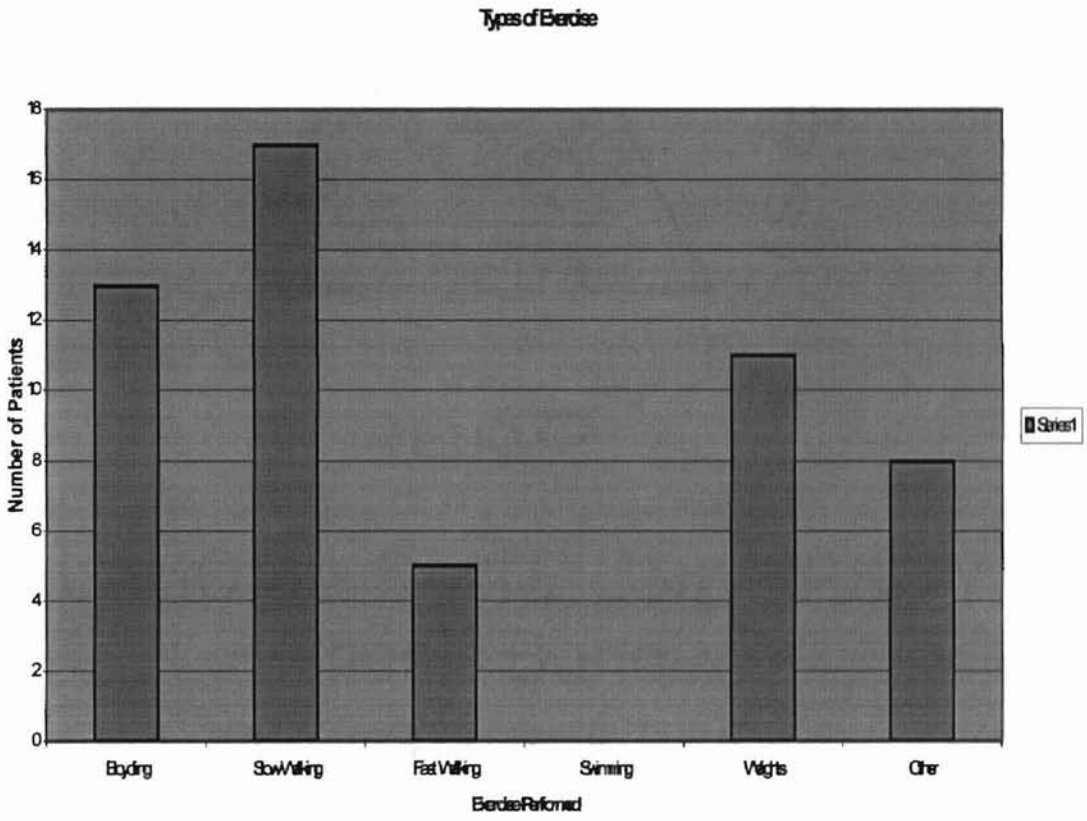
Only one patient reports exercising less than 30 minutes per week; ten patients report exercising between 30 minutes and 3 hours per week; while fifteen patients report exercising more than 3 hours per week.

Figure 2.



14. In a typical week, what type(s) of exercise do you perform? (See Figure 3.) Thirteen patients reported riding a bicycle; seventeen reported walking slower than 3.5 mph, while five patients reported walking at 3.5 mph or faster. Eleven patients said that they still participate in weight training. Other current activities listed by patients include "calisthenics, stress exercises, golf, stairs, work outside, yard work, abdominal work, and outdoor activities".

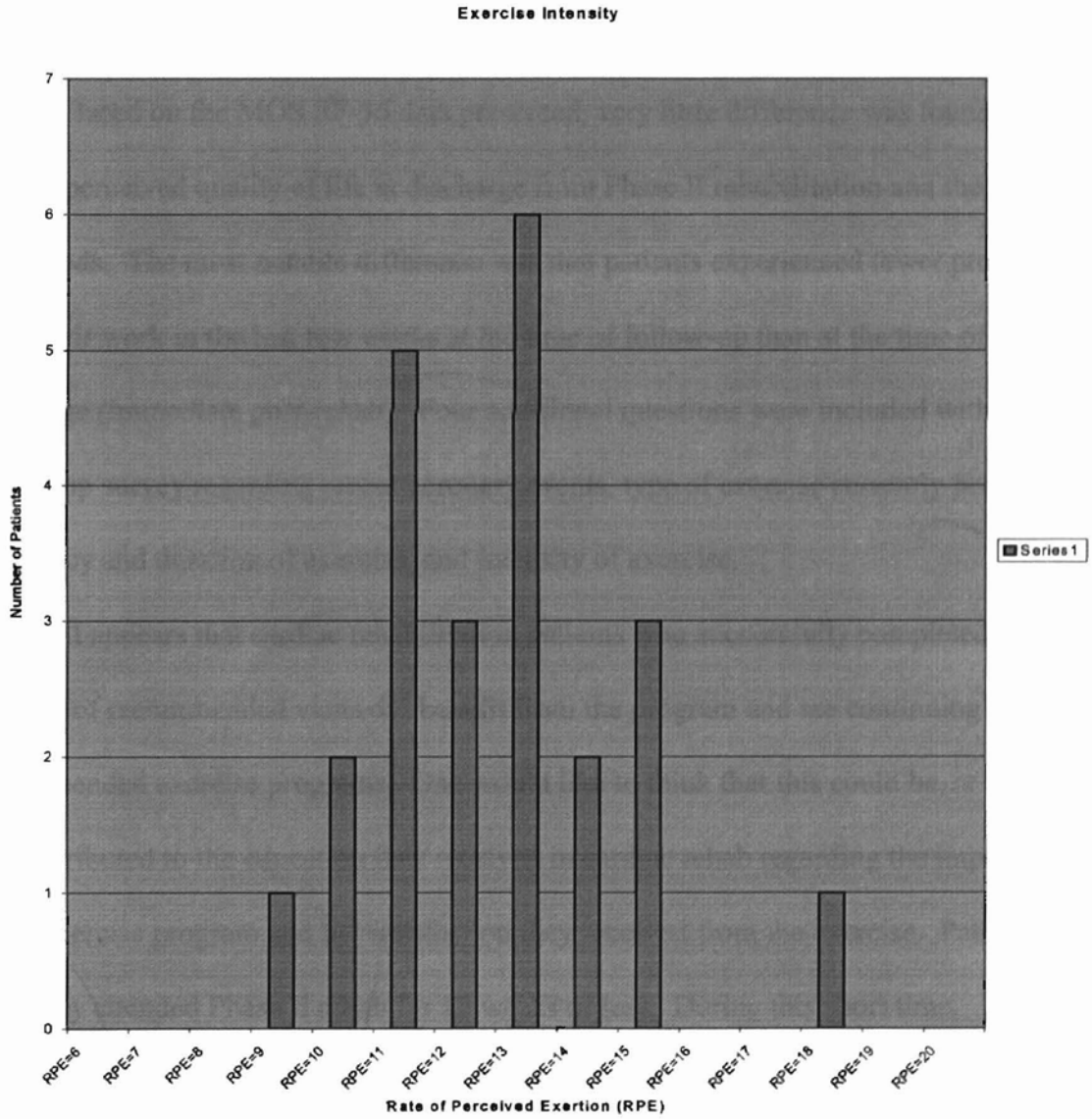
Figure 3.



15. Based on Borg's Scale of Perceived Exertion, which was used in cardiac rehab, at what intensity do you generally exercise, not including the warm-up and cool-down periods? (See Figure 4.)

One patient reported working at an RPE of 9; two at an RPE of 10; five patients reported an RPE of 11; three patients at an RPE of 12; six at an RPE of 13; two at 14; three patients reported an RPE of 15; and one at a level of 18.

Figure 4.



Discussion

Increasing patient awareness of risk factors has been reported to result in remarkable, beneficial lifestyle changes and improve quality of life (Shepperd, Maroto, & Pbert, 1996). Cardiac rehabilitation programs have been a key factor in assisting patients in making the health-related lifestyle changes. The problem of this study was to determine the relationship between cardiac rehabilitation patients' quality of life, as determined by the MOS SF-36 survey, and long-term compliance to an exercise program following release from Phase II rehabilitation.

Based on the MOS SF-36 data presented, very little difference was found between patient perceived quality of life at discharge from Phase II rehabilitation and the follow-up periods. The most notable difference was that patients experienced fewer problems with their work in the last few weeks at the time of follow-up than at the time of discharge (immediate post-rehab). Four additional questions were included with the follow-up survey regarding recent coronary events, type of exercise currently performed, frequency and duration of exercise, and intensity of exercise.

It appears that cardiac rehabilitation patients who successfully completed half the number of recommended visits did benefit from the program and are continuing to follow recommended exercise programs. One would like to think that this could be, at least in part, attributed to the education they received in cardiac rehab regarding the importance of an exercise program and the satisfaction they received from the exercise. Patients generally attended Phase II rehab for 12 weeks or less. During this short time, improvement is seen fairly quickly in exercise tolerance, body weight, and general

feelings of well-being. Often at this time, patients are regaining self-confidence in their ability to physically perform activities. Once this is established, it is likely that patients do not want to risk "losing ground" by ceasing to exercise and becoming deconditioned again. Patients may, in fact, credit the physical activity to an improved or at least maintainable quality of life.

A new appreciation of life after a near-death experience, such as a heart attack, may also be responsible for the changes in lifestyle. A major event may often make one re-evaluate his or her lifestyle. Patients may now want to get more out of life (and their bodies) and thus make exercise a higher priority, when they've seen the benefits firsthand.

However, the use of a self-reporting instrument may not be the most accurate method of getting honest answers, as the patient may imagine which answer is most desirable and give that answer instead of the most truthful answer, thus skewing the accuracy of the data. This is a common problem with self-report surveys.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, & RECOMMENDATIONS

Summary of Findings

Two hypotheses were stated and both were accepted:

Hypothesis 1. There will be no difference in the quality of life scores on the MOS SF-36 survey by post-rehabilitation patients who adhere to the exercise program following release from Phase II cardiac rehabilitation.

Hypothesis 2. There will be no differences between exercise program adherence rates in those patients released from Phase II cardiac rehabilitation one year ago (1999), two years ago (1998), and three years ago (1997).

There were no significant differences in quality of life scores by patients who adhered to their exercise program. Also, there were no significant differences between adherence rates in patients who were released one year ago, two years ago, or three years ago. Based upon these findings, it appears that patients who attended Phase II cardiac rehab for at least half the recommended number of visits in the Midwestern community continue to exercise after discharge.

Conclusions

The subjective answers to the MOS SF-36 survey show little differences in patients' perceived quality of life at the time of discharge and the time of the follow-up study. Furthermore, the self-reported adherence rates to an exercise prescription did not

differ greatly between the patients who were discharged three years ago, two years ago, and one year ago.

The researcher had hoped to identify individuals with certain characteristics that correlate with poor adherence, so that greater steps may be taken to stress the importance of secondary prevention and to encourage program maintenance (e.g. introducing different types of educational materials, greater follow-up interventions, or hiring a personal trainer for motivation after release from Phase II rehabilitation). However, all patients reported adhering to an exercise program.

Cardiac rehabilitation programs are designed to improve quality of life by decreasing feelings of anxiety and disability and increasing vitality (Hujibrechts, 1997). Research has shown that cardiac rehab participants had an improved understanding of heart disease and better complied with their exercise programs (Pollock, Schmidt, 1995). Apparently in this population, the beneficial effects of exercise outweigh the risks and discomforts of exercise.

Based upon the results of this study, the conclusion has been submitted that cardiac rehabilitation had a positive effect on these patients' perceived quality of life and has reinforced long-term adherence to an exercise program.

Recommendations for Future Studies

Recommendations for future studies would include using the pre-test MOS SF-36 in addition to immediate post and follow-up surveys. This may show more dispositional/ outlook changes by patients as they proceed through their rehab treatments.

A detailed account of patient exercise habits might be more accurate. For example, ask the patient if he/she works out at home, a fitness center, etc., and if they generally exercise in the morning, afternoon or evening. This may make patients more conscientious about their current habits and answer more honestly, instead of giving the answers they believe are desirable.

A larger population would be preferred. Perhaps the research might include patients from several different facilities with cardiac rehab programs to attain this larger group. Further breakdown of data to analyze subjects' demographic data (e.g. gender, age, employment status) might also be of use.

REFERENCES

Allison, T.; Black, J.; Williams, D.; Squires, R.; Johnson, B.; Gau, G. (1998). Medical and psychological predictors of one-year outcomes in cardiac rehabilitation patients. Circulation, 98 (17), 33-51.

American Association of Cardiovascular and Pulmonary Rehabilitation. (1995). Guidelines for cardiac rehabilitation programs. (2nd Ed.). Champlaign, IL: Human Kinetics.

American College of Sports Medicine. (2000). Guidelines for exercise testing and prescription. (6th Ed.). Baltimore, MD: Lippincott, Williams and Wilkins.

American College of Sports Medicine. (2001). Resource manual for exercise testing and prescription. (2nd Ed.). Philadelphia, PA: Lea and Febiger.

Anderson, K,; Anderson, L.; Glanze, W. (1994). Mosby's Medical, Nursing, and Allied Health Dictionary, 4th Edition. St. Louis, MO: Mosby.

Annesi, J. (1998). Effects of computer feedback on adherence to exercise. Perceptual and Motor Skills, 87 (2), 723-730.

Birney, M.; Matukaitus, J.; Hardie, T.; Ednie, A. (1998). Psychophysiological outcomes of participation in phase II cardiac rehabilitation. Journal of Cardiopulmonary Rehabilitation, 18 (5), 350.

Bittner, V.; Oberman, A. (1993). Efficacy studies in coronary rehabilitation. Cardiology Clinician, 11 (2), 333-347.

Bock, B.; Albrecht, A.; Traficante, R.; Clark, M.; Pinto, B.; Tilkemeier, P.; Marcus, B. (1997). Predictors of exercise adherence following participation in a cardiac rehabilitation program. International Journal of Behavioral Medicine, 4 (1), 60-75.

Brazier, J.; Harper, R.; Jones, N.; O'Cathain, A.; Thomas, K.; Usherwood, T.; Westlake, L. (1992). Validating the SF-36 health survey questionnaire: new outcome measure for primary care. British Medical Journal, 305, 160-164.

Bunker, S.; McBurney, H.; Aikman, H. (1998). Cardiac rehabilitation: the extent, reasons, and predictors of non-attendance. Journal of Cardiopulmonary Rehabilitation, 18 (5), 350.

Burke, L.; Dunbarjacob, J.; Hill, M. (1997). Compliance with cardiovascular-disease prevention strategies: a review of the research. Annals of Behavioral Medicine, 19 (3), 239-263.

Burns, K.; Camaione, D.; Froman, R.; Clark, B. (1998). Predictors of referral to cardiac rehabilitation and cardiac exercise self-efficacy. Clinical Nursing Research, 7 (2), 147.

Carlson, J.; Feltz, D.; Johnson, J.; Franklin, B. (1998). Does traditional cardiac rehabilitation using continuous ECG monitoring decrease patient self-efficacy for independent exercise? Journal of Cardiopulmonary Rehabilitation, 18 (5), 345.

Conn, V.; Taylor, S.; Abele, P. (1991). Myocardial infarction survivors: age and gender differences in physical health, psychosocial state and regimen adherence. Journal of Advanced Nursing, 16 (9), 1026-1034.

Cousins, N. (1983). The Healing Heart. New York: W. W. Norton and Company.

Croog, S.; Levine, S. (1982). Life After a Heart Attack. New York: Human Sciences.

Einerson, J.; Vitcenda, A.; Ward, A.; & McBride, P. (1999). Secondary prevention treatment outcomes in cardiac patients at discharge and follow-up. Journal of Cardiopulmonary Rehabilitation, 19 (5), 306.

Engbloom, E.; Korpilahti, K.; Hamalainen, H.; Ronnemaa, T.; & Puukka, P. (1997). Quality of life and return to work 5 years after coronary artery bypass surgery. Journal of Cardiopulmonary Rehabilitation,17 (1), 29-36.

Evenson, K.; Fleury, J. (2000). Barriers to outpatient cardiac rehabilitation participation and adherence. Journal of Cardiopulmonary Rehabilitation, 20 (4), 241-246.

Evenson, K.; Rosamond, W.; & Luepker, R. (1998). Predictors of outpatient cardiac rehabilitation utilization: the Minnesota heart survey registry. Journal of Cardiopulmonary Rehabilitation, 18 (3), 192-198.

Fielding, R. (1989). A note on early indicators of non-adherence to a cardiac rehabilitation programme. British Journal of Medicine and Psychology, 62, 97-101.

Fletcher, G. (1998). Current status of cardiac rehabilitation. American Family Physician, 58 (8), 1778-1782.

Fleury, J. (1991). Wellness motivation in cardiac rehabilitation. Heart and Lung, 20 (1), 3-8.

Friedman, D.; Williams, A.; Levine, B. (1997). Compliance and efficacy of cardiac rehabilitation and risk factor modification in the medically indigent. American Journal of Cardiology, 79 (3), 281-285.

Garduno, D.; Cort, D.; Harner, S.; Rutledge, J.; Kappagoda, T. (1998). Psychological characteristics of participants in a lifestyle program for coronary artery disease. Journal of Cardiopulmonary Rehabilitation, 18 (5), 375.

Gernertdott, P.; Nicholson, N. (1996). Computerized cognitive assessment of patients with cardiac and pulmonary disorders in a rehabilitation setting. Biofeedback and Self-regulation, 21 (4), 360.

Gordon, N.; Haskell, W. (1997). Comprehensive cardiovascular-disease risk reduction in a cardiac rehabilitation setting. American Journal of Cardiology, 80, 69-73.

Hershberger, P., Robertson, K., & Markert, R. (1999). Personality and appointment-keeping adherence in cardiac rehabilitation. Journal of Cardiopulmonary Rehabilitation, 19 (2), 106-111.

Huerin, M.; Rosario, A.; Bergman, G.; Belardi, J.; Trivi, M.; Guzman, L.; Rubinstein, F. (1998). Compliance with cardiovascular rehabilitation: comparison of standard and a new adherence strategies. Journal of the American College of Cardiology, 31 (2), A171-A172.

Hujibrechts, I.; Erdman, R.; Duivenvoorden, H.; Deckers, J.; Leenders, I.; Pop, G.; Passchier, J. (1997). Modification of physical-activity 5 months after myocardial infarction: relevance of biographic and personality characteristics. International Journal of Behavioral Medicine, 4 (1), 76-91.

Ice, R. (1985). Long-term compliance. Physical Therapist, 65 (12), 1832-1839.

Johnson, N.; Heller, R. (1998). Prediction of patient nonadherence with home-based exercise for cardiac rehabilitation: the role of perceived barriers and perceived benefits. Preventive Medicine, 27 (1), 56-64.

Kamwendo, K.; Hansson, M.; Hjerpe, I. (1998). Relationships between adherence, sense of coherence, and knowledge in cardiac rehabilitation. Rehabilitative Nursing, 23 (5), 240-245, 251.

Milani, R.; Lavie, C. (1998). The effects of body-composition changes to observed improvements in cardiopulmonary parameters after exercise training with cardiac rehabilitation. Chest, 113 (3), 599-601.

Miller, T.; Balady, G.; Fletcher, G. (1997). Exercise and its role in the prevention and rehabilitation of cardiovascular-disease. Annals of Behavioral Medicine, 19 (3), 220-229.

Morrin, L.; Black, S. (1998). Impact of cardiac rehabilitation program length on secondary prevention and health-related quality-of-life outcomes. Circulation, 98 (17), 1442.

Murray, G.; Beller, G. (1983). Cardiac rehabilitation following coronary artery bypass surgery. The American Heart Journal, 105 (6), 1009-1018.

Oldridge, N. (1991). Compliance with cardiac rehabilitation services. Journal of Cardiopulmonary Rehabilitation, 11 (1), 115-127.

Oldridge, N. (1997). Outcome assessment in cardiac rehabilitation. Journal of Cardiopulmonary Rehabilitation, 17 (3), 179-194.

Oldridge, N.; Gottlieb, M.; Guyatt, G.; Jones, N.; Streiner, D.; Feeny, D. (1998). Predictors of health-related quality of life with cardiac rehabilitation after acute myocardial infarction. Journal of Cardiopulmonary Rehabilitation, 18 (2), 95-103.

Pashkow, P.; Ades, P.; Emery, C.; Frid, D.; Miller, N.; Peske, G.; Reardon, J.; Schiffert, J.; Southard, D.; ZuWallack, R. (1995). Outcome measurement in cardiac and pulmonary rehabilitation by the AACVPR outcomes committee. Journal of Cardiopulmonary Rehabilitation, 15 (6), 394-405.

Pollock, M.; Schmidt, D. (1995). Heart Disease and Rehabilitation, 3rd Edition Champaign, IL: Human Kinetics.

Rosenow, D. (1998). Comparison of the clinical profile and outcome of women and men in cardiac rehabilitation. Psychosomatic Medicine, 60 (1), 95.

Rutledge, J.; Hyson, D.; Garduno, D.; Paumer, L.; & Kappagoda, T. (1999). Lifestyle modification program in management of patients with coronary artery disease: the clinical experience in a tertiary care hospital. Journal of Cardiopulmonary Rehabilitation, 19 (4), 226-234.

Schuster, P.; Wright, C.; Tomich, P. (1995). Gender differences in the outcomes of participants in home programs compared to those in structured cardiac rehabilitation programs. Rehabilitative Nursing, 20 (2), 93-101.

Shepperd, J.; Maroto, J.; Pbert, L. (1996). Dispositional optimism as a predictor of health changes among cardiac patients. Journal of Research in Personality, 30 (4), 517-534.

Stegman, M.; Miller, P.; Hageman, R.; Irby, D.; Kositzky-Klutman, A.; Rajek, N. (1987). Myocardial infarction survival: how important are patients' attitudes and adherence behavior? American Journal of Preventive Medicine, 3 (3), 147-151.

Steptoe, A. (1998). Psychological factors and cardiovascular disease. Current Opinion in Psychiatry, 11 (6), 655-660.

Steptoe, A.; Mathews, A. (1984). Health Care and Human Behavior. London: Academic Press.

Stoudemire, A. (1995). Psychological Factors Affecting Medical Conditions. Washington, D.C.: American Psychiatric Press.

Suter, P.; Suter, W.; Perkins, M.; Bona, S.; Kendrick, P. (1996). Cardiac rehabilitation survey: maintenance of lifestyle changes and perception of program value. Rehabilitation Nursing, 21 (4), 192-195.

Taylor, C.; Berra, K. (1993). Psychosocial factors in rehabilitation. Journal of Cardiopulmonary Rehabilitation, 13 (2), 78-79.

Ware, J.; Sherbourne, C. (1992). The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. Medical Care, (30), 473-483.

Williams, M.; Hardy, K.; Ryschon, K.; Esterbrooks, D. (1998). Multicenter evaluation of quality-of-life outcome measures in cardiac rehabilitation patients stratified by gender, age, and clinical presentation. Circulation, 98 (17), 22-77.

Wilmore, J.; Costill, D. (1994). Physiology of Sport and Exercise. Champaign, IL: Human Kinetics.

APPENDIX A
IRB APPROVAL

Oklahoma State University
Institutional Review Board

Protocol Expires 10/25/01

Date Thursday, October 26, 2000 IRB Application No ED0137

Proposal Title PREDICTION OF LONG-TERM EXERCISE COMPLIANCE IN CARDIAC REHABILITATION

Principal Investigator(s)

✓Amanda L. Southard
304 N Walnut
Kennett, MO 63857

Steven Edwards
432 Willard
Stillwater, OK 74078

Reviewed and Processed as Expedited

Approval Status Recommended by Reviewer(s): Approved

Signature

Carol Olson, Director of University Research Compliance

Thursday, October 26, 2000
Date

Approvals are valid for one calendar year, after which time a request for continuation must be submitted. Any modifications to the research project approved by the IRB must be submitted for approval with the advisor's signature. The IRB office MUST be notified in writing when a project is complete. Approved projects are subject to monitoring by the IRB. Expedited and exempt projects may be reviewed by the full Institutional Review Board.

APPENDIX B
SURVEY INSTRUMENT

OSU Wellness Center MedSCAN SF – 36

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

   ○ Excellent ○ Very Good ○ Good ○ Fair ○ Poor

2. **Compared to one year ago,** how would you rate your health in general now?

   ○ Much Better ○ Better ○ About the same ○ Worse ○ Much worse

3. 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?

	Limited A lot	Limited a little	Not at all
a. **Vigorous activities:** running, lifting heavy objects, participating in strenuous sports	○	○	○
b. **Moderate Activities:** moving a table, pushing a vacuum cleaner, bowling, or playing golf	○	○	○
c. **Lifting or carrying groceries**	○	○	○
d. **Climbing several flights of stairs**	○	○	○
e. **Climbing one flight of stairs**	○	○	○
f. **Bending, kneeling, or stooping**	○	○	○
g. **Walking more than a mile**	○	○	○
h. **Walking several blocks**	○	○	○
i. **Walking one block**	○	○	○
j. **Bathing or dressing yourself**	○	○	○

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 your physical health?

	Yes	No
a. Cut down on the amount of time you spend on work or other activities	○	○
b. Accomplished less than you would like	○	○
c. Were limited in the kind of work or other activities	○	○
d. Had difficulty performing the work or other activity (for example it took extra effort)	○	○

5. 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 emotional health?

	Yes	No
a. Cut down on the amount of time you spend on work or other activities	○	○
b. Accomplished less than you would like	○	○
c. Didn't do work or other activities as carefully as usual	○	

6. During the **past 4 weeks,** to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?

   ○ Not at all ○ Slightly ○ Moderately ○ Quite a bit ○ Extremely

Patient ID _____

OSU Wellness Center MedSCAN SF – 36

7 How much bodily pain have you had during the **past 4 weeks**?
○ None ○ A little bit ○ Moderately ○ Quite a bit ○ Extremely

8 During the **past 4 weeks**, how much did pain interfere with your normal work (including outside the home and housework)
○ None ○ A little bit ○ Moderately ○ Quite a bit ○ Extremely

9 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. Did you feel full of pep?	○	○	○	○	○	○
b. Have you been a very nervous person?	○	○	○	○	○	○
c. Have you felt so down in the dump that nothing could cheer you up?	○	○	○	○	○	○
d. Have you felt calm and peaceful?	○	○	○	○	○	○
e. Did you have a lot of energy?	○	○	○	○	○	○
f. Have you felt downhearted and blue?	○	○	○	○	○	○
g. Did you feel worn out?	○	○	○	○	○	○
h. Have you been a happy person?	○	○	○	○	○	○
i. Did you feel tired?	○	○	○	○	○	○

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

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

11 How TRUE or FALSE is each of the following statements for you?

	Definitely true	Mostly true	Don't know	Mostly false	Definitely false
a. I seem to get sick a little easier than other people	○	○	○	○	○
b. I am as healthy as anybody I know	○	○	○	○	○
c. I expect my health to get worse	○	○	○	○	○
d. My health is excellent	○	○	○	○	○

For the following question, please circle ALL answers that apply to you:

12. Since being released from the monitored cardiac rehabilitation program, have you had any coronary events?
    a. myocardial infarction (heart attack)
    b. angioplasty
    c. bypass surgery
    d. angina
    e. shortness of breath
    f. heart transplant
    g. other (please list) _____
    h. none

13. In a typical week, how much exercise do you get?
    a. less than 30 minutes per week
    b. 30 minutes to 3 hours per week
    c. more than 3 hours per week

14. In a typical week, what type(s) of exercise do you perform? (Circle all that apply
    a. bicycling
    b. slower walking or treadmill (under 3.5 mph)
    c. faster walking or treadmill (at or over 3.5 mph)
    d. swimming
    e. weight training
    f. other (please list): _____

15. Based on Borg's Scale of Perceived Exertion, which was used in cardiac rehab, at what intensity do you generally exercise (not including the warm-up and cool-down periods)? Please circle only one
    a. 6
    b. 7
    c. 8
    d. 9
    e. 10
    f. 11
    g. 12
    h. 13
    i. 14
    j. 15
    k. 16
    l. 17
    m. 18
    n. 19
    o. 20

APPENDIX C
INFORMED CONSENT

INFORMED CONSENT

You are invited to participate in a study entitled "Prediction of Long-term Exercise Compliance in Cardiac Rehabilitation Patients". This study involves research and is being conducted through Oklahoma State University.

There are no experimental procedures, only a brief subjective survey. There are no right or wrong answers so please just answer honestly. As you may recall, this survey was given to you upon exit from cardiac rehab at the Wellness Center. This is simply a follow-up study, with 4 short, additional questions. Your name will not be used in the research project and all answers will be confidential. Surveys will be coded so that the immediate post-rehab and follow-up surveys may be compared. Only the researcher herself will have access to the identification codes and they will be kept in a locked cabinet at her private residence. These records will be destroyed within 6 weeks of the completion of the research.

After the surveys are returned, the post-rehab and follow-up surveys will be compared and the data will be analyzed statistically to help determine if certain characteristics upon exiting the cardiac rehabilitation program can be used as predictors of adherence to exercise. This may be beneficial in targeting cardiac patients who are less likely to adhere to their maintenance programs so that greater measures of encouragement and motivation may be used. There are no foreseeable risks to you for participation in this study.

If you have any questions or would like further information, feel free to contact me, Amanda Southard, at (573) 717-1827, or Robin Purdie at the OSU Wellness Center at (405) 744-9355. You may also contact Sharon Bacher, OSU's IRB Executive Secretary at (405) 744-5700. Ms. Bacher is located in OSU's Research Services department at 203 Whitehurst, Stillwater, OK 74078.

Participation is voluntary and you will in no way be penalized if you choose not to participate. You are free to withdraw your consent and end your participation at any time without penalty after notifying the project director.

I have read and understand the foregoing. Any questions I had have been answered to my satisfaction. I sign it freely and voluntarily.

NAME_____ **DATE**_____

Please print

SIGNATURE_____

APPENDIX D
EXPLANATORY LETTER SENT WITH SURVEY

November 6, 2000

Dear Former Cardiac Rehab Participant

I invite you to participate in a study entitled "Prediction of Long-term Exercise Compliance in Cardiac Rehabilitation Patients". Amanda Southard, who worked with you in cardiac rehabilitation at the Wellness Center and is now a candidate for the Master of Science degree at Oklahoma State University, is conducting the research.

All that is required of you is

1) Read and sign the enclosed consent form.
2) Complete the brief survey that is enclosed.
3) Return the completed survey ***and*** signed consent form in the self-addressed, stamped envelope provided ***no later than November 20, 2000***

As you will recall, this survey was given to you upon exit from cardiac rehab at the Wellness Center. This is simply a follow-up study, with 4 short, additional questions. It will only take a few minutes and your honesty is appreciated as your name will not be used in the research project and all answers will be confidential.

If you have any questions, feel free to call me at (573) 717-1827 or Robin Purdie at the Wellness Center, 744-9355. Thank you in advance for your cooperation and participation. I hope you are doing well and I hope to hear from you soon!

With Sincere Appreciation,

Amanda L. Southard
OSU Masters Candidate,
Former Wellness Center Graduate Assistant

VITA 2

Amanda L. Southard

Candidate for the Degree of

Master of Science

Thesis: PREDICTION OF LONG-TERM EXERCISE COMPLIANCE IN CARDIAC REHABILITATION PATIENTS

Major Field: Health, Physical Education and Leisure

Biographical:

Personal Data: Born in Jonesboro, Arkansas, daughter of Larry and Sue Southard.

Education: Graduated from Trumann High School, Trumann, Arkansas in May 1993; received Bachelor of Science degree in Exercise Science from Arkansas State University, Jonesboro, Arkansas in May 1997; completed requirements for Master of Science degree in Health, Physical Education, and Leisure at Oklahoma State University, Stillwater, Oklahoma in August, 2001.

Experience: Intern, Graduate Assistant, Fitness Center Co-manager, Oklahoma State University Wellness Center, Stillwater, Oklahoma, January 1997 through December 1999; Chronic Disease Health Educator, Dunklin County Health Department and Pemiscot County Health Center, Hayti and Kennett, Missouri, April 2000 through October 2000; Exercise Physiologist, Twin Rivers Regional Medical Center, Kennett, Missouri, October 2000 through present.

Professional Certifications: *American College of Sports Medicine* Health Fitness Instructor, *The Arthritis Foundation* PACE (People with Arthritis Can Exercise) Instructor.