AN EVALUATION OF A
CARDIAC REHABILITATION PROGRAM

by
LEANNE HEPELL

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School
Department of Nursing
The University of British Columbia
Vancouver, Canada

Date Sept 18, 1998
Abstract

Cardiac rehabilitation, an important component of the treatment for coronary artery disease, is provided by a multidisciplinary team in the Healthy Heart Program. The purpose of this study was to evaluate the impact of the Healthy Heart Program on maintenance of healthy lifestyle behaviors and hospital readmission rates, to increase our understanding of the effectiveness of the program, and to make recommendations for improvement of the program.

The study began with a retrospective chart review to select study participants, and from which data was collected on demographics and rate of achievement of healthy lifestyle goals during the program. Analysis of the data revealed that the majority of participants were able to successfully achieve their goals during the program. A telephone interview was then conducted with graduates of the program to determine if healthy lifestyle behaviors were maintained and the rate of and reasons for visits to hospital. Analysis of the data revealed that sustained behavior change did occur for at least six months after exiting the program. Analysis of the data also revealed that few Healthy Heart Program participants required visits to the emergency department or admission to hospital for cardiac reasons.

Recommendations for improvement to this program include improved stress management, diet management and smoking cessation strategies. As well, strategies to provide more individualized programs for modification of cardiac risk factors would be useful. Ongoing evaluation on cardiac rehabilitation programs for maintenance of healthy lifestyle behaviors is also necessary.
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Chapter One

BACKGROUND

The past several decades have brought significant advances in the knowledge of and treatment for coronary artery disease (CAD). "Coronary artery disease is narrowing of the coronary arteries sufficient to prevent adequate blood supply to the myocardium" (Taber's, 1997). Primary preventive initiatives through the media have increased public awareness about cardiac risk factors such as sedentary lifestyle, high fat diet, smoking and prolonged stress. Advances in drug therapies such as the use of beta-blockers, thrombolytic agents and aspirin, have revolutionized the successful medical treatment of CAD. As well, revascularization procedures such as coronary artery by-pass surgery and percutaneous coronary angioplasty now provide very effective treatment for people with known CAD. Increased public awareness about cardiac risk factors and advances in medical and surgical treatment have all resulted in a reduction in the overall mortality rate from CAD (Balady et al., 1994).

Despite the declining mortality rate, CAD remains the leading cause of death in Canada (Health Canada, 1995). As well, forty-three percent of all deaths in the United States were attributed to coronary disease related causes (Balady et al., 1994). The morbidity and disability associated with CAD alone has serious medical and socioeconomic implications. Currently people with CAD live longer, have ongoing cardiac events requiring medical interventions and frequent re-admissions to hospital (Balady et al.). According to the Heart and Stroke Foundation of Canada (1995), thirty-eight percent of all hospital admissions in 1991-1992 were attributed to coronary artery
disease related problems. The direct and in-direct costs of CAD are significant. An estimated 85 billion dollars is spent annually in the United States on direct costs for CAD (Braumwald, 1997). The in-direct costs due to goods and services not provided because of cardiac disabilities are even greater. Twenty percent of previously employed people do not return to work following a cardiac event (Pashkow & Dafoe, 1993). In 1995, Canada spent 518.3 million dollars on pensions and benefits related to cardiac disease (Heart & Stroke Foundation of Canada, 1995).

Major primary prevention efforts need to be continued in order to reduce the overall incidence of CAD. As well, continued development in medical and surgical techniques are needed in order to successfully treat the clinical manifestations of the disease. Cardiac rehabilitation efforts also need to be supported and enhanced as these programs play a pivotal role in the effective management of the lifelong consequences of CAD.

According to the 1994 American Heart Association position statement cardiac rehabilitation is standard care that should be integrated into the care for all patients with known CAD. The overall goal of cardiac rehabilitation is to restore and maintain the optimal physiological, psychological, social and vocational status of people with CAD (Baldy et al., 1994). Cardiac rehabilitation programs combine prescriptive exercise, counseling and education to reduce cardiac risk factors, lessen activity-related symptoms, reduce mortality and lessen the physical and psychological disabilities associated with the disease.

The reported physiological benefits of cardiac rehabilitation programs are, a reduction in overall mortality related to CAD (Squires, Gau, Miller, Allison, & Lavie,
1990), improved exercise capacity (Lavie & Milani, 1995) and decreased symptoms of
angina (Squires et al.). However inadequate sample size, short follow-up or crossover of
patients following randomization limits the statistical significance of studies that reported
a reduction in mortality from participation in a cardiac rehabilitation program. In order to
achieve statistical significance and support the claim that participation in a cardiac
rehabilitation program decreased mortality Oldridge, Guyatt, Fischer and Rimms (1988)
carried out a meta-analysis on the combined results of ten randomized studies. The results
of the meta-analysis demonstrated a 25% reduction in overall CAD mortality. O'Conner
et al., (1989) conducted a meta-analysis on 22 studies in order to achieve statistical
significance. The findings suggest there is a 20% reduction in overall mortality from
participation in cardiac rehabilitation programs. Lavie and Milani reported that exercise
training, an important component of cardiac rehabilitation programs, improves the
functional capacity of the heart, and decreases myocardial oxygen demands, thereby
reducing the metabolic and circulatory demands of daily living. Improved functional
capacity of the heart with prescriptive exercise reduces the debilitating symptoms of

The proven psychological benefits of cardiac rehabilitation programs are also
well documented. Participation in a cardiac rehabilitation program is reported to
improve a person's sense of well being, and to decrease feelings of tension, anxiety
and depression commonly associated with the acute manifestation of CAD (Balady,
1988; Milan, Lavie, & Cassidy, 1996; Stern, 1987). In addition, cardiac rehabilitation
programs provide expert education and counseling about cardiac risk factors in order to
promote healthy lifestyle changes (Balady, et al., 1994).

The physiological and psychological benefits of cardiac rehabilitation for people with CAD have been well documented, as described previously. However, there have been no published evaluations of cardiac rehabilitation programs that examine the effectiveness of the standard 8-12 week program on attainment and maintenance of healthy lifestyle behaviors. As well there are a limited number of studies that report on the impact that maintenance of healthy behaviors has on emergency department visits and re-admissions to hospital. Evaluations of cardiac rehabilitation programs are necessary with the realization that the need for cardiac rehabilitation is growing due to advanced diagnostic technology, improved treatment modalities, shorter lengths of stay in hospitals, the increasing total population, and an aging population in general. The increased need for cardiac rehabilitation and the inability to meet this demand currently, has resulted in longer waiting list for entry into cardiac rehabilitation programs.

There is also a need to examine, from a Canadian perspective, the effectiveness of cardiac rehabilitation programs in the maintenance of healthy lifestyle behaviors since there are no Canadian program evaluations reported in the literature. As well, the number of cardiac rehabilitation programs currently offered in Canada is inadequate to meet the needs of the vast number of people with CAD. The need for program evaluations has become more apparent during the current age of health cost constraints, where programs are required to demonstrate their contribution to cost-effective, quality patient care.

In April 1996, a partial cardiac rehabilitation program called the Healthy Heart Program was funded in the hospital under study, a 760-bed tertiary, and teaching hospital.
The program was developed in collaboration with another large teaching hospital. The Healthy Heart Program offered supervised exercise and education sessions about cardiac risk factors. A multi-disciplinary team was formed including a registered nurse, exercise specialist, exercise leaders, dietician and cardiologist. The program was based on the objectives and recommendations from the American College of Cardiology, American Heart Association (1994), offering 8-12 weeks of supervised exercise training and prescription, risk factor modification, counseling and education. The program was operational for one year, when additional funding was received to complete the program with the addition of both an intake clinic and an exit clinic. The intake clinic was designed for individual assessment of participant’s cardiac risk factors and the development of a plan for management of these risk factors. The exit clinics were developed in order to assess the participant’s progress during the program and to create a cardiac risk factor prescription to be followed at home or in a community center. During the first year of operation a program questionnaire proved overall participant satisfaction with the Healthy Heart Program. However, there has been no formal evaluation of the program’s impact on participant’s lifestyle behavior after completion of the program.

The purpose of this study was to increase our understanding of the effectiveness of the Healthy Heart Program. It was hoped that this study will also contribute to our understanding of how cardiac rehabilitation programs in general effect behavioral change to reduce cardiac risk factors. This knowledge was gained by evaluating the program’s impact on participants’ maintenance of healthy lifestyle behaviors, and the impact this has on the need for hospitalization after successful completion of the program. The results of this study will be used to make recommendations for improvements to the way
in which the program components are delivered. These changes to the program delivery may enable the Healthy Heart Program to provide more effective cardiac rehabilitation for a larger number of people. As well, the results of this study may be used to make improvements in other cardiac rehabilitation programs.
Chapter Two

THEORETICAL BACKGROUND AND LITERATURE REVIEW

To set the stage for this study, a number of concepts and bodies of literature will be discussed. The chapter is divided into two main sections. The first section, the theoretical background includes an overview of coronary artery disease and cardiac rehabilitation programs, highlighting key studies that have significance for this study. In the second section, a comprehensive review of studies that reports outcomes of cardiac rehabilitation programs are provided.

Theoretical Background

This section begins by presenting an overview of coronary artery disease in terms of characteristics, prevalence and treatment. Following this section, a discussion of the historical development of cardiac rehabilitation programs will be presented. Finally, a traditional program model for cardiac rehabilitation will be presented.

Coronary Artery Disease

Atherosclerosis is a disease process found in many medium sized arteries in the body such as coronary arteries (Braumwald, 1997). Atherosclerosis is a progressive disease process that begins in childhood as fatty streaks and has clinical manifestations in middle to late adulthood (Braumwald). The atherosclerotic lesions found in coronary artery disease consist of a combination of dense or fibrous material that is made up of lipids, necrotic debris and fibrous plaques (Braumwald). The composition of the lesion determines whether the lesion is stable or at risk for rupture or thrombosis. The clinical
manifestation of thrombi or plaque rupture is chest pain (angina), or myocardial infarction (MI) caused by decreased blood flow to the heart. Acute onset of CAD usually requires medical management combined with interventional and often surgical treatment. Despite sophisticated treatment modalities, CAD is a chronic disease requiring aggressive management of coronary artery risk factors in order to halt the progression of the disease (Gordon & Haskell, 1997).

**Characteristics and Prevalence of Coronary Artery Disease**

More than one in every five persons in the United States suffers from CAD (Balady et al., 1994). CAD is the leading cause of death in Canada (Health Canada, 1995). CAD typically affects males over the age of 45 and females over the age of 55 or women with premature menopause without estrogen replacement. Many risk factors predispose an individual to CAD (Health Canada, 1995). These risk factors include physical inactivity, high fat diet, obesity, smoking, hypertension, elevated serum cholesterol levels, diabetes, age and family history of CAD (Baxendale, 1992). Some risk factors such as age and family history can not be modified directly, however risk factors such as inactivity, high fat diet, smoking, obesity, elevated cholesterol, hypertension and diabetes can be controlled or eliminated. Since CAD often progresses silently the first clinical manifestation of coronary artery disease is often chest pain or acute MI.

**Treatment for Coronary Artery Disease**

Over the last twenty-five years interventions for the treatment of acute CAD (angina & MI), have improved significantly resulting in increased survival rates (Pashkow & Dafoe, 1993). The focus of treatment is to limit the extent of damage done to
the myocardium from ischemia, the lack of blood flow to the heart. Currently there are a
variety of sophisticated medical and invasive treatments available for CAD.

Reperfusion therapy with thrombolytic drugs is designed to dissolve clots in the
coronary arteries that obstruct blood flow during a myocardial infarction (American
College of Cardiology, American Heart Association, 1996). As well the anti-thrombosis
properties of aspirin, and the cardio-protective properties of beta-blockers has
revolutionized medical therapy for treatment of myocardial infarction from CAD
(Pashkow & Dafoe, 1993).

Percutaneous coronary angioplasty (PTCA) is an invasive procedure that involves
dilation of the blocked coronary artery by repeated inflation of a balloon at the end of a
catheter. Coronary stenting is a procedure that can be done in conjunction with PTCA.
The stent, a wire coil, is placed in the coronary artery to prevent re-stenosis. Coronary
artery by-pass graft (CABG) is a surgical technique involving replacement of and
rerouting blood flow past stenosed coronary arteries. CABG is usually indicated for
patients with three-vessel disease or severe two-vessel disease.

Barriers to Effective Treatment for Coronary Artery Disease

Coronary artery disease is a chronic disease that often progresses silently.
Despite media attention regarding the danger of unhealthy lifestyle behaviors many
individuals do not consider lifestyle changes until the disease is acute and they
experience a sudden admission to hospital with chest pain or myocardial infarction.
Attempting to teach the patient about CAD and their risk factors after an acute event is difficult and incomplete due to interruption from appointments, visitors, and increasingly shorter lengths of hospital stay. Learning experiences in the hospital may also be limited by psychological factors such as denial, fear, anger and depression. Physiological factors such as fatigue and pain may also inhibit optimal learning. Upon discharge home from the hospital, many patients may lack knowledge of their ongoing needs for prescriptive exercise, diet instructions and medication use, (Liddy & Crowley, 1987).

Cardiac Rehabilitation Programs

Historical Development

In the first half of this century patients recovering from acute myocardial infarction were treated with complete bedrest and hospitalization for six weeks (Staniloff, 1984). Lewing and Lown (1951) introduced the “chair treatment”, which allowed patients to sit in a chair intermittently with strict activity restrictions. In the 1960s, studies proved that there was no increase in mortality or morbidity when patients were mobilized two weeks post myocardial infarction and discharged from hospital at three weeks (Staniloff). In the 1970s cardiac rehabilitation emerged supported by the expertise of a nurse, cardiologist, exercise specialist, and dietician who formed a new team approach for primary and secondary prevention of CAD (Staniloff). Currently early mobilization and cardiac rehabilitation starts in hospital post myocardial infarction.
The Cardiac Rehabilitation Model

Cardiac rehabilitation is usually divided into four phases. Phase I begins in hospital once the patient is deemed hemodynamically stable. Inpatient cardiac rehabilitation consists of a combination of patient and family education and a progressive program for ambulation. Phase II is a comprehensive outpatient program combining supervised exercise training with risk factor modification by experts trained in cardiac rehabilitation. Phase III of cardiac rehabilitation is the maintenance phase for the exercise and risk factor modification prescribed in Phase II. Phase IV of cardiac rehabilitation is ongoing maintenance of risk factor prescriptions and usually takes place at home and/or in a community facility.

Cardiac rehabilitation programs are traditionally made up of an interdisciplinary team consisting of cardiologists, nurses, and exercise specialists, exercise leaders and dieticians. The standard method for program delivery is 8-12 weeks of supervised exercise and activity prescription, educational sessions about cardiac risk factors and heart disease, and counseling to enable behavioral change and symptom management (Balady et al., 1994). The primary mandate of a cardiac rehabilitation program is to decrease mortality and morbidity from CAD. Cardiac rehabilitation programs accomplish this mandate by enabling behavioral change in order that participants can reduce, control and/or eliminate cardiac risk factors. As well, cardiac rehabilitation experts teach participants how to effectively management their symptoms in order to live more productive lives and to decrease the need for acute care service. Using a program logic model framework (Dwyer & Makin, 1997), Figure 1 conceptualizes how cardiac rehabilitation programs accomplish their mandate. On the left hand side of the diagram
are the components of the cardiac rehabilitation program. In the middle of the diagram are the program outcomes. These desired outcomes, namely behavioral change and symptom management are enabled through education, counseling and support during the program. The right hand side of the diagram illustrates the goals of the program, which are decreased mortality, morbidity and the need for acute care.

<table>
<thead>
<tr>
<th>COMPONENTS OF CARDIAC REHABILITATION</th>
<th>OUTCOMES</th>
<th>GOALS</th>
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<tr>
<td>Exercise Training</td>
<td>Behavioral</td>
<td>↓ Mortality</td>
</tr>
<tr>
<td>Diet Counseling</td>
<td>Change</td>
<td>↓ Morbidity</td>
</tr>
<tr>
<td>weight reduction</td>
<td>Symptom</td>
<td></td>
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<tr>
<td>cholesterol management</td>
<td>Management</td>
<td></td>
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<tr>
<td>Smoking Cessation Counseling</td>
<td></td>
<td>↓ Need for</td>
</tr>
<tr>
<td>Stress Management Counseling</td>
<td></td>
<td>Acute Care</td>
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<td>Medication Counseling</td>
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*Figure 1. Logic Model for a Cardiac Rehabilitation Program*

**Components of Cardiac Rehabilitation**

Exercise training is an integral component of cardiac rehabilitation. Exercise improves myocardial function, reduces weight, improves glucose tolerance in patient’s with diabetes, raises high density lipoprotein (HDL) cholesterol levels and improves confidence levels (Braumwald, 1997). Cardiac rehabilitation programs offer supervised exercise by trained experts whom also formulate exercise prescriptions using risk
stratification from established guidelines provided by the American Heart Association.
Cardiac rehabilitation combines aerobic exercise to improve cardiovascular endurance and resistance training to improve strength and muscular endurance.

Cardiac rehabilitation programs also provide nutritional counseling by a registered dietician to enforce a diet restricted in saturated fats and cholesterol in order to achieve and maintain normal body weight, normal serum cholesterol levels, blood pressure and glucose tolerance.

Cardiac rehabilitation programs also include an organized approach to smoking cessation and maintenance of smoking cessation. The Healthy Heart Program includes staff trained to provide smoking cessation plans and follow-up, self-help material and referral to more intense smoking cessation programs if necessary.

Another important component of cardiac rehabilitation programs is the provision of psychological counseling and support. Twenty to thirty percent of people suffer from moderate to severe depression after an MI. Five to ten percent of people suffer from an anxiety disorder after experiencing an MI. Cardiac rehabilitation offers individual counseling as well as group support in order to help deal with the emotional trauma often associated with the acute manifestations of CAD. Referrals to psychiatrists, psychologists and social workers are established for continual evaluation and management as necessary.

Cardiac rehabilitation programs also provide extensive counseling on the appropriate use of medications such as Nitroglycerine to effectively manage the symptoms of angina. As well participants are educated about the side effects and expected outcomes of their medication regime.
Outcomes of Cardiac Rehabilitation

Cardiac rehabilitation programs utilize research-based guidelines to enable behavioral change to positively influence cardiac risk factors. It is believed that graduates of cardiac rehabilitation programs have increased knowledge about their disease, and the skills to make healthy, lifelong changes to their risk factors in order to stop the progression of CAD. In a study involving twenty-five participants of a hospital-based and outpatient cardiac education program, Wiens, (1998) found that in comparison to forty-seven people who participated only in a hospital-based education program, first time myocardial infarction patients were more knowledgeable about heart disease.

Graduates of cardiac rehabilitation also have the skills to effectively manage the chronic symptoms associated with CAD to live more productive lives, and to reduce the need for acute care. In a study of seventeen participants receiving cardiac rehabilitation Kehl (1991) found that in comparison to thirty-five people who did not receive cardiac rehabilitation, participants in the cardiac rehabilitation program had increased knowledge about heart disease and consequently were admitted to hospital less often than non-participants.

Goals of Cardiac Rehabilitation Programs

The mandate of cardiac rehabilitation is to decrease mortality and morbidity associated with CAD. According to two meta-analyses conducted by Oldridge et al. (1988) and O’Conner et al. (1989), mortality is reduced by 20-25% in participants of cardiac rehabilitation programs verses non-participants. According to Milani, Lavie and
Cassidy (1996) cardiac rehabilitation programs improve participant’s quality of life and increase the ability to return to work. In addition to helping people with CAD live longer, productive lives, an additional mandate for cardiac rehabilitation programs is to decrease the need for re-admissions to hospital as well as decrease the need for unnecessary visits to emergency departments.

Literature Review

The purpose of this section is to review the studies that examine outcomes of cardiac rehabilitation including maintenance of healthy lifestyle behaviors and re-admissions to hospital. Excluded from the review are studies reported in a foreign language. The literature was searched from 1966 to present using a computerized literature search through Medline and CINHAL. The search yielded a total of 7 articles. Two of these six articles are actually meta-analyses conducted on several studies regarding the relationship between cardiac rehabilitation participation and mortality.

The seven studies include two meta-analyses, four experimental studies and one descriptive study. The two meta-analyses and the three experimental studies report a change in outcome from cardiac rehabilitation. The changes in outcome from cardiac rehabilitation are decreased mortality, decreased hospital visits and re-admissions, and an increase in return to work rates. Although these studies report a change in outcome it is unclear if the change is due to sustained behavior change and improved symptom management. There is one descriptive study, which reported on the cardiac rehabilitation cost-benefit ratio.

There are a number of published randomized clinical trials of cardiac
rehabilitation programs that report a reduction in mortality. However, the
majority of these trials lack statistical significance due to small sample size, short follow-up or crossover of patients after randomization. To overcome these problems

Oldridge et al. (1988) analyzed the combined results of 10 randomized clinical trials.

Oldridge et al. included all randomized controlled trials of cardiac rehabilitation after myocardial infarction, both published and unpublished studies. The studies were obtained from a computerized literature search and by canvassing 18 experienced cardiac rehabilitation colleagues for their knowledge of published and unpublished results. These 10 trials contained 4,347 patients (2,145 in the control groups, 2,202 in the rehabilitation groups). Compared with the control patients the rehabilitation group demonstrated a significant reduction of 24% for all-cause mortality, and a 25% reduction for cardiovascular mortality.

To determine if cardiac rehabilitation programs are beneficial to patient outcomes, with respect to mortality, O'Conner et al. (1989) conducted a meta analysis of 22 randomized trials involving 4,554 patients. O’Conner et al. obtained all published articles including abstracts from meetings by a computerized search as well as an informal search for studies known to the research group. In this meta-analysis the total and cardiovascular mortality, sudden death and fatal and non-fatal myocardial infarction were analyzed. Total and cardiovascular mortality rates in the rehabilitation group were 20% and 22% lower respectively, than in the control group after 3 years. Fatal reinfarction was also
significantly reduced by 25% in the rehabilitation group. In the rehabilitation group, sudden death was significantly reduced only at 1 year but improved over the next 2-3 years. There was no difference between the interventional group and the control group for non-fatal reinfarctions at any point in this study.

These meta-analysis clearly demonstrate that cardiac rehabilitation can decrease mortality and morbidity, however it is unclear if these reductions are due to sustained behavioral change and improved symptom management.

An experimental study, conducted in Sweden, reported a 26.7% reduction in total mortality and a 27.1% reduction in cardiovascular mortality over 10 years in the cardiac rehabilitation group (interventional group). In this study the interventional group consisted of all MI patients below 65 years of age that had participated in a cardiac rehabilitation program (n=147; 124 men and 23 females). An additional finding revealed that there were significantly more people in the interventional group still at work 5 years after their myocardial infarction: 67.8% verses 33.3% (p<0.001). The majority of the people in the interventional group had reached the age of retirement (65 years) during the study, however there were still significantly more people at work in the interventional group: 58.6% verses 22.2% (p=0.05) (Hedback, Perk, & Wodlin, 1993). It is unclear as well in this study if sustained behavioral change and improved symptom management is responsible for the reduction in mortality and improved return to work rate.
Another study conducted in Sweden consisted of post-myocardial infarction patients divided into two groups an interventional group (n=91), assigned to a cardiac rehabilitation program and a control group (n=99), not assigned to cardiac rehabilitation. During the first three months there was a significantly lower incidence of rehospitalization in the interventional group, both in days of hospitalization and percentage of patients admitted (Bondestam, Breikss, & Hartford, 1995). Visits to the emergency department without rehospitalization were also significantly lower in the intervention group compared to the control group (Boneman et al.). Again it is difficult to determine if participation in cardiac rehabilitation alone is responsible for decreased hospitalization or if the underlying reason is due to behavior change.

Kehl (1991) conducted a retrospective study in England looking at whether post-myocardial infarction patients who had attended a cardiac rehabilitation program benefited from increased knowledge of heart disease and were readmitted less often. The study consisted of a comparison of patients who attended an outpatient cardiac rehabilitation programs (n=17) verses those who received only routine care in the hospital (n=35). The chart review indicated that those people who attended a cardiac rehabilitation program spent less than half the amount of time in hospital as a result of re-admissions. The results of this study however are limited due to the small sample size.

Wiens (1998) conducted a study looking at whether first time myocardial infarction patients who participated in both hospital-based and outpatient cardiac education programs (n=25) are more knowledgeable about heart disease and engage in healthy behaviors to a greater extent than those who participated in a hospital-based educational program only (n=47). The study concluded that patients who participate in
outpatient cardiac education are more knowledgeable about heart disease, however they do not engage in healthy behaviors as a way of life to a greater extent then those who did not attend the outpatient education program. Participants from both groups did engage in healthier behaviors to a greater extent after their myocardial infarction than before their cardiac event. The results of this study are limited by the small sample size. As well the study examined only one component of cardiac rehabilitation, cardiac education as opposed to a comprehensive cardiac rehabilitation program including an intake clinic for cardiac assessment and goal setting, an exit clinic for progress evaluation and the development of a risk factor prescription, supervised exercise classes and education sessions.

A study by Ades, Pashkow and Nestor (1997) calculated the cost-effectiveness of cardiac rehabilitation in dollars per year of life saved in relation to other common interventions. The cost-effectiveness was calculated by combining published results of randomized trials of cardiac rehabilitation on mortality rates, epidemiological studies of long-term survival in the overall post-infarction population and studies of patient charges for rehabilitation services and the averted medical expenses for hospitalization after rehabilitation. The results of this study reported that cardiac rehabilitation compared with other post-MI treatment interventions is more cost-effective than thrombolytic therapy, coronary bypass surgery, and cholesterol lowering drugs, though less cost-effective than smoking cessation programs.
Conclusion

This review has shown the positive outcomes from cardiac rehabilitation programs as decreased mortality rates, decreased hospital visits and readmission rates, an increase in return to work and increased knowledge regarding cardiac disease. As well, cardiac rehabilitation has been shown in one study to be a cost-effective intervention for people with CAD. What is missing in the literature is a critical analysis of the effectiveness of cardiac rehabilitation programs on attaining and maintaining healthy lifestyle behaviors. It is not clear in the literature if the improvements in morbidity and mortality and decreased hospitalization can be attributed to sustained behavior change for healthy lifestyle habits and/or improved symptom management.

In days of increasing health care cost constraint it is important to explore more fully how effective cardiac rehabilitation programs are for enabling behavioral change for maintenance of healthy lifestyle behaviors, and whether maintenance of healthy behaviors decreases the need for acute care. Examining the outcomes of the Healthy Heart cardiac rehabilitation program will determine if the program is effective or if changes need to be made in order that the program’s objectives are accomplished. As well, the results of this study can be used as a program model for other cardiac rehabilitation programs.
The purpose of this study was to increase our understanding of the effectiveness of the Healthy Heart Program, to evaluate the impact of the implementation of a cardiac rehabilitation program on enabling change for maintenance of a healthy lifestyle, to analyze the effect that maintenance of healthy lifestyle behaviors has on the use of acute care services, and to make recommendations for improvement of the Healthy Heart Program. A program evaluation perspective guided the design of this study. Both the process and the outcome of this program were examined in order to understand how each component of the program affected the whole. The program was evaluated in two phases. Phase I was conducted to determine whether participants were able to meet the objectives of the Healthy Heart Program upon exiting the program. Following this, phase II was conducted to determine if the program’s desired outcomes, of sustained healthy lifestyle and improved CAD symptom management reducing the need for acute care services, were accomplished. As well participants’ feedback on the program and barriers to maintaining healthy lifestyle behaviors was examined for the purpose of identifying program improvements.

In Phase I, a list of graduates from the program was obtained through a chart audit of all participants in the Healthy Heart Program between the months of March 1997 – February 1998. The graduates’ charts were pulled and examined to obtain baseline data such as demographics, and to determine if participants met their goals during the program. In Phase II graduates were contacted by mail to determine their interest in participating in the study. Telephone interviews were conducted with consenting
participants to determine if graduates of the Healthy Heart Program maintained healthy lifestyle behaviors after completion of the program and to determine if they required hospitalization for recurrent cardiac problems.

Specifically the study asked the following questions:

1. Were graduates of the Healthy Heart Program able to accomplish their goals, which are based on the program objectives by the end of the program?
2. Was there a relationship between goal accomplishment and key variables such as age, gender, employment status, family history of heart disease, and presenting cardiac history?
3. Were healthy lifestyle behaviors maintained for ≥ 6 months after completion of the program?
4. Was there a relationship between health behaviors, after completion of the program, and key variables such as age, gender, family history, employment status and presenting cardiac history?
5. Did those patients who maintained healthy lifestyle behaviors for ≥ 6 months, require acute care services for cardiac reasons?
6. What barriers did patients experience in maintaining healthy lifestyle behaviors?
7. Did graduates of the program have suggestions that would improve the program?
8. Is there a significant difference on key variables between those who agreed to participate in the telephone interview and those who did not participate?

The criteria for inclusion in the study were:

2. English speaking and the ability to comprehend English.
3. Consent to participate in the telephone interviews (Phase II).

Sample

A total of 91 patients graduated from the Healthy Heart Program between March 1997 – February 1998. In that the study sample size was limited, attempts were made to contact all 91 participants for inclusion in the study.

The study commenced with an audit of the charts of all 91 graduates to determine if they were able to accomplish their goals (based on the program’s objectives), during the program. Data were then collected by telephone questionnaire to determine if these healthy lifestyle behaviors were maintained for at least six months following completion of the program. Information was also collected during the telephone survey to determine if participants required hospitalization for cardiac reasons, the barriers participants experienced maintaining healthy lifestyle behaviors and participant’s suggestions for program improvements.

Setting

The Healthy Heart Program is part of a 750 bed tertiary level teaching hospital. The program serves a large metropolitan area. Program participants are primarily recruited from the hospital’s cardiac care unit and cardiac surgical unit, following an acute cardiac event. The program consists of exercise training and counseling to reduce cardiac risk factors.

Data Collection Instruments

A chart review form, (Appendix A) and telephone questionnaire (Appendix B) were developed to collect data in this study. The chart review form, developed by the investigator, indicated the graduation date of the Healthy Heart Program participant
between March 1997 – February 1998. The data collection tool was used to document participants’ demographic data including age, sex, employment status, presenting cardiac history, and family history of cardiac disease. Data collection also included a list of goals, developed with the help of the Healthy Heart Program team, in the intake assessment. These goals were revisited in the exit clinic assessment to determine if participants were successful in meeting their goals during the program. Participants’ date of graduation from the Healthy Heart Program was also recorded on the data collection tool. As well, the date that subjects participated in the telephone interview was also recorded on the data collection tool.

The telephone questionnaire contained 32 items (Appendix B), concerning key behavioral risk factors such as exercise, smoking, cholesterol, blood pressure, diet, medication adherence, and quality of life issues and the need for acute care services. Sixteen items were used to determine maintenance of healthy lifestyle behaviors. Four items were used to determine the need for acute care services. Two items were used to determine birth origin and length of time lived in Canada. The questionnaire also included two open-ended questions, which allowed for participants to provide their feedback about the program and to list barriers experienced in maintaining healthy lifestyle behaviors. The remaining eight items concerning details surrounding maintaining healthy lifestyle behaviors were used for program improvements. Other than the two open-ended questions, each item was closed-ended with predetermined responses.

The researcher used the American College of Cardiology, American Heart Association (1996) position statement regarding the objectives for cardiac rehabilitation
programs to develop the majority of the questions. The items concerning exercise, smoking, serum cholesterol, blood pressure, stress, and symptom management were developed by this researcher (questions 4 - 9, 11, 12, 14 - 20, and 23 - 32) (Appendix B). Most of the remaining questions were taken from a validated questionnaire namely the “Canadian Health Promotion Survey” (Health & Welfare Canada, 1993). One item (question # 22) concerning medication practices was taken from the self-care index (Shuster, Wright, & Tomich, 1995).

The questionnaire was administered to the study participants over the telephone and took approximately 10 - 15 minutes to complete. Prior to the study, the questionnaire was piloted using 10 people enrolled in the Healthy Heart Program under study. The questionnaire was piloted to ensure that the items were comprehensible, response sets appropriate and the time for completion was reasonable. Minor revisions were made to the questionnaire following the pilot administration. To decrease the risk of bias the same research assistant was used to administer the questionnaire to the study participants. The research assistant was trained to ensure that the questions were delivered in the same manner to each participant. A proposed script for the research assistant to initiate the telephone interview is included in Appendix C. Following this study, the questionnaire will continue to be used by the Healthy Heart Program under study for ongoing program evaluation.

Ethics

Permission for this study was obtained from the University of British Columbia Behavioral Sciences Screening Committee for Research and Other Studies Involving Human Subjects. As well, permission from the hospital’s Clinical Research Committee
was obtained. Participants for the telephone interview were recruited through a letter of initial contact (Appendix D). Participants were given a stamped, self-addressed envelope to return the consent form to the researcher indicating their desire to participate or not to participate in the study (Appendix E).

The letter of initial contact informed participants that their participation was voluntary and that they had the right to withdraw at any time. Participants in the study were assured that failure to consent or withdrawal during the study would not influence any future care. The information obtained in this study has been kept confidential and anonymous. Confidentiality and anonymity of the study participants was maintained by the assignment of numbers, rather than names during the analysis of the data. The questionnaires were shredded and the database is kept in a locked file for ongoing program analysis. There were no risks associated with participation in this study. The study results are being used for program improvements, which will benefit future participants.

Conclusions

A program evaluation design was used in this research. The data collection was divided into two phases. The first phase involved a chart review to determine whether graduates of the program met their goals upon exiting the program. The second phase involved a follow-up of these participants to determine long term health behaviors and outcomes. The findings related to these phases are described in the following chapters.
The Healthy Heart Program provides exercise training and counseling to reduce cardiac risk factors. This chapter will focus on the findings of the first phase of the study. In this phase a retrospective chart audit was conducted using the records of the graduates of the program to obtain demographics and to determine if, upon exit, participants accomplished their goals to reduce cardiac risk factors during the program.

As described in Chapter three, the first phase of the research was directed towards determining if graduates of the Healthy Heart Program were able to accomplish their goals for reducing cardiac risk factors (based on the programs' objectives) by the end of the program. These evaluation data will provide direction for the Healthy Heart Program under study as well as other existing and/or evolving cardiac rehabilitation programs.

Data for this phase were gathered from chart audits and was recorded on a data collection tool (Appendix A). Entries from the data collection tool (Appendix A) were assigned a number, which was entered into the computer, cleaned and analyzed using Statistical Package for the Social Sciences (SPSS). A two-tailed significance level of .05 was set for all statistical tests.

Findings

Demographic Data

There were 91 subjects in this phase of the study sample. Subjects ranged in age from 37 - 87 years with a mean age of 62.8 years (SD = 11.9). (see Table 1).
Table 1

Demographic Data N = 91

<table>
<thead>
<tr>
<th>Items</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Females</td>
<td>33</td>
<td>36.3</td>
</tr>
<tr>
<td>Males</td>
<td>58</td>
<td>63.7</td>
</tr>
<tr>
<td>Employed</td>
<td>30</td>
<td>33.0</td>
</tr>
<tr>
<td>Unemployed</td>
<td>16</td>
<td>17.5</td>
</tr>
<tr>
<td>Retired</td>
<td>45</td>
<td>49.5</td>
</tr>
<tr>
<td>Family History of Cardiac Disease</td>
<td>36</td>
<td>39.6</td>
</tr>
<tr>
<td>No Family History of Cardiac Disease</td>
<td>55</td>
<td>60.4</td>
</tr>
</tbody>
</table>

Participants in the program presented with a variety of cardiac histories. Many had multiple diagnoses or procedures. Sixty-two subjects (68.1%) presented with previous myocardial infarction (MI), 19 subjects (20.9%) presented with previous coronary artery bypass surgery (CABG), 33 subjects (36.3%) had undergone percutaneous angioplasty/stenting (PTCA/Stent), 19 subjects (20.9%) had angina, one subject (1.1%) had congestive heart failure (CHF). Four subjects (4.4%) had suffered a cerebral vascular accident (CVA), and four subjects (4.4%) were in the program for primary prevention.
Goals Accomplished during the Healthy Heart Program

As indicated in Table 2, of the 91 subjects, 89 subjects (97.8%) reported they had accomplished their goal for improved exercise tolerance during the program. Only 13 subjects (14.3%) reported accomplishing their goal for maintaining a healthy diet. Twenty-six subjects (28.6%) reported never having smoked, a large proportion of participants, 52 subjects (57.1%) reported that they had quit smoking before entering the Healthy Heart Program and 13 subjects (14.3%) continued to smoke. All 13 (14.3%) of the smokers were unsuccessful in quitting smoking by the end of the program. Sixty-nine subjects (75.8%) had abnormal cholesterol values that improved during the program. Interestingly, all 25 subjects (27.5%) who listed maintenance of blood pressure as a goal were able to maintain or improve their blood pressure levels during the program. Only five subjects (5.5%) were successful in reducing their stress levels during participation in the Healthy Heart Program. Interestingly, 68 subjects (74.7%) did not indicate stress reduction as a goal to be accomplished during the program.
Table 2

Goal Accomplishment During the Healthy Heart Program  N = 91

<table>
<thead>
<tr>
<th>Item</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goal accomplished</td>
<td>89</td>
<td>97.8</td>
</tr>
<tr>
<td>Goal not accomplished</td>
<td>1</td>
<td>1.1</td>
</tr>
<tr>
<td>Not applicable</td>
<td>1</td>
<td>1.1</td>
</tr>
<tr>
<td>Diet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goal accomplished</td>
<td>13</td>
<td>14.3</td>
</tr>
<tr>
<td>Goal not accomplished</td>
<td>37</td>
<td>40.7</td>
</tr>
<tr>
<td>Not applicable</td>
<td>41</td>
<td>45.1</td>
</tr>
<tr>
<td>Smoking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goal accomplished</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Goal not accomplished</td>
<td>13</td>
<td>14.3</td>
</tr>
<tr>
<td>Not applicable</td>
<td>78</td>
<td>85.7</td>
</tr>
<tr>
<td>Cholesterol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goal accomplished</td>
<td>69</td>
<td>75.8</td>
</tr>
<tr>
<td>Goal not accomplished</td>
<td>17</td>
<td>18.7</td>
</tr>
<tr>
<td>Not applicable</td>
<td>5</td>
<td>5.5</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goal accomplished</td>
<td>25</td>
<td>27.5</td>
</tr>
<tr>
<td>Goal not accomplished</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Not applicable</td>
<td>66</td>
<td>72.5</td>
</tr>
<tr>
<td>Stress reduction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goal accomplishment</td>
<td>5</td>
<td>5.5</td>
</tr>
<tr>
<td>Goal not accomplished</td>
<td>18</td>
<td>19.8</td>
</tr>
<tr>
<td>Not applicable</td>
<td>68</td>
<td>74.7</td>
</tr>
</tbody>
</table>

Analyses were conducted to determine if key variables such as gender, employment, family history of cardiac disease, presenting cardiac history, and age, influenced goal accomplishment. The effects of these covariates are discussed in the
following sections. Since all participants', who listed blood pressure as a goal for improvement or maintenance, accomplished this goal, and all participants who listed smoking cessation as a goal were unsuccessful in accomplishing this goal, these variables were not included in this analysis.

Comparison of Gender with Goal Accomplishment

There was no significant difference between males and females for accomplishment of goals for exercise $\chi^2(1, N = 90) = .55, p = .45$; in this analysis, some cell sizes are $< 5^*$. All study participants, with the exception of one male, reported accomplishing their goals for exercise. There was no significant difference between males and females regarding accomplishment of goals for diet $\chi^2 (1, N = 50) = .62$, $p = .43$, although more men (45%) than women (20%) accomplished their goals. Interestingly, more men (47.2%) than women (34.6%) in the study reported they had never smoked, more men (69.2%) than women (30.7%) had quit smoking, and more women (61.5%) than men (38.4%) reported they still smoke. There was a significant difference $\chi^2 (1, N = 86) = 4.76, p = .02$ between the number of males (87.2%) and females (67.7%) who were able to improve their cholesterol levels during the program. No significant difference between gender for accomplishment of the goal for stress reduction, was found, $\chi^2 (1, N = 23) = .03, p = .85$.

Comparison of Employment with Goal Accomplishment

There was no significant difference between employment status and goal accomplishment for exercise $\chi^2 (2, N = 90) = 1.0, p = .60$; all study participants except for

1) When cell size are $< 5$ the reliability of the statistic decreases so caution must be taken when considering these results.
2) * Signifies cell size $< 5$. 
one retired male reported accomplishing their goal for exercise. As well, there was no significant difference between employment status and the goal accomplishment for diet $\chi^2(2, N = 50) = 3.4, p = .17$, although there was a trend of employed people (11.1%) not meeting their goals for diet as compared to unemployed people (40%) and retired people (31.8%). There was also no significant difference between employment status, (employed 78.5%, unemployed 71.4%, retired 84%) and accomplishment of the goal for improved or maintenance of cholesterol levels, $\chi^2(2, N = 86) = 1.1, p = .56$, or stress management $\chi^2(2, N = 23) = 4.2, p = .12^*$, although there was a definite trend for improved stress management among retired people (50%) as compared to employed (15.3%) and unemployed people (0%).

Although not directly related to this research study, there was a significant relationship between the covariate smoking, and employment status, $\chi^2(4, N = 91) = 22.2, p < .05^*$. Interestingly, none of the subjects who were retired, smoked, in comparison to 46.1% of employed smokers and 53.8% unemployed smokers. More retired people had quit smoking before the program (51.9%) as compared to those who were employed (36.5%) and unemployed (11.5%). More retired people had never smoked (69.2%) as compared to people employed (19.2%) and unemployed people (11.5%).

Comparison of Family History of Cardiac Disease and Goal Accomplishment

There was no significant relationship between having a positive family history for cardiac disease and the accomplishment of the goals for, exercise $\chi^2(1, N = 90) = .64, p = .42$, and diet, $\chi^2(1, N = 50) = 2.7, p = .10$. However, there was a trend for goal accomplishment of dietary habits among subjects without a family history of cardiac
disease (33.3%) compared to people with a family history of heart disease (11%). There was also no significant relationship between goal accomplishment for cholesterol $\chi^2(1, N=86) = 1.5, p = .20$, and stress management $\chi^2(1, N=23) = .37, p = .53$ and a positive family history of cardiac disease.

Although not directly related to this study, it is interesting that 61.5% of the people who smoked in this study had a family history of heart disease. Interestingly, 64% of the people who listed blood pressure control as a goal did not have a family history of cardiac disease as compared to 36% people who had a family history of heart disease.

Comparison of Cardiac History and Goal Accomplishment

A history of MI was not significantly associated with exercise accomplishment, $\chi^2(1, N=90) = .48, p = .48$, achievement of goals related to cholesterol levels, $\chi^2(1, N=86) = .71, p = .39$, or stress control, $\chi^2(1, N=23) = .32, p = .56$. There was a significant difference between having a history of MI and accomplishing dietary goals, $\chi^2(1, N=50) = 12.76, p < .05 \ast$. Fifty-five percent of people who accomplished their goal for improved diet had not experienced a MI as compared to 9.37% who had suffered from a previous MI. Although not directly related to this study, interestingly 69.2% of smokers had suffered a previous MI, and 60% of people with reported hypertension had suffered a previous MI.

There was a trend but no significant relationship between having accomplished goals for exercise and a history of CABG surgery, $\chi^2(1, N=90) = 3.7, p = .05 \ast$. There was no significant relationship between CABG surgery and goal accomplishment for diet, $\chi^2(1, N=50) = .08, p = .77$, or stress management $\chi^2(1, N=23) = .95, p = .32$. 
However, those subjects who had CABG surgery were more likely to have accomplished their goal for improved cholesterol levels, then those who did not 

\[ \chi^2 (1, N = 86) = 5.6 = p = .01. \]

There was no significant relationship between having PTCA/Stent procedures, and the accomplishment of goals for, exercise, \[ \chi^2 (1, N = 90) = .55, p = .45, \] improved dietary practices, \[ \chi^2 (1, N = 50) = .40, p = .52, \] improved cholesterol levels, \[ \chi^2 (1, N = 86) = 1.1, p = .29, \] or stress management \[ \chi^2 (1, N = ) = .03 p = .85 \]

Forty-four percent of smokers had a PTCA/Stent procedure.

There was no significant relationship between a history of angina and goal accomplishment for exercise, \[ \chi^2 (1, N = 90) = .27, p = .60, \] improved dietary habits, \[ \chi^2 (1, N = 50) = .20, p = 64, \] cholesterol management \[ \chi^2 (1, N = 86) = 3.2, p = .07, \] or stress management \[ \chi^2 (1, N = 23) = 2.2, p = .13. \]

**Comparison of Age with Goal Accomplishment**

A series of t-tests was done to determine if goal accomplishment differed with respect to mean age. There was no significant difference between age and goal accomplishment related to exercise, \[ t = .84, p = .40; \]\[ t = - .80, p = .42; \] cholesterol, \[ t = -1.3, p = .19; \] or stress, \[ t = -1.3, p = .20. \]

**Conclusions**

The objective of the first phase of this study was to determine if participants were able to accomplish their goals to reduce cardiac risk factors during the program. Overall participants of the program were very successful in accomplishing their goals for improved exercise tolerance, cholesterol management and blood pressure control. Less
than half of the participants who listed diet changes as a goal were able to accomplish this goal. As well the goal for stress management was accomplished by only 5.5% of the participants, and the goal for smoking cessation was not accomplished by any participants during the program. Analyses were conducted to determine if key variables such as gender, employment status, family history of cardiac disease, program graduates' cardiac history, and age influenced goal accomplishment. Overall no significant relationship was found between program goal accomplishment and these covariates, except there was a significant relationship between gender and goal accomplishment related to cholesterol levels. More males than females maintained and/or improved their cholesterol levels during the program. These findings will be discussed in chapter six.
The ultimate goal of the Healthy Heart Program is for graduates to sustain healthy lifestyle behaviors learned during the program. Determining whether participants of the program were able to maintain healthy lifestyle habits for at least six months provided important feedback on the outcome of the program. This chapter will focus on the findings of the final phase of this study. In this phase a telephone questionnaire was conducted to determine if graduates of the program maintained healthy lifestyles ≥ 6 months after completion of the program.

In phase II of this study, questionnaires were mailed to the 91 participants who graduated from the program between March 1997 and February 1998. Initially 36 graduates indicated a willingness to participate. Follow-up phone calls obtained 13 additional participants, for a total of 49 participants (53.8%). Seventeen participants, (18.7 %) refused to participate in the study, two (2.2 %) had moved with no forwarding address. Twenty-three (25.3 %) of the participants were unaccounted.

A telephone questionnaire was administered to the 49 subjects who consented to participate in the study. The questionnaire contained 32 questions with predetermined selection answers and space for the research assistant to enter responses to the open ended questions. Entries from the telephone questionnaire were assigned a number, which was entered into the computer, cleaned and analyzed using Statistical Package for
the Social Sciences (SPSS). A two – tailed significance level .05 was set for all statistical
tests.

What follows is a detailed description of the subjects who consented to participate
in the telephone interviews. First, the subjects key variables, including age, gender,
family history, employment status, presenting cardiac history, and goal accomplishment
at the completion of the Healthy Heart Program are described. Next, the health behaviors
that emerged from the telephone interviews were examined and then compared with
gender, employment status, country of origin, number of years lived in Canada and age to
determine if there were relationships between health behaviors and these key variables.
To determine if non-participants in the telephone interviews differed from participants,
the two groups were compared in relation to key variables. Finally, subjects who
maintained healthy lifestyle behaviors were compared with subjects who did not maintain
healthy behaviors, to determine if factors such as gender, goal accomplishment and age
accounted for differences between the two groups.

Findings

Demographics

There were 49 subjects in the telephone questionnaire sample. Subjects ranged in age
from 40 – 81 years with a mean age of 65.3 years (SD = 10.7); over half of the subjects,
(61.2%) were between the ages of 57–75 years, (See Table 3).
Table 3
Demographics N = 49

<table>
<thead>
<tr>
<th>Items</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>12</td>
<td>24.5</td>
</tr>
<tr>
<td>Males</td>
<td>37</td>
<td>75.5</td>
</tr>
<tr>
<td>Employed</td>
<td>16</td>
<td>32.6</td>
</tr>
<tr>
<td>Unemployed</td>
<td>4</td>
<td>8.2</td>
</tr>
<tr>
<td>Retired</td>
<td>29</td>
<td>59.2</td>
</tr>
<tr>
<td>Family History of Cardiac Disease</td>
<td>16</td>
<td>32.7</td>
</tr>
<tr>
<td>No Family History of Cardiac Disease</td>
<td>33</td>
<td>67.3</td>
</tr>
</tbody>
</table>

Participants in Phase II of the study, presented with a variety of cardiac histories. Many had multiple diagnoses or had undergone multiple procedures. Of the 49 subjects, 37 subjects, (75.5%), presented with a history of MI. Thirteen subjects, (26.5), presented with previous CABG. Nineteen subjects, (38.8%), presented with previous PTCA/Stent. Eleven subjects, (22.4%), presented with angina. Two of the subjects, (4.1%), presented with a previous CVA, and one subject was, enrolled in the program for primary prevention.

Slightly less than half of the participants (46.9%) were born in Canada. Three participants (6.1%) were born in the United States, 3 (6.1%) were born in India, 3 (6.1%) were born in Germany and 2 (4.1%) were born in England. Of the 49 subjects, 44 (89.7%) who were not Canadian born had lived in Canada ≥ 20 years, 5 have lived in Canada < 20 years.
Healthy Heart Program Participants Goal Accomplishment

All but one subject who consented to participate in the telephone interviews, reported that they had accomplished their goal for improved exercise tolerance during the program. Only five subjects out of 24 subjects reported that they had accomplished their goal for improved diet. Five subjects reported that they continued to smoke, 3 subjects reported, never smoking and, 41 subjects had quit smoking in the past. Forty-one subjects maintained or improved their cholesterol levels during the program. All thirteen subjects that listed blood pressure as a goal, maintenance and/or improvement their levels. Only one subject accomplished their goal for improved stress management. (see Table 4).

Table 4

Goal Accomplishment During the Healthy Heart Program N = 49

<table>
<thead>
<tr>
<th>Item</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goal accomplished</td>
<td>48</td>
<td>98</td>
</tr>
<tr>
<td>Diet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goal accomplished</td>
<td>5</td>
<td>10.2</td>
</tr>
<tr>
<td>Cholesterol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goal accomplished</td>
<td>41</td>
<td>83.7</td>
</tr>
<tr>
<td>Smoking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goal accomplishment</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goal accomplishment</td>
<td>13</td>
<td>26.5</td>
</tr>
<tr>
<td>Stress</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goal accomplished</td>
<td>1</td>
<td>2.0</td>
</tr>
</tbody>
</table>
Telephone Questionnaire Results

The following is a detailed analyses of the healthy behaviors that emerged from the telephone interviews.

When the 49 subjects were asked at follow-up about their sustained lifestyle behaviors, the majority reported exercising $\geq 3-4$ times a week. Eighteen subjects, exercised 3-4 times a week, 9 subjects exercised 5-6 times a week and 9 subjects exercised daily. The remaining 13 subjects exercised $< 3-4$ times a week. Of those subjects who exercised, 8 subjects (16.3%) reported they exercised between 15-30 minutes at a time, and 39 subjects (73.5%) reported exercising for greater than 30 minutes at one time. Forty-seven subjects (95.9%) indicated that they felt they were getting as much exercise as they needed.

The most common type of exercise reported was walking (79.6%), followed by jogging (6.1%), biking (4.1%), swimming, and a variety of "other" types of exercise such as using a treadmill or rowing machine, and participating in aerobics, tennis and cricket. Of the 49 subjects, 36 subjects (73.5%) reported that they knew their target heart rate for exercise, however, 21 subjects reported not knowing if they were exercising within their target heart rate.

Of the 49 subjects, five subjects (10.2%) reported continuing to smoke. Forty-two subjects (85.7%) reported that they had been told that their blood cholesterol was high, and 40 subjects (81.6%) reported that they were following the plan given to them at the Healthy Heart Program to control their cholesterol levels. Thirty-three subjects (67.3%) reported that the plan prescribed was medication to control their cholesterol, 8 subjects (16.3%) reported that they were following a low fat diet.
Of the 49 subjects, 28 subjects (57.1%) reported that they had been told by a health professional that they had high blood pressure, and 26 subjects (53.1%) reported that they were following a plan to control their blood pressure. Twenty-four subjects (49%) reported that the plan prescribed was medication, one subject reported following a low fat diet, and one subject reported exercising to control blood pressure.

Forty-six subjects (93.9%) reported following a diet plan prescribed to them at the Healthy Heart Program. Forty-four subjects (89.8%) reported that the plan prescribed was a low fat diet.

Fourteen subjects (28.6%) described their life as not at all stressful, 16 subjects (32.7%) described their life as not very stressful, 13 subjects (26.5%) described their life as somewhat stressful, 6 subjects (12.2%) described their life as very stressful. Thirty subjects (61.2%) of the 49 subjects, reported following the plan given to them at the Healthy Heart Program to relieve their stress. Table 5 outlines the methods reported by the participants to relieve stress.
Table 5

Participants' Methods to Relieve Stress

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise</td>
<td>5</td>
<td>10.2</td>
</tr>
<tr>
<td>Retired</td>
<td>3</td>
<td>6.0</td>
</tr>
<tr>
<td>Take more time to relax</td>
<td>2</td>
<td>4.1</td>
</tr>
<tr>
<td>Walking</td>
<td>2</td>
<td>4.1</td>
</tr>
<tr>
<td>Avoid stress</td>
<td>2</td>
<td>4.1</td>
</tr>
<tr>
<td>Golf</td>
<td>2</td>
<td>4.1</td>
</tr>
<tr>
<td>Reads</td>
<td>2</td>
<td>4.1</td>
</tr>
<tr>
<td>Enjoy life</td>
<td>2</td>
<td>4.1</td>
</tr>
<tr>
<td>Don’t over extend self</td>
<td>2</td>
<td>4.1</td>
</tr>
<tr>
<td>Deep breathing</td>
<td>2</td>
<td>4.1</td>
</tr>
<tr>
<td>Reduce work</td>
<td>1</td>
<td>2.0</td>
</tr>
<tr>
<td>Music</td>
<td>1</td>
<td>2.0</td>
</tr>
<tr>
<td>Self control</td>
<td>1</td>
<td>2.0</td>
</tr>
<tr>
<td>Taking it out on something</td>
<td>1</td>
<td>2.0</td>
</tr>
<tr>
<td>Visualization</td>
<td>1</td>
<td>2.0</td>
</tr>
<tr>
<td>Not applicable</td>
<td>19</td>
<td>41.0</td>
</tr>
</tbody>
</table>
Five subjects (10.2%) reported that compared to other people their age, their health was excellent, 15 subjects (30.6%) reported that their health was very good, 23 subjects (46.9%) reported that their health was good. Forty-eight subjects (98%) reported that they had been taking their medications according to their doctor's prescription.

Twenty subjects (40.8%) reported experiencing chest discomfort in the last six weeks, and 13 subjects (26.5%) reported taking nitroglycerin for their chest discomfort.

As indicated in Table 6, only 4 subjects (8.1%) had been treated in the emergency room for problems with their heart after completion of the Healthy Heart Program. Of these four subjects, three (6.1%) reported not knowing what was wrong with their hearts, one reported angina as the problem. Only one subject reported being admitted to hospital for angina since completing the program.

Table 6

<table>
<thead>
<tr>
<th>Acute Care Use of the Graduates of the Healthy Heart Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
</tr>
<tr>
<td>--------------------------------</td>
</tr>
<tr>
<td>Emergency room visit</td>
</tr>
<tr>
<td>No Emergency room visit</td>
</tr>
<tr>
<td>Admitted to hospital</td>
</tr>
<tr>
<td>No admissions to hospital</td>
</tr>
</tbody>
</table>
Table 7 lists the participant's suggestions for improvements to the Healthy Heart Program. Slightly over half of the participants had suggestions for improvements in the program. Interestingly 16 people (32.7%) wanted the program extended in length.

Table 7

Participants' Suggestions for Improvements to the Healthy Heart Program

<table>
<thead>
<tr>
<th>Item</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No suggestions</td>
<td>23</td>
<td>46.9</td>
</tr>
<tr>
<td>Extend the program</td>
<td>16</td>
<td>32.7</td>
</tr>
<tr>
<td>Add more equipment</td>
<td>4</td>
<td>8.2</td>
</tr>
<tr>
<td>Improve information given</td>
<td>3</td>
<td>6.1</td>
</tr>
<tr>
<td>Offer refresher course</td>
<td>2</td>
<td>4.1</td>
</tr>
<tr>
<td>Combine exercise &amp; education in 1 day</td>
<td>1</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Table 8 lists the barriers that participants experienced when trying to maintain healthy lifestyle behaviors, after completing the Healthy Heart Program. These barriers ranged from lack of time due to work and life in general, difficulties with participating in regular exercise and eating healthy food, lack of motivation, boredom, laziness, lack of self discipline, lack of support, lack of encouragement, and a variety of health reason
### Table 8

Barriers Participant's Experienced Maintaining Healthy Lifestyle Behaviors

<table>
<thead>
<tr>
<th>Items</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No barriers experienced</td>
<td>18</td>
<td>36.7</td>
</tr>
<tr>
<td>Lack of time due to work/life</td>
<td>9</td>
<td>18.3</td>
</tr>
<tr>
<td>Difficulties with participating in regular exercising</td>
<td>8</td>
<td>16.3</td>
</tr>
<tr>
<td>and eating healthy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of motivation/lack of encouragement</td>
<td>5</td>
<td>10.2</td>
</tr>
<tr>
<td>Health conditions</td>
<td>5</td>
<td>10.2</td>
</tr>
<tr>
<td>Needed a follow-up program</td>
<td>2</td>
<td>4.0</td>
</tr>
<tr>
<td>Difficult to slow down &amp; relax</td>
<td>1</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Analyses were conducted to determine if key variables such as gender, employment, family history of cardiac disease, presenting cardiac history, country of origin, years lived in Canada and age, influenced health behaviors. The effects of these covariates considered are discussed in the following sections.

**Relationship Between Health Behaviors at ≥ Six Months and Gender:**

There was no significant relationship between gender and the number of times people reported exercising in a week, $\chi^2 (4, N = 49) = .78, p = .94$, or the amount of time subjects reported being active during exercise, $\chi^2 (2, N= 49) = 1.5, p = .45$, or the perception of the amount of exercise needed, $\chi^2 (2, N= 49) = .78, p = .67$. There was also no significant relationship between gender and the type of exercise performed, although more women reported walking (91.6%) as compared to men (77.7%).
significant relationship between gender and subjects reported knowledge of target heart rate, \( \chi^2 (1, N=49) = .37, p = .53 \).

While there was no significant difference between gender and subject’s reported smoking behavior, \( \chi^2 (2, N=49) = 5.7, p = .05 * \), more women tended to smoke (16.6%) as compared to men (6.0%), more men reported to have quit smoking (69.5%) as compared to women (33.3%), and more women reported having never smoked (50%) as compared to men (29.7%).

There was no significant relationship between gender and reported knowledge of elevated cholesterol levels or actions to treat cholesterol.

Table 9

<table>
<thead>
<tr>
<th>Item</th>
<th>( \chi^2 )</th>
<th>(d f)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge of cholesterol levels</td>
<td>.84</td>
<td>2</td>
<td>.65</td>
</tr>
<tr>
<td>Treatment plan for cholesterol</td>
<td>.78</td>
<td>2</td>
<td>.68</td>
</tr>
<tr>
<td>Following prescription for elevated cholesterol levels</td>
<td>.06</td>
<td>2</td>
<td>.97</td>
</tr>
</tbody>
</table>

* Signifies cell size < 5.
There was no significant relationship between gender and reported knowledge of high blood pressure or actions to manage high blood pressure.

Table 10

Relationship Between Gender and Blood Pressure N = 49

<table>
<thead>
<tr>
<th>Item</th>
<th>$\chi^2$</th>
<th>(d f)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge of high blood pressure</td>
<td>.68</td>
<td>2</td>
<td>.70</td>
</tr>
<tr>
<td>Treatment plan for high blood pressure</td>
<td>3.5</td>
<td>3</td>
<td>.32</td>
</tr>
<tr>
<td>Following prescription for high blood pressure</td>
<td>.73</td>
<td>2</td>
<td>.69</td>
</tr>
</tbody>
</table>

There was no significant relationship found between gender and subjects report of following a diet plan prescribed at the Healthy Heart Program $\chi^2(2, N= 49) = 1.4$, $p = .49$. The use of a diet plan did not differ between males and females significantly, $\chi^2(2, N=49) = 3.2$, $p = .20$.

There was no significant difference between gender and subjects' description of life in terms of stress $\chi^2(3, N= 49) = .88$, $p = .82$. Interestingly 33.3% of women described their lives as "not at all stressful" as compared to 27% of men. Slightly more men (13.5%), described their life as "very stressful" as compared to 8.3% of women.

There was also no significant difference between gender and subjects report of following a plan for stress management prescribed in the Healthy Heart Program, $\chi^2(2, N= 49) = 3.1$, $p = .20$. More women (83.3%), reported following the plan given to them at the Healthy Heart Program as compared to men (67.5%). There was no significant relationship between gender and subjects' reported perception of health, $\chi^2(4, N= 49) = 2.7$, $p = .59$. 
There was also no significant relationship between gender and subjects' report of taking medications according to their prescription, \( \chi^2 (1, N=49) = 3.1, p = .07 \). While there was no statistically significant difference between gender and subject's experience of chest discomfort within the last 6 weeks, \( \chi^2 (2, N=49) = 4.5, p = .10 \), more men (48.6%), tended to experience chest discomfort as compared to women (83.3%). As well no significant relationship between gender and subjects report of taking nitroglycerin for chest discomfort \( \chi^2 (3, N=49) = 5.0, p = .16 \), was found, however it is interesting that both women who experienced chest discomfort took nitroglycerin as compared to only 11 out of the 18 men, who had experienced chest discomfort.

No statistically significant relationship was found between gender and the reported number of visits to the emergency department \( \chi^2 (1, N=49) = 1.5, p = .21 \). More women, (16.6%) reported visiting the emergency department as compared to men (5.4%). There was also no significant difference between gender and the reported reasons for emergency visits \( \chi^2 (1, N=41) = 1.3, p = .24 \).

**Relationship Between Health Behaviors at ≥ Six Months and Employment Status:**

There was a significant relationship between employment and the number of times subjects' reported exercising, \( \chi^2 (8, N=49) = 16.3, p = .03 \). Fifty percent of unemployed subjects reported exercising 1-2 times a week as compared to 37.5% of working subjects, and 13.7% of retired subjects. The remaining 50% of the unemployed subjects reported exercising 5-6 times a week as compared to 31.2% of working subjects and 6.8% of retired subjects. Forty-eight percent of retired subjects reported exercising 3-4 times a week, as compared to 25% of working subjects.
There was no significant relationship between employment status and the amount of time spent exercising. Interestingly the majority of subjects reported exercising > 30 minutes. There was no significant relationship between employment status and subjects perception of whether they were exercising enough, \( \chi^2 (4, N=49) = 3.5, p = .47 \). Fifty percent of the employed subjects felt that they were not getting as much exercise as they needed, as compared to unemployed subjects (75%) and retired subjects (44.8%). There was no significant difference between employment status and the reported knowledge of target heart rate, \( \chi^2 (2, N=49) = 1.7, p = .41 \).

No significant relationship between employment and reported smoking behaviors, \( \chi^2 (4, N=49) = 7.6, p = .10 \), was found. Interestingly none of the retired subjects reported that they smoked, whereas 25% of unemployed subjects and 12.5% of employed subjects smoked. Forty-four percent of retired subjects, 25% of unemployed subjects and 18.7% employed subjects, reported never having smoked.

There was no significant relationship between employment and reported knowledge of elevated cholesterol level, \( \chi^2 (4, N=49) = 3.7, p = .44 \), or the reported compliance with following a plan for cholesterol management, \( \chi^2 (2, N=44) = 2.5, p = .28 \). The majority of subjects reported taking medication to control their cholesterol levels.

There was no significant relationship between employment and reported knowledge of high blood pressure, \( \chi^2 (4, N=49) = .87, p = .92 \), or reported compliance with following a plan to control blood pressure, \( \chi^2 (4, N=49) = .60, p = .96 \). The majority of subjects reported taking medication for their hypertension.
As well, there was no significant relationship between employment and reported compliance with the diet plan prescribed at the Healthy Heart Program, $\chi^2(4, N=49) = 2.7, p = .59$. The majority of subjects reported following a low fat diet.

There was no significant relationship between employment status and subjects’ description of their life with respect to stress, $\chi^2(6, N=49) = 5.2, p = .51$. Thirty-four percent of people retired, reported that their life was not at all stressful as compared to 25% of unemployed people and 18.7% of employed people. More employed subjects reported their life as very stressful, as compared to retired and unemployed people.

There was a significant relationship between employment status and subjects’ reported perceptions of health $\chi^2(8, N=49) = 26.8, p < .05^*$. Fifty percent of unemployed subjects reported that their health was poor, while none of the employed subjects or retired subjects perceived their health as poor.

There was no significant relationship between employment and subjects’ report of chest discomfort in the last 6 weeks, $\chi^2(4, N=49) = .95, p = .91$. Fifty percent of unemployed subjects had experienced chest discomfort as compared to 37.5% of employed subjects and 41.3% of those who were retired. There was no significant relationship between employment and subjects’ report of taking nitroglycerin for chest discomfort, $\chi^2(4, N=49) = 2.0, p = .73$. Interestingly, all of the subjects who were unemployed took nitroglycerin for chest pain as compared to 66.6% of employed subjects and 53.8% of retired subjects.

No significant relationship was found between employment and reported treatment in an emergency department for heart problems since exiting the Healthy Heart Program, $\chi^2(2, N=49) = .61, p = .73$). More retired subjects than employed subjects had
been treated and no unemployed subjects reported being treated in the emergency department for cardiac related problems.

**Relationship Between, Health Behaviors at ≥ Six Months and Country of Origin:**

(Canada/not Canada)

There was no significant relationship between country of origin and the number of times subjects reported exercising per week, $\chi^2 (4, N= 49) = 3.16, p = .53$. It is interesting that more non-Canadian born subjects (23%) exercised daily as compared to Canadian born subjects (13%). There was also no significant relationship between the amount of time subjects' reported exercising and their country of origin, $\chi^2 (2, N= 49) = .047, p = .97$, or subjects reported perception of the amount of exercise they needed, $\chi^2 (2, N= 49) = 5.0, p = .08$, or the reported types of exercise performed $\chi^2 (5, N= 48) = 9.3, p = .09$. There was no significant relationship between country of origin and reported knowledge of target heart rate $\chi^2 (1, N= 49) = .33, p = .56$. There was a significant relationship between country of origin and amount of times per week that people exercised within their target heart rate $\chi^2 (5, N= 49) = 16.5, p < .05$. Thirty-eight percent of non-Canadian born subjects exercised 3-4 times per week within their target heart rate where as no Canadian born subjects. A large number of both groups did not know if they exercised within their target heart rate (42.8%).

No statistical significance between country of origin and reported smoking behaviors, $\chi^2 (2, N= 49) = .52, p = .77$, were found. Eight percent of Canadian born subjects continued to smoke as compared to 3.89% of non-Canadian born subjects.

There was a significant relationship between country of origin and the reported knowledge of elevated cholesterol levels, $\chi^2 (2, N= 49) = 8.0, p = .01$. More Canadian
born subjects, (95%) reported that their cholesterol levels were elevated, as compared, to non-Canadian born subjects (73%). There was no significant relationship between country of origin and compliance with the plan given to them to control their cholesterol levels, $\chi^2 (1, N= 44) = .01, p = .92$.

There was no significant relationship between country of origin and the reported knowledge of having high blood pressure, $\chi^2 (2, N= 49) = 3.7, p = .15$, or the reported compliance with a treatment plan for high blood pressure, $\chi^2 (2, N= 49) = 2.4, p = .30$.

There was no significant relationship between country of origin and the reported compliance with following the diet plan prescribed at the Healthy Heart Program, $\chi^2 (1, N= 49) = 2.8, p = .09$, or type of diet plan followed, $\chi^2 (2, N= 46) = 2.0, p = .35$.

There was no significant relationship between country of origin and subjects' description of their life in terms of stress, $\chi^2 (3, N= 49) = 4.5, p = .20$. The majority of both groups reported that their lives were "somewhat stressful". There was also no significant relationship between country of origin and the reported compliance with following a plan for stress management prescribed in the Healthy Heart Program, $\chi^2 (2, N= 49) = 1.8, p = .39$.

As well, there was no significant relationship between country of origin and subjects' perception of their health, $\chi^2 (4, N= 49) = 4.6, p = .32$. The majority of both groups reported that their health was "good" on a scale ranging from poor to excellent.

There was no significant difference between country of origin and subjects' reported compliance with taking medication according to their prescription, $\chi^2 (1, N= 49) = .90, p = .34$, or the reported recent experience of chest discomfort, $\chi^2$
The majority of people in both groups took nitroglycerin for chest discomfort.

There was a significant relationship between country of origin and visits to the emergency department $\chi^2 (1, N=49) = 4.9, p < .05$. Seventeen percent of Canadian born subjects visited the emergency department while no non-Canadian born subjects did so. However one Canadian born subject was admitted to hospital for cardiac reasons.

The reported health behaviors were also queried to determine if there was a relationship between health behaviors and the number of years non-Canadian born subjects lived in Canada, $> 20$ years or $\leq 20$ years. There was no significant relationship between these two variables.

**Relationship Between, Health Behaviors at $\geq$ Six Months and Age**

There was no statistically significant relationship between age and the reported health behaviors, with the exception of smoking. Subjects who had quit smoking were older (65.8 years) than those who continued to smoke (48.0 years), ($t = -3.2, p < .05$). As well there was a significant relationship between mean age and those subjects who had never smoked. Subjects who reported never smoking were older (67.3) then those who continued to smoke (48.0 years), ($t = -2.8, p < .05$).

**Analysis of the Healthy Heart Program Participants Who Did Not Consent to Participate in the Study**

Forty-two out of 91 subjects did not participate in the telephone survey. An analysis was conducted to determine if there were differences between the subjects who consented to participate in the telephone questionnaire and those who did not.
There was a significant difference between mean age of subjects who consented to participate in the survey and those who did not, (t = -2.1, p = .03). Subjects who responded to the survey were older (Mean age = 65.3 years) than those who did not respond (60.0 years). While there was no significant gender difference, there was a trend, $\chi^2 (2, N = 91) = 5.4, p = .06$, with more females not consenting to participate (Mean age = 62.5%) than males (36.8%). There was no significant difference in accomplishment of program goals between the two groups.

In summary, the subjects who did not consent to participate in the telephone questionnaire tended to be younger, and female. Interestingly there were no significant differences between consent to participate in the telephone questionnaire and program goal accomplishment.

Analysis of Maintenance of Healthy Lifestyle Behaviors

In order to determine if participants maintained healthy lifestyles ≥ 6 months after graduation from the Healthy Heart Program, the responses to 16 health behavior questions, concerning exercise, smoking, cholesterol, blood pressure, stress and symptom management, were used to create a composite score. Each item was given a score between zero and two. “Zero” was assigned if the subject was not maintaining healthy behaviors, “one” indicated some effort to maintain healthy behavior and “two was given for maintaining healthy behaviors. The scoring of each question was verified with the Healthy Heart Program multidisciplinary team, and was based on the expected results according to the programs’ objectives. A total score of 32 indicated maintenance of healthy lifestyle behavior, a score of < 32 indicated that not all healthy behaviors had been maintained fully. Interestingly only 3 participants scored 32 points, indicating that
all healthy lifestyle behaviors had been maintained for ≥ 6 months after graduation from the Healthy Heart Program.

The questionnaire was further analyzed to determine if all the questions were a true reflection of maintenance of healthy lifestyle behaviors. Since many participants did not know how many times per week they exercised within their target heart rate, questions # 5 and # 6 were dropped, and the analysis for maintenance of healthy lifestyle behaviors for ≥ 6 months was re-done. With the two items dropped the new scores ranged from zero to two. And scores of 28 indicated maintenance of healthy behaviors and scores of < 28 indicated that not all healthy behaviors had been fully maintained. Using this modified score, twenty-nine subjects (59.1%) maintained healthy lifestyle behaviors for ≥ 6 months, as compared to 20 subjects (40.9%) who did not maintain healthy behavior.

A t-test was done to determine if there was a relationship between age and maintenance of healthy lifestyle behaviors. There was no significant difference between age and maintenance of healthy lifestyle behaviors $t = -1.8, p = .06$. There was however a trend showing that those people who maintained healthy lifestyle behaviors were older (mean age 67.5 years), as compared to those who did not (mean age 61.0 years). There was no statistically significant difference between gender and maintenance of healthy lifestyle behaviors, $\chi^2 (1, N= 49) = 1.6, p = .20$. More females, however, maintained healthy lifestyle behaviors (75.0%), as compared to males (54.0%).

3The items used to create the composite score are highlighted in the telephone questionnaire, Appendix B.
Conclusions

The objective of the second phase of this study was to determine if participants were able to maintain healthy lifestyle behaviors for at least six months. A significant number of subjects maintained healthy lifestyle behaviors for at least six months after exiting the Healthy Heart Program.

The reported health behaviors were examined in detail. Participants’ suggestions for improvement to the program as well as barriers they reported experiencing while trying to maintain healthy lifestyle behaviors were discussed. Interestingly only four subjects were treated in the emergency room and only one subject was admitted to hospital with angina after exiting the Healthy Heart Program.

The reported health behaviors and identified key variables, such as gender, employment status, country of origin, number of years lived in Canada and age, were analyzed to determine if there were differences. There was a significant difference between employment status and participants’ perception of health. More unemployed subjects’ rated their health as “poor” as compared to subjects who were employed or retired.

The subjects who did not consent to participate in the study were compared to the 49 subjects who participated in the telephone questionnaire to determine if there were differing characteristics between the two groups. Interestingly the two groups did not differ in goal accomplishment, however subjects who did not consent to participate in the telephone interviews were, younger and female as compared to the subjects who consented to participate. The findings from these analyses will be discussed in chapter six.
Chapter Six

CONCLUSIONS AND RECOMMENDATIONS

The purpose of this study was to increase our understanding of the effectiveness of the Healthy Heart Program; to evaluate the impact of the implementation of a cardiac rehabilitation program on enabling change and maintenance of healthy lifestyle behaviors; to analyze the effect that maintenance of healthy lifestyle behaviors has on the need for acute care services; and to make recommendations for improvement to the Healthy Heart Program under study. The previous two chapters presented the findings of the two phases that constituted the study; Phase I: an analysis of program graduates, to determine if, upon exit, participants accomplished their goals to reduce cardiac risk factors during the program; Phase II: (a) to determine if healthy lifestyle behaviors were maintained for at least six months after completion of the program, and (b) to determine the effect that maintenance of healthy lifestyle behaviors had on the need for acute care services.

The findings of this study indicate that the Healthy Heart Program enabled healthy lifestyle behavior changes that were maintained at least six months after the program. Participants that were successful in accomplishing goals for improved exercise tolerance, cholesterol management, and blood pressure control during the program continued to maintain these goals for at least six months after exiting the program. Goals such as improved dietary changes, and stress management, that were accomplished to a lesser degree, continue along the same trends after participants' exited the program. Goals for smoking cessation were not met during the program and remained unachieved.
Only a few program graduates used acute care services. Four graduates of the Healthy Heart Program required a visit to the emergency department for cardiac problems and only one graduate required admission to hospital for angina.

This chapter begins with a discussion of the impact that the Healthy Heart Program has on enabling change for healthy lifestyle behaviors. Next, variables related to the effectiveness of the Healthy Heart Program will be discussed. Following this discussion, recommendations for the improvement of the program and future research, will be outlined. First, however, some limitations of the research will be presented.

Limitations

The retrospective chart analysis has potential limitations. Documentation may be subjective in nature and can differ according to the individual charting the progress notes in the program.

The telephone questionnaire also has several potential limitations. Self-reporting can limit the validity of the results as people tend to optimistically bias self-report results (Burns & Grove, 1993). As well, respondents who participate in the telephone questionnaire may have been more motivated than others, leading to a somewhat distorted view of the success of the Healthy Heart Program.

The use of convenience sampling limits the validity of this study as this approach provides little opportunity to control for bias. As well the small sample size has potential limitations to this study. A power analysis to determine the number of subjects required to detect differences or relationships in populations was not calculated, as the number of graduates of the Healthy Heart Program was small. Therefore all 91 graduates of the program were contacted by letter to participate. The response rate of 53.8% (49 subjects)
is reasonable but represents a small sample size and limits the representativeness of the results (Burns & Grove, 1993).

The validity and the reliability of the questionnaire may pose limitations to the study. It is advisable to use questionnaires that have been tested for ambiguous language, leading questions that influence the respondent, questions that assume a pre-existing state of affairs and double questions (Burns & Grove, 1993). The questionnaire for this study, was constructed using the American Heart Association recommendations for Healthy Heart Programs, and questions from other validated questionnaires, was pre-tested for comprehension and appropriateness of response sets.

The program evaluation method also has some potential limitations. There are multiple measures that can be examined when doing a program evaluation. This evaluation focused on a limited set of measures and so provides one perspective of the program. This perspective may have differed, had for example, improved exercise tolerance been measured by treadmill testing, and improvement in cholesterol management been determined by blood test results, rather than the use of self-report. This study provides insight into how the Healthy Heart Program enables change for healthy lifestyle behaviors but may not be generalizable to other programs. This program evaluation, however, will provide valuable information to the program under study. In light of these limitations the study results must be viewed with caution. The remainder of this chapter will focus on the discussions of the findings.

**Impact of the Healthy Heart Program**

The findings of this study indicate that the Healthy Heart Program enabled some healthy behavior changes that were maintained for at least six months after exiting the
program. A large majority of the Healthy Heart Program graduate’s improved their exercise tolerance, cholesterol management and blood pressure control upon exiting the program. These goals were maintained for at least six months after the program.

Improvement in exercise tolerance during the program is an expected outcome as exercise is a major emphasis of the program, with participants attending a supervised exercise class twice a week. The majority of participants accomplished their goals for cholesterol management and blood pressure control, through the use of medication. The Healthy Heart Program staff, teaches the importance of adherence to prescription medications, as well, the program's multidisciplinary team monitor lipid values and blood pressure, closely, and makes recommendations to the family physicians and/or referring cardiologists. In addition, education classes regarding the importance of cholesterol management and blood pressure control are offered weekly.

There is no research in the literature that analyses the effectiveness of cardiac rehabilitation programs on attaining and maintaining healthy lifestyle behaviors. This research study showed that over half of the subjects, who participated in the telephone questionnaire, reported maintaining healthy lifestyle behaviors for at least six months after exiting the program.

The Healthy Heart Program may have had a positive impact on the need for acute care services. Only four subjects who participated in the telephone interviews required visits to the emergency department, for treatment of angina, and only one subject was admitted to hospital for unstable angina. Three out of the four subjects who required a visit to the emergency department were retired. The one subject who was admitted to acute care was employed. Interestingly all four subjects were Canadian born. This may
represent the need for culturally sensitive education regarding the importance of seeking medical help if nitroglycerin does not relieve chest discomfort.

Overall these results correlate with the analyses of the study. Participants report being compliant with taking medications such as nitroglycerin for chest discomfort, blood pressure medications and cholesterol lowering agents. As well, participants report that they participate in regular exercise. This study also showed that a large portion of the participants maintained healthy lifestyle behaviors for at least six months after exiting the program. Researchers have found that participation in a cardiac rehabilitation program does decrease the need for emergency department visits and admissions to hospital (Bondeman et. al., 1995; Kehl, 1991).

Despite the positive study results of sustained behavior change and minimal visits to acute care, the analysis of the data supports the need for improved methods for stress management, diet management and smoking cessation. Very few participants of the program accomplished their goals for stress management. Subjects who tended not to accomplish their goals for stress management were younger than retirement age, both employed and unemployed. Stress can be a major contributing factor to CAD. Stress management programs help participants manage anxiety associated with a cardiac event as well as helping people to acquire new skills to lesson the need for nicotine, alcohol, over-work or food (Dafoe, 1997). The fear of not being able to return to work can also cause stress (Dafoe), in fact more unemployed people in this study rated their health as "poor" compared to employed and people who had retired. These factors need to be considered and the stress management component of the program improved. All Healthy Heart Program participants have suffered a stressful cardiac event and would benefit from
individual and group stress management sessions focusing on psychological issues (Balady et al, 1994).

None of the participants of the program accomplished their goal for smoking cessation. In this study, people younger than retirement age, and more women than men continue to smoke. Smokers tended to have a positive family history for cardiac disease and had experienced more MIs and PTCA/Stent procedures than non-smokers. In order to identify smoking cessation as a goal and to support the person through the cessation process, a strategy for preventing smoking relapse must also be incorporated in the program. Adjunctive aids such as the nicotine patch are also usually required (Balady et al, 1993). Improved stress management strategies need to be offered in conjunction with a smoking cessation program, to enable participants to be successful.

Program planning must also take into consideration the different needs of women and men in cardiac rehabilitation. For example more men accomplished their goals for improved cholesterol levels, and more women continue to smoke. As well more men than women accomplished their goals for diet management. According to Ginzel (1996), women have different psychological needs as compared to men after their cardiac event and tend to be less compliant with rehabilitation programs than men.

The largest barrier participants reported for maintaining healthy lifestyle behaviors was lack of time due to work and “life in general”. The difficulties with participating in regular exercise and eating a healthy diet were also identified. Participants identified a lack of motivation and a lack of support as barriers. Ten percent of participants identified barriers involving health reasons, such as arthritis and chest discomfort as barriers to participating in regular exercise.
These barriers correlated with participants’ main suggestions for improvements to the program. The majority of participants’ suggestions were to extend the length of the program, for ongoing support. Rather than extend the length of the program, a strategy to contact graduates or to schedule monthly return visits for reassessment could be established. As well, more community center programs for people with CAD need to be developed and implemented for ongoing cardiac rehabilitation needs.

**Recommendations for Program Improvements**

Since smoking increases the risk of mortality and morbidity of people with CAD, the Healthy Heart Program needs to develop a smoking cessation intervention to effectively help patients to stop smoking (Balady, 1994). As well the program needs to focus on developing strategies to effectively manage stress and diet. During the intake clinic assessment, the program plan for cardiac risk factor reduction needs to be set according to the individualized needs of each person. For example, if smoking cessation is identified as a priority goal, the participants program should be set up to focus on strategies to enable that behavior change. As well, the person's age, gender, cardiac history, employment status, and country of origin need to be considered when developing individualized program plans.

As well ongoing evaluation of cardiac rehabilitation programs focusing on enabling behavior change for healthy lifestyle behaviors change is necessary.

**Conclusion**

Dealing with chronic illness, such as cardiac disease remains a challenge for health care. Establishment of cardiac rehabilitation programs such as, the Healthy Heart Program has attempted to meet this challenge. Little however has been written about the
effectiveness of these programs for enabling sustained healthy behavior change. There is 
a need to understand the impact of cardiac rehabilitation programs on cardiac disease. 
The findings of this study suggest a number of variables that influence the effectiveness 
of the Healthy Heart Program.

The study findings indicate that participants were successful in reducing some 
cardiac risk factors upon exit of the program and that the program was successful in 
enabling sustained behavior change for healthy lifestyle behaviors for at least six months. 
As well, there is a suggestion that sustained healthy behaviors may have had a positive 
effect on the need for acute care. Overall, the participants in the telephone interviews 
praised the program highly and the dedicated professionals that work in the program.
References


Ginzel, A. (1996), Women’s compliance with cardiac rehabilitation programs, Progrress in Cardiovascular Nursing, 11, 30-35.


Appendix A

HEALTHY HEART PROGRAM
Data Collection Form

Identification Number: __________

Inclusion Criteria:

___ Graduate of the healthy heart program between March-November 1997

___ English speaking

Program Graduation Date:

Interview Date:

DEMOGRAPHIC DATA

AGE: (Indicate actual age)_______

SEX: (circle) 1. Male 2. Female

EMPLOYMENT STATUS: (Circle) 1. Employed 2. Unemployed 3. Retired

Presenting Cardiac History:

☐ MI ☐ Transplant
☐ CABG ☐ PVD
☐ PTCA/Stent ☐ CVA
☐ Angina ☐ Other
☐ CHF ☐ Primary

Family History of Cardiac Problems:

☐ Yes ☐ No

Goals:

Intake Assessment

☐ Exercise
☐ Diet
☐ Smoking
☐ Blood Cholesterol
☐ Maintaining BP
☐ Stress Reduction

Exit Clinic Assessment

☐ Exercise
☐ Diet
☐ Smoking
☐ Blood Cholesterol
☐ Maintaining BP
☐ Stress Reduction
Appendix B

ID # _______ HEALTHY HEART PROGRAM
TELEPHONE QUESTIONNAIRE

Please respond to the following questions:

1) How many times per week, on average do you exercise?
   ☐ Daily
   ☐ 5-6 times a week
   ☐ 3-4 times a week
   ☐ 1-2 times a week
   ☐ Less than once a week
   ☐ Never
   ☐ Don’t know

2) When you do this exercise, how much time are you active? Would it be …
   ☐ More than 30 minutes?
   ☐ Between 15 and 30 minutes?
   ☐ Less than 15 minutes?

3) Do you feel that you get as much exercise as you need or less than you need?
   ☐ As much as needed
   ☐ Less than needed
   ☐ Don’t know

4) What type of exercise do you typically do?
   ☐ Jog
   ☐ Walk
   ☐ Swim
   ☐ Bike
   ☐ Other ________________________ (Please describe)

5) Do you know your exercising target heart rate?
   ☐ Yes (Go to question 6)
   ☐ No (Go to question 7)

6) How many times per week, on average do you exercise within your exercising target heart rate?
   ☐ Daily
   ☐ 5-6 times a week
   ☐ 3-4 times a week
   ☐ 1-2 times a week
   ☐ Less than once a week
   ☐ Never
   ☐ Don’t know
7) At the present time do you smoke cigarettes?
   □ Never Smoked (Go to question 10)
   □ No (Go to question 8)
   □ Yes (Go to question 9)

8) If no . . . Why did you quit? ____________

9) If yes . . . At what smoking cessation are you at?
   □ Pre-contemplation (Not thinking about quitting)
   □ Contemplation (Thinking about quitting)
   □ Preparation (Preparing to quit in the next 30 days)
   □ Action (Following a plan to stop smoking i.e reducing # cigarettes smoked)
   □ Maintenance (Engaged in a smoking cessation plan)
   □ Relapse (Smoking)
   □ Set quit date (Set date in the future)

10) Were you ever told by a doctor, nurse or other health professional that you blood cholesterol was high? (This would require a blood test)
   □ Yes
   □ No
   □ Don’t Know

11) Are you following the plan given to you at the Healthy Heart Program to control your cholesterol?
   □ Yes (Go to question 12)
   □ No (Go to question 13)
   □ Don’t Know (Go to question 13)

12) If yes . . . What are you doing to control your cholesterol? (Tick all that apply)
   □ Taking medication
   □ Following a low fat diet
   □ Exercising
   □ Other ____________

13) Have you ever been told by a doctor, nurse or other health professional that you have high blood pressure?
   □ Yes
   □ No
   □ Don’t Know

14) Are you doing anything to control your blood pressure?
   □ Yes
   □ No (Go to question 16)
   □ Don’t Know (Go to question 16)
15) If yes . . . What are you doing to control your blood pressure? (Tick all that apply)
- Taking medication
- Following a low fat diet
- Exercising
- Other ________________

16) Are you following the diet prescribed to you at the Healthy Heart Program?
- Yes
- No (Go to question 18)
- Don’t Know (Go to question 18)

17) If yes . . . What diet plan are you following?
- Low salt
- Low fat
- Diabetic diet
- Don’t Know

18) Would you describe your life as . . .
- Very stressful?
- Somewhat stressful?
- Not very stressful?
- Not at all stressful?

19) Are you following the plan given to you at the Health Heart Program to help relieve your stress?
- Yes
- No (Go to question 21)
- Don’t Know (Go to question 21)

20) If yes . . . what are you doing to relieve your stress?

________________________________________________________________________

21) In general, compared to other people your age, would you say your health is . . .
- Excellent?
- Very good?
- Good?
- Fair?
- Poor?

22) Have you been taking your medications according to how they were prescribed to you by your doctor?
- Yes
- No
- Don’t Know
23) Have you experienced any chest discomfort (or its equivalent) in the last six weeks?
☐ Yes
☐ No (Go to question 25)
☐ Don’t Know (Go to question 25)

24) If yes . . . Have you taken your nitroglycerin for your chest discomfort (or its equivalent) in the last six weeks?
☐ Yes
☐ No
☐ Don’t Know

25) Have you been treated in the emergency room for problems with your heart since completing the Healthy Heart Program?
☐ Yes
☐ No (If no go to question 27)

26) What was the reason for this visit to the emergency room?
☐ Acute myocardial infarction
☐ Angina
☐ Chest pain, non-cardiac
☐ Arrhythmia
☐ Unknown

27) Have you been admitted to hospital for problems with your heart since completing the Healthy Heart Program?
☐ Yes
☐ No (Go to question 29)
☐ Don’t Know (Go to question 29)

28) What was the reason for this hospitalization?
☐ Acute myocardial infarction
☐ Angina
☐ Chest pain, non-cardiac
☐ Arrhythmia
☐ Cardiac Surgery
☐ Angiogram
☐ Angioplasty/Stent
☐ Unknown

29) Do you have any suggestions for improvements to the Healthy Heart Program?

30) What barriers did you experience with trying to maintain health lifestyle behaviors after leaving the Healthy Heart Program?

31) What country were you born in?
32) How long have you lived in Canada?
Appendix C

Sample of proposed script of the telephone interview

Hello, my name is ________________, I am working with Leanne Heppell on her research study evaluating the Healthy Heart Program at Vancouver General Hospital. I would like to conduct a brief interview with you about your participation in the Healthy Heart Program. Did you receive our letter explaining this study? If yes- do you have any question about this study? Are you willing to participate in this interview, which will take between 15-30 minutes? Prior to starting the interview I would like to review a couple of important points. First, your responses are confidential and will be identified with only a number. Second, if there are any questions you do not feel comfortable in answering during this interview you are free to refuse to answer those questions, or withdraw from the study. If it is okay I would like to begin the questionnaire.

If a participant responds that they did not receive the letter, a copy of the letter will be read to them, their willingness to participate will then be assessed in the above manner.
An Evaluation of a Cardiac Rehabilitation Program
Primary Investigator: Leanne Heppell
Telephone: XXX-XXXX

To:

I am a registered nurse working on my Masters in Nursing at the University of British Columbia. For my thesis I am doing an evaluation of the Healthy Heart Program at Vancouver General Hospital. Since you have participated in the program I would like to interview you by telephone. This interview will take approximately 15-30 minutes to complete. You will be asked questions about your exercise habits, diet, cholesterol and general quality of life.

Your participating in this study is completely voluntary. You have the right to refuse to participate in this study and to withdraw from the study at any time without having any future health care affected. Your answers will be assigned a number rather than using your name to keep your identity confidential.

If you would like to participate in this study, please return the stamped, self-addressed envelope with the slip of paper marked “contact”. If you do not wish to participate in the study please mark the box “do not contact”, and return in the stamped, self addressed envelop.

Thank you for your participation in this research study. Your input will be used to make improvements to the Healthy Heart Program, which will benefit future participants.

Please do not hesitate to contact me at the number given above if you have any questions or concerns. If you would like verification of this research project please do not hesitate to contact Dr. Joy Johnson, UBC Faculty Advisor (xxx-xxxx), Sandy Rubin, the patient services director for cardiac sciences, critical care and transplant at Vancouver General Hospital. Her phone number is xxx-xxxx. If you have any concerns about your rights or treatment as a research subject please contact Dr. Richard Spratley, Director of the UBC Office of Research Services at xxx-xxxx.

Sincerely,

Leanne Heppell BScN, RN (MSN Candidate)
Appendix E

ID # ________

PLEASE MARK THE BOX “CONTACT” IF YOU WISH TO PARTICIPATE IN THE STUDY.
PLEASE MARK THE BOX “DO NOT CONTACT” IF YOU DO NOT WISH TO PARTICIPATE IN THE STUDY.

PLEASE RETURN THIS SLIP OF PAPER IN THE STAMPED, SELF-ADDRESSED ENVELOPE, PROVIDED.

PLEASE MAIL THIS ENVELOPE WITHIN ONE WEEK.

☐ CONTACT
☐ DO NOT CONTACT

THANK YOU FOR YOUR CONSIDERATION.