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Effects Of Smoking On Walking Improvements Of Patients With Peripheral Vascular Disease

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The Effects of Smoking on Walking Improvements

of Patients with Peripheral Vascular Disease.
(TITLE)

BY

Rachelle J. Cook

THESIS

**SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
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ABSTRACT

The purpose of this study was to determine the effects of smoking on walking improvements in peripheral vascular disease (PVD) patients in a cardiac rehabilitation setting who either currently smoke, quit smoking prior to beginning the exercise program, or did not smoke.

Fifty-three participants from the Phase III PVD cardiac rehabilitation program of Decatur Memorial Hospital were divided into three groups according to their smoking status. One group consisted of twenty-eight non-smokers. Another group consisted of sixteen smokers. The third group consisted of nine ex-smokers. The mean age of the non-smoker group was 74.96 ± 7.14 years, 67.75 ± 10.09 years for the smoker group, and 60.56 ± 11.50 years for the ex-smoker group. All three groups exercised for forty minutes per session, three times a week for three months. The exercise program consisted of a five-minute warm-up on the bicycle, thirty minutes of walking on the treadmill, and a five-minute cool-down on the arm ergometer.

All three groups were tested by using a ramped treadmill protocol known as the Gardner Treadmill Protocol. This test was done prior to the patient beginning the exercise program and after 3-months of regular participation in the rehabilitation program.

Descriptive statistics and analsyis of variance (ANOVA), $p < 0.05$, were used to assess the initial and post-test data. This study revealed that all three groups improved in walking distances over the three month time period. Therefore, exercise rehabilitation is a benefit to everyone regardless of their smoking status. However, even though all three

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CHAPTER I

INTRODUCTION

Peripheral vascular disease (PVD) is a circulation problem in which the arteries in the arms or legs become clogged or narrowed which interferes with the normal blood flow. Intermittent claudication results from PVD, and is caused by the formation of plaques that narrow or occlude arteries. The result of this is inadequate blood flow, causing ischemic muscle pain (Collins, Langbein, Orebaugh, Bammert, Hanson, Reda, et al., 2003). This affects about 10 million people or one in twenty people over the age of 50 in the United States alone. Only about half of these people have symptoms and approximately 2.5 of them have actually been diagnosed with PVD and are seeking a doctor for treatment. Of these people, 2.1 million are managing their disease through exercise and drug therapy. On the other hand, about 2.5 million are undiagnosed. Most of the people who do not seek medical attention dismiss the leg pain as a sign of aging (Society of Interventional Radiology, 2003).

The main factors that increase the likelihood of PVD are smoking, hyperlipidemia, hypertension, low ankle brachial index (ABI) of .9 or less, diabetes, obesity, over the age of 50, inactivity and family history. However, smoking is by far the most important risk factor that one needs to change if diagnosed with PVD (Perry, 2002). Therefore, if one is diagnosed with PVD the first step in treatment is a change in lifestyle. This means it is very important that the smoking patient quit smoking once diagnosed so that the patient will benefit more from the treatment options. Some other lifestyle

changes include exercise and a low fat, low sodium diet which will help decrease the person's weight, blood pressure, cholesterol, and blood sugar; therefore, reducing risk factors that not only cause PVD but also many other cardiovascular problems as well (Society of Interventional Radiology, 2003).

Until recently, treatment options for patients suffering from PVD were limited to drug therapy, surgery, or even amputation. Currently, doctors like to first treat the patient with a supervised exercise program along with drug therapy. They have found that exercise along with drug therapy is usually cheaper, safer, and more durable than other treatment options such as surgery. Also, the patient experiences over all physical function benefits (Gardner & Poehlman, 1995).

Despite the fact that smoking is a very limiting factor to PVD patients and it is known that smoking can decrease the benefits of treatment, the relationship between smoking and walking improvements of patients with PVD has not previously been investigated among the cardiac rehabilitation population.

The ability to walk is a much needed activity of daily living. However, many patients suffering from PVD are barely able to walk even one block. Therefore, if one can improve his walking ability, his overall activities of daily living would also improve thus making life much easier.

Need for the Study

Many researchers have studied the effects of smoking on the cardiovascular system and how it is a major risk factor for PVD. However, only one study was found

that looked specifically at the effects of smoking on walking improvements of patients with PVD. The study done by Andrew W. Gardner (1996) tested thirty-eight patients who smoked and 100 patients who had quit smoking seven years before the study on a ramped treadmill protocol to see if there was any difference in time to claudication. The current study expands on this idea by not only testing the subjects initially, but also after three months of exercise in a cardiac rehabilitation program.

Purpose of the Study

The purpose of this study was to determine the effects of smoking on walking improvements in peripheral vascular disease (PVD) patients in a cardiac rehabilitation setting who either currently smoke, quit smoking prior to beginning the exercise program, or do not smoke.

Hypotheses

1. Walking distances will improve over time in all three groups, with the non-smoking group and the ex-smoking group having the greatest improvement.

2. Walking distances will improve more among males than females. Males are at a greater risk for PVD therefore, they will have more of a need for improvement.

3. Walking distances will improve more among the participants who are taking the Pletal medication than the ones who are not medicated.

Limitations of the Study

1. Patients had to be referred to the PVD exercise program by their doctor.

2. When being tested on the Gardner Treadmill Protocol, data is assessed according to the patient's perception of pain and severity.

3. The number of subjects was limited due to the high dropout rate and even death. A total of 91 patients entered the program and 53 patients actually completed three months of the exercise program. A total of 45 patients were in the non-smoking group in which seventeen of them dropped out leaving only 28 to finish the program. A total of 31 patients were in the smoking group of which fifteen of them dropped out leaving only sixteen to finish the program. A total of fifteen patients were in the ex-smoking group of which six dropped out leaving only nine to finish the program.

4. There is significant day-to-day variability when testing patients due to mood, health, and claudication symptoms.

5. There are frequently other factors affecting walking ability such as arthritis, diabetes, high blood pressure, and other cardiovascular problems.

Definition of Terms

Peripheral Vascular Disease: arterial narrowing or obstruction that restricts blood flow to distal tissues.

Intermittent Claudication: walking induced pain in one or both legs that is relieved at rest.

Ankle/Brachial Index (ABI): measurement of ankle systolic blood pressure and brachial systolic blood pressure. Calculated as ankle systolic pressure/brachial systolic pressure.

Actual Claudication Distance (ACD): point at which near-maximal pain is reached while walking.

Non-smoker: patient who has never smoked or who has quit more than five years prior to the exercise program.

Ex-smoker: patient who has quit smoking less than six months prior to the exercise program.

Smoker: patient who is currently smoking while participating in the exercise program.

CHAPTER II

REVIEW OF LITERATURE

This chapter reviews the literature related to PVD, smoking, and how smoking affects exercise training. The first part of the chapter focuses on PVD; exercise programs; exercise testing and prescription for the PVD patient; precautions, limitations, and problems; and lifestyle modifications. The second part of the chapter focuses on smoking and its effects on the cardiovascular system as well as how it is related to peripheral vascular disease and how it affects exercise training. The final part of the chapter is a summary of exercise training on PVD.

Peripheral Vascular Disease

Peripheral vascular disease (PVD) is one of the most significant health problems in the United States today. PVD is very significant because of the prevalence of concomitant coronary and cerebral artery disease (Gardner, 2001). PVD is due to blood clots and narrowed arteries of the lower limbs (Harvard Heart Letter, 1996). PVD occurs from lesions on the abdominal aortic and iliac, femoral, popliteal, and tibial arteries resulting in a reduction in blood flow. This ultimately affects the ambulation and mobility of that specific area.

PVD is a potentially fatal disease, but not usually because of the problems incurred in the legs. Commonly, people diagnosed with PVD, also have arteriosclerosis

in arteries of the heart, brain, or other organs. PVD and the occurrence of atherosclerosis go hand in hand. The association between these two diseases is very strong. It is a caution that medical staff as well as the patient always needs to be aware of during the rehabilitation process. PVD may seem like merely an inconvenience, but it is a major health concern. One must be careful not to ignore signs of PVD, but to seriously focus on proper treatment. Many people attribute the leg pain symptoms that come with PVD to the pains that come with old age. It is very characteristic that these people will have pain or tightness in the back of the calves or thighs. Wherever the patient notes that the pain is, this will determine where the obstruction to blood flow is in the legs (Perry, 2002).

Claudication is a walking-induced pain in one or both legs (specifically in the lower leg or calf region) that does not go away with continued walking and is relieved only by rest (Stewart, Hiatt, et. al., 2002). Walking causes pain in the legs due to a reduction in blood flow caused by arterial obstruction, which then causes a buildup of metabolic waste products. These waste products cause the blood vessels to dilate, which reduces resistance in the vascular system. Due to the inadequacy of the vascular system, oxygen supply is not equal to the demand and there is an unequal amount of vascular resistance between the foot and calf. Blood is then unable to reach the calf muscle which then causes the pain and numbness that one might experience (Hall, et al., 1982). A lack of circulation is the basic underlying problem in these patients. When one has PVD, they have a functional impairment. Many daily activities that once seemed effortless now are done with a great deal of pain. Thus, the main purpose of treating this illness is to

eventually reduce some of this pain and rehabilitate the patient to be better able to perform daily activities (Hall, et al., 1982).

Diagnosis

The ankle brachial index (ABI) is used in the diagnostics of PVD and in finding the severity of PVD disease. This is a painless exam in which the blood pressure in your arms and ankles is checked using a regular blood pressure cuff and a Doppler ultrasound stethoscope. The pressure in your arm is compared to the pressure in your leg to determine how well your blood is flowing and if further tests are needed. If PVD is detected, other tests are administered in order to confirm the diagnosis. Such tests include duplex ultrasound, magnetic resonance angiography (MRA) and computed tomography (CT) angiography (Society of Interventional Radiology, 2003). All of these tests can help determine the severity of the disease in order to determine the appropriate type of treatment.

Treatment

Treatment options are based on the severity of the disease. Severity of disease is better classified using the Fontaine Classification system in which it divides PVD into stages of severity. In the earliest stages of PVD, Stage 1, symptoms may not be apparent. The small amount of reduction in blood flow does not produce symptoms that are obvious and usually remain undetected. As PVD progresses, ischemia in the leg muscles will start to create some noticeable pain. This is termed Stage 2, intermittent claudication. This stage is where a majority of PVD patients in rehabilitation facilities

would find themselves. In the more advanced stages of PVD, the pain that the patient is experiencing is so intense that they experience this pain even at rest. This stage is Stage 3. Progression from this stage will lead to ischemic leg ulcers and gangrene. This is Stage 4. Patients that are diagnosed with either stage 3 or 4 are usually in danger of losing that limb (Gardner, 2001). These patients are candidates for surgery or interventional radiology treatments.

Some interventional radiology treatments include angioplasty, stents, thrombolytic therapy, or stent grafts. Angioplasty is where a tiny balloon is inserted into the blocked blood vessel and is then inflated to open the vessel. Stents are tiny metal cylinders that are inserted into the blocked vessel in order to hold it open. Thrombolytic therapy uses drugs that are delivered to the blocked site and burst the blood clots. A stent graft is a stent covered with synthetic fabric that is inserted into the blood vessels to bypass the blood clot. Some surgical methods of treatment include thrombectomy and bypass grafts. Thrombectomy is only done when the onset of PVD is sudden. This technique inserts a balloon catheter beyond the clot, which is then inflated and pulled back, bringing the clot with it. A bypass graft is a procedure that removes a vein from another part of the body and uses it to create a bypass around the blocked artery (Society of Interventional Radiology, 2003).

If the disease is less severe, exercise therapy is considered first. Physicians recommend exercise for Stage 1 and 2 PVD patients. Claudication, the main effect of PVD patients at lower exercise levels, is the insufficiency of blood reaching the leg muscles. Therefore, exercise helps to increase skeletal muscle metabolism, improve inflammatory responses, increase collateral vessel development, and improve endothelial

vasodilator function. (Ernst, 1991; Gardner, 1997). With or without drug therapy, exercise rehabilitation has been highly effective in improving ambulation in patients with intermittent claudication. Exercise rehabilitation is an important component in the care of patients with PVD because it is safer, cheaper, and more durable than drug therapies, endovascular therapies, and surgery. It also improves overall cardiovascular health. Exercise seems to alleviate most discomfort during the initial claudication, and it prolongs the time before the pain occurs, however if exercise does not alleviate the pain, doctors will use one of the other treatment options (Perry, 2000).

Many doctors will prescribe medications to help lower cholesterol and blood pressure. They may also prescribe medications to help prevent blood clots or reduce the pain of PVD. One drug that is used for claudication is Pletal. Pletal is a medication that is typically given in 50 mg or 100 mg tablets to patients with claudication problems. Pletal causes the arteries to vasodilate, which allows the blood to move through the artery more freely. Pletal also reduces the adherence of platelets so that they do not adhere to the fatty deposits found in the arteries. Therefore, Pletal can be an effective method in relieving the pain of intermittent claudication (Otsuka America Pharmaceutical, 2003). The ability of Pletal to improve walking distance in patients with stable intermittent claudication was studied in eight large, randomized, placebo controlled, double blind trials of twelve to twenty-four weeks duration using dosages of 50 mg BID, 100 mg BID, and a placebo. The effects of Pletal were determined by using an exercise treadmill test to determine change in walking distance and the Walking Impairment Questionnaire to determine patient's perceptions of walking distance and speed. The results showed that patients who were taking 100 mg of Pletal improved their walking distances and speed by

28% to 100%, 50 mg of Pletal improved their walking distances and speed by 20% to 60%, and the placebo group only changed –10% to 30%. Both groups of patients taking the 50 mg and 100 mg reported great improvements in their walking speed and distance on the Walking Impairment Questionnaire, whereas the placebo group reported only minimal change (Otsuka America Pharmaceutical, 2003).

Exercise Programs

Exercise programs have been quite effective in dealing with peripheral vascular disease. However, the length of the exercise program influences the amount of improvement in the initial claudication distance (Gardner, 2001). A study done by Gardner, Katzel, Sorkin, and Goldberg (2002) revealed that an exercise program lasting eighteen months increased initial claudication distance (ICD) by 189% and absolute claudication distance by 80%. They also found that a six-month exercise program has similar results; however, improvements are maintained if the exercise program lasts longer (Gardner et al., 2002). A supervised exercise program is also another big influence for improvement in walking distance and quality of life. Most studies have shown that a supervised program can help double or triple the time to claudication and that improvements are continuously made for up to fifteen months (Golledge, 1997). A study done by Ernst (1991) compared supervised exercise programs to unsupervised exercise programs. With this he found that 70% of patients in the supervised program were symptom-free by program's end whereas only 30% of patients in the unsupervised program were symptom-free.

An exercise program is very beneficial for the PVD patient because it helps improve blood sugar, cholesterol levels, blood pressure, and weight in which all these may lessen leg pain and will improve overall cardiovascular health. The best type of an exercise program is one that includes a weight bearing exercise such as walking on the treadmill. Walking helps because it helps train the artery walls to relax, which widens the area for proper blood flow. It also helps the muscle cells to utilize oxygen and nutrients more effectively along with increasing and improving collateral vessel development. In all walking calms inflammation which helps decrease claudication pain (Harvard Heart Letter, 2003).

Exercise Testing

The best type of exercise test for the PVD patient is a treadmill test since walking is more likely to produce claudication pain. The objectives of a treadmill test for clients with PVD is to assess the distance that it takes for the patient to reach the pain threshold, and also the level of maximum pain that the patient experiences on the treadmill. A pain scale ranging from 0-4, with 0 meaning no pain and 4 meaning maximal pain, is used to assist patients in rating claudication pain while walking. Another reliable measure is the ankle/brachial index, which is when ankle and brachial systolic blood pressures are measured at rest, during exercise, and following exercise. Regular blood pressure and heart rate are also taken during the treadmill test. An exercise test is also done in order to determine whether coronary artery disease is present (Gardner, 1997).

The study by Gardner, Skinner, Cantwell, and Smith (1991) compared the reliability of claudication pain, metabolic measurements and hemodynamic measurements of patients with PVD by using progressive treadmill tests and single-stage treadmill tests. Progressive treadmill tests use a ramped protocol while single-stage tests use a constant speed and grade. They found that disease severity is best assessed with a progressive treadmill test because it increases in intensity gradually whereas the single-stage test has a high intensity from start (Gardner et al., 1991). Therefore, the best type of exercise test used for patients with PVD is a treadmill test with gradual increments in grade. These increments in grade allow claudication times to be compared to disease severity. Most protocols use a constant speed of 2 mph with an increase in grade of 2% every two minutes over a span of time (Gardner, 1997; Montgomery & Gardner, 1998). This test requires the subject to withstand from holding on to the handrails, except for brief moments to maintain balance, because it causes variability in claudication times due to the ability of decreasing the amount of weight on the legs. Patients are also instructed to walk to maximal pain in order to determine disease severity (Gardner, 1997).

Exercise Prescription

A patient with PVD that shows symptoms of claudication needs to be put into an appropriate fitness program. This type of rehabilitative program should be a weight bearing activity, however, a non-weight bearing activity, such as the bicycle or arm ergometer, could act as the warm-up and cool-down (Gardner, 1997).

This program should be designed with a goal towards improving claudication pain symptoms, reducing risk factors, and providing the patient with the ability to perform everyday activities (Gardner, 1997). For PVD patients, the best mode of exercise would be interval walking on the treadmill, simply walking, or stair climbing because the main objective is to use the calf muscles (Barnard & Hall, 1989). Treadmill walking is by far the exercise of choice for PVD patients. Everyone knows how to walk. Secondly, it is an activity that most patients can easily do as long as the speed and grade are adjusted accordingly to the patient's level of activity. Third, the treadmill can be controlled easily and used for retest situations (Barnard & Hall, 1989). With walking on the treadmill, the PVD patient should gradually increase the duration of the workout before increasing the intensity (Gardner, 1997). Once an increase in duration has been achieved, the patient then should increase the grade as opposed to the speed as the workout intensity increases (Collins et al., 2003). Patients should also walk at an intensity that causes pain at a score of 3 on a 4-point scale (Gardner, 1997).

Most researchers feel that developing claudication during exercise is an important needed goal. One should walk to the point of severe claudication, rest until the pain diminishes, then walk again until a total time of 15-30 minutes is completed. One should progress to 40-60 minutes, 6-7 days per week by program end (Bendrick & Buchal, 1989; Ward, Taylor, & Rippe, 1991). This program should also be supervised and last for at least 6 months followed by lifetime maintenance. The patient should progress from 50% of peak exercise capacity to 80% by program's end (Gardner, 2001).

Precautions, Limitations, and Problems

Many PVD patients also have other cardiovascular problems that can affect their exercise program. Some PVD patients have experienced a myocardial infarction, coronary bypass surgery, angina, and pulmonary problems. Patients with PVD also tend to have hypertension, hyperlipidemia, and diabetes (Barnard & Hall, 1989). Since most PVD patients have other risk factors, they may also become short of breath, fatigued, and dizzy while working out. Many patients also have orthopedic limitations such as arthritis, neuropathy, and orthopedic-related pain (Gardner, 1997). These limitations could lead to a further decrease in exercise tolerance. In order to take precaution against these limitations, a physician and an exercise physiologist should be involved during exercise testing, and a nurse and an exercise physiologist should be present during exercise rehabilitation.

During the exercise test the patient should also get a full EKG assessment done to rule out any other cardiovascular problems. Some problems with testing patients with PVD are that there is a day-to-day variability in which they may have more pain on some days than others and that the test is all based on perception of pain in which this is limiting due to the fact that some people rate pain differently than others. If other concomitant co-morbidities are present, exercise should not be performed. These patients should also get a complete medical assessment prior to entering an exercise program (Gardner, A. W., 1997).

Lifestyle Modifications

Before and during an exercise program patients with PVD should quit smoking along with any other form of tobacco product since this increases claudication. Patients should also try to lower their cholesterol and blood pressure by taking their medications and changing their diets. Along with this, they need to also prevent other cardiovascular problems by getting regular checkups, taking the appropriate medications, and joining a fitness program. In the fitness program, weight-bearing activities are best for these patients. The weight bearing activity that most people chose to do is to walk on a treadmill or walk outside. Therefore, exercise with additional lifestyle changes such as quitting smoking, can greatly improve a PVD patient's walking ability (Harvard Heart Letter, 2003; Gardner, 2001).

Smoking

Smoking is one of the most preventable causes of diseases and death in America. Each year about 400,000 people die from diseases caused by smoking and approximately one million people start smoking. A total of 25% of all Americans smoke cigarettes. Smokers have a higher rate of mortality and developing many diseases. The risk for disease and death increases depending on the amount of years one has smoked, how much one smokes, and how deeply one inhales while smoking. There is even a higher risk if one already has heart or blood vessel problems. Nicotine, which is found in the tobacco of cigarettes, increases heart rate and blood pressure and causes the arteries in the

arms and legs to narrow and constrict. This leads to blood clotting which may lead to artery and blood vessel damage. Also, smoking cigarettes involves inhaling carbon monoxide which is a harmful gas that gets into the blood and decreases oxygen going to the different body parts. People who smoke also have a greater chance of developing hardening of the arteries, which increases the risk for stroke (The Care Notes System, 2000). Overall, the more you smoke, the greater your risk for heart disease, cancer, pulmonary diseases, lower bone mineral density, stroke and even death.

However, smokers are at an even greater risk for vascular diseases such as peripheral vascular disease. Recent research has estimated that 70-90% of patients with PVD are smokers at the time of diagnosis (Ronayne, Connor, & Scobie, 1989). One study showed that smoking was found to increase the risk of PVD two to nine times greater compared to non-smokers, and the risk increases with the increase in intensity of the habit (Hughson, Mann, & Garrod, 1978). It has been shown that people who smoke earlier in life tend to have an even more increased risk for PVD than people who began smoking at a later age. Smoking is also related to deterioration and progression to a more severe disease and amputation. In fact smokers tend to be eleven times more likely to need amputation than non-smokers with PVD and are at considerable risk for amputation within five years of diagnosis (Tsiara, Elisaf, & Mikhailidis, 2003; Coffman, 1983; Thomas, 1981). In addition, smokers tend to have more severe claudication pains and symptoms along with lower resting ankle pressures (Christman, Ahijevych, & Buckworth, 2001). Therefore, it is very important for a patient with PVD to stop smoking especially since studies have found that stopping smoking increases walking distance by two to threefold in about 85% of patients with PVD (Tierney, Fennessy, &

Hayes, 2000). Gardner (1996) looked at the effect of smoking on walking improvements of patients with intermittent claudication. The study recruited thirty-eight patients who smoked and 100 patients who had quit smoking seven years before the program. These patients were tested using the ramped treadmill protocol of 2 mph at a 0% grade with a 2% increase every 2 minutes until maximal pain was reached. It was found that the smoking group had more severe pain that occurred one minute and thirty-seven seconds sooner compared to the non-smoking group. They also found that the pain took two minutes and twenty-one seconds longer to subside at rest compared to the non-smoking group (Gardner, 1996).

Studies have found that smoking decreases overall physical function. A study done by Sandvik, Erikssen, and Thaulow (1995) compared 347 male smokers to 791 male non-smokers in physical fitness and lung function. They found that overall physical fitness was substantially lower among smokers than non-smokers along with a decline in lung function over time (Sandvik et al, 1995). Another study done by Bernards, Twisk, Mechelen, Snel, and Kemper (2003) looked at the relationship between smoking and cardiovascular fitness and heart rate response to exercise. They found that cardiovascular fitness and heart rate response are greatly reduced among smokers compared to non-smokers (Bernards et al., 2003).

Summary

PVD is a major health problem affecting many people over the age of 65 that may lead to the development of gangrene and amputation. This is one reason why people with

symptoms of PVD need to get medical assistance immediately in order to get it treated. Walking has been shown to decrease claudication pain by redistributing blood flow due to the increase in collateral vessel formation. This increase in blood flow allows more oxygen to reach the working muscles which decreases claudication pain. Exercise rehabilitation along with lifestyle modifications are effective ways in treating patients with PVD. Exercise not only helps control PVD symptoms, but also helps control other significant diseases, such as hypercholesterolemia and hyperglycemia.

There are many research studies on the benefits of an exercise program for patients with PVD, however there was only one study that looked into the effects of smoking on walking distances of patients with PVD. Therefore, the current study takes into consideration how smoking effects the walking improvements of patients with PVD in a cardiac rehabilitation setting.

CHAPTER III

METHODOLOGY

The purpose of this study was to determine the effects of smoking on walking improvements in PVD patients in a cardiac rehabilitation setting who either currently smoke, quit smoking prior to beginning the exercise program, or do not smoke.

Subjects

Ninety-one subjects gave informed consent to participate in cardiac rehabilitation. However, only fifty-three (25 males, 28 females) of the subjects completed three months of exercise. Fifty-one subjects were Caucasian and two were African-American. There were twenty-eight subjects with a mean age of 74.96 ± 7.14 years (11 males, 17 females) in the non-smoking group, sixteen subjects with a mean age of 67.75 ± 10.09 years (10 males, 6 females) in the smoking group, and nine subjects with a mean age of 60.56 ± 11.5 years (4 males, 5 females) in the ex-smoking group. The mean age for males was 70.12 ± 9.47 years. The females' mean age was 70.54 ± 11.18 years. Of the twenty-eight non-smoking subjects, 24 had high blood pressure, 22 had high cholesterol, and 22 were on Pletal. The smoking group (n=16) included 13 with high blood pressure, 8 with high cholesterol, and 11 on the Pletal medication. The ex-smoking group (n=9) included 5 with high blood pressure, 3 with high cholesterol, and 6 on the Pletal medication. A total of 33 out of 53 patients had high cholesterol (15 males, 18 females) and 42 had high

blood pressure (22 males, 20 females). Thirty-nine out of fifty-three were medicated with 100 mg of Pletal (20 males, 19 females). For those patients taking Pletal, 30 had high blood pressure, 25 had high cholesterol, 22 were non-smokers, 11 were smokers, and 6 were ex-smokers. Fourteen patients were not medicated with Pletal (6 males, 8 females). For the non-medicated patients, 12 had high blood pressure, 8 had high cholesterol, 6 were non-smokers, 5 were smokers, and 3 were ex-smokers.

Participants signed an informed consent to participate in cardiac rehabilitation and filled out a health history questionnaire (Appendix B & C). Both of these forms became part of the patient's medical record. Subjects were included by if they participated in the PVD program at Decatur Memorial Hospital, and if they participated in aerobic exercise three times per week for three months.

All three groups were in a PVD Phase III rehabilitation program that involved aerobic exercise (bicycle, treadmill, arm ergometer) three times per week.

Demographics of the subjects can be found in Tables 1 through 4.

Table 1   Demographic Characteristic Frequency for all Subjects.

Factor	Frequency	Percent
Male	25	47
Female	28	53
Caucasian	51	96
African-American	2	4
Non-Smokers	28	53
Smokers	16	30
Ex-Smokers	9	17
High Cholesterol	33	62
Normal Cholesterol	20	38
High Blood Pressure	42	79
Normal Blood Pressure	11	21
Medicated	39	74
Non-Medicated	14	26

Table 2   Frequencies and Percents for Males and Females.

Factor	Females Frequency	Females Frequency	Males Frequency	Males Percent
High Blood Pressure	22	78.6	20	80
Normal Blood Pressure	6	21.4	5	20
High Cholesterol	15	53.6	18	72
Normal Cholesterol	13	46.4	7	28
Non-Smokers	17	60.7	11	44
Smokers	6	21.4	10	40
Ex-Smokers	5	17.9	4	16
Medicated	20	71.4	19	76
Non-Medicated	8	28.6	6	24

Table 3   Frequencies and Percents for Medicated and Non-medicated.

Factor	Medicated Frequency	Medicated Percent	Non-Med Frequency	Non-Med Percent
High Blood Pressure	30	76.9	12	85.7
Normal Blood Pressure	9	23.1	2	14.3
High Cholesterol	25	64.1	8	57.1
Normal Cholesterol	14	35.9	6	42.9
Non-Smokers	22	56.4	6	42.9
Smokers	11	28.2	5	35.7
Ex-Smokers	6	15.4	3	21.4
Males	19	48.7	6	42.9
Females	20	51.3	8	57.1

Table 4   Frequencies and Percents for Non-smokers, Smokers, and Ex-smokers.

Factor	Frequency	Percent
Non-Smokers		
High Blood Pressure	24	85.7
Normal Blood Pressure	4	14.3
High Cholesterol	22	78.6
Normal Cholesterol	6	21.4
Males	11	39.3
Females	17	60.7
Medicated	22	78.6
Non-Medicated	6	21.4
Smokers		
High Blood Pressure	13	81.3
Normal Blood Pressure	3	18.8
High Cholesterol	8	50
Normal Cholesterol	8	50
Males	10	62.5
Females	6	37.5
Medicated	11	68.8
Non-Medicated	5	31.3
Ex-Smokers		
High Blood Pressure	5	55.6
Normal Blood Pressure	4	44.4
High Cholesterol	3	33.3
Normal Cholesterol	6	66.7
Males	4	44.4
Females	5	55.6
Medicated	6	66.7
Non-Medicated	3	33.3

Exercise Program

Each subject received an orientation to the rehabilitation unit and exercise machines prior to the first exercise session. Correct technique, warm-up, cool-down, stretching, and exercises were taught. All three groups participated in aerobic exercise sessions three times per week within their designated class times. Subjects had to attend at least 80% of the exercise sessions in order to be included in this study. Their exercise sessions consisted of a warm-up on a bicycle, walking on a treadmill, and cooling down on an arm ergometer.

The warm-up following stretching was five minutes on the bicycle. Subjects then walked on the treadmill for a total of 30 minutes in which patients were allowed to walk continuously or in increments with rest in between. The cool-down consisted of five minutes on the arm ergometer.

Exercise Test

Nurses, exercise physiologists, cardiology technicians and cardio-pulmonary assistants within the cardiac rehabilitation unit performed the exercise test. Multiple testers were used due to the number of patients, different class times and work schedules of the employees. The exercise test was done initially prior to beginning the exercise program and after completing three months of the exercise program. The exercise test used was a ramped treadmill protocol called the Gardner Treadmill Protocol (Table 5). This test uses a constant speed of 2mph with an increase in grade of 2% every two

minutes. The first stage of the test is a warm-up at 2mph with 0% grade; however, if the patient is unable to walk that fast, the speed was adjusted to their comfort level. This speed would then stay constant throughout the test. If the patient reached stage nine, the grade was no longer increased. Instead, the speed was increased by 0.5mph every two minutes until the test reached a total of twenty minutes, stage ten. As the test progressed, the patient was instructed to state when he or she first felt any initial sign of claudication symptoms (ICD). The patient was then instructed to state when he or she reached maximal pain (ACD). The time to initial claudication (ICD), time to absolute claudication (ACD), where the symptoms were present, distance in meters, and stage last finished were recorded in the patient's chart. The values from month to month were then compared in order to see any progression within the patient's walking distance.

Table 5   Gardner Treadmill Protocol

Time (min)	Speed (mph)	Grade %	Stage
1	2.0	0	1
2	2.0	0	1
3	2.0	2	2
4	2.0	2	2
5	2.0	4	3
6	2.0	4	3
7	2.0	6	4
8	2.0	6	4
9	2.0	8	5
10	2.0	8	5
11	2.0	10	6
12	2.0	10	6
13	2.0	12	7
14	2.0	12	7
15	2.0	14	8
16	2.0	14	8
17	2.5	14	9
18	2.5	14	9
19	3.0	14	10
20	3.0	14	10

Data Analysis

One-way analyses of variance (ANOVA) were performed to compare the
improvements in walking distance of the three groups initially and posttest. Paired
sample t-tests were also used to compare monthly improvements among the groups
individually. The level of significance was set at $p < .05$.

CHAPTER IV

RESULTS

Introduction

The purpose of this study was to determine the effects of smoking on walking improvements in PVD patients in a cardiac rehabilitation setting who either currently smoke, quit smoking prior to beginning the exercise program, or do not smoke. Comparisons of change in walking distances were made within the three groups as well as between the three groups comparing the means and standard deviations for each of the tests. Comparisons of change in walking distances were also made between males and females and between medicated and non-medicated patients.

Descriptive Statistics of Participants

Ninety-one participants entered the study, however, thirty-eight were excluded from the study due to various reasons. Some were excluded from the study because they were not adherent with their exercise program. Each participant was expected to attend a minimum of 80% of the sessions. Two of the participants died and others decided to drop out due to personal reasons. There was a total of fifty-three subjects aged 43-87 (70.34 ± 10.31 years) who finished the study. These subjects were divided into three groups according to their smoking status. Twenty-eight subjects were in the non-smoking group, sixteen were in the smoking group, and nine were in the ex-smoking

group. Their exercise program consisted of forty minutes a day, three times per week. The exercises that they performed were a five-minute warm-up on the bicycle, thirty-minutes of walking on the treadmill, and a five-minute cool-down on the arm ergometer. Walking distance was tested using the Gardner Treadmill Protocol.

Gender, high blood pressure, high cholesterol, and medicated or not, were also examined in this study. There were a total of twenty-five women and twenty-eight men involved in this study. Of these subjects, 42 (79.2%) had high blood pressure and 33 (62.3%) had high cholesterol. In addition, there were a total of 39 participants (73.6%) who were medicated with Pletal.

Initial walking distance, distance walked after three months of training, and the amount of change in walking distance to claudication are shown in Tables 6 to 8 for the individual subjects in each group.

Table 6 shows that the walking distances increased overall for most of the non-smoking subjects. Only three subjects did not show an increase in walking distance. One decreased by 47 meters, the other by 52 meters, and another decreased by 83 meters. The greatest increase in walking distance was 479 meters.

Table 6   Non-smoking Group Individual Baseline and Posttest Values for

Walking Distances (meters) Including Amount of Change.

Subject #	Walk 1	Walk 2	Change
1	347	532	185
2	606	748	142
3	265	268	3
4	296	400	104
5	187	140	-47
6	350	504	154
7	316	422	106
8	525	473	-52
9	58	157	99
10	112	385	273
11	117	445	328
12	184	426	242
13	896	1108	212
14	443	460	17
15	125	167	42
16	155	362	207
17	71	286	215
18	677	1156	479
19	69	197	128
20	41	388	347
21	446	540	94
22	274	191	-83
23	421	560	139
24	196	400	204
25	346	391	45
26	327	372	45
27	396	601	205
28	285	428	143

Table 7   Smoking Group Individual Baseline and Posttest Values for

Walking Distances (meters) Including Amount of Change.

Subject #	Walk 1	Walk 2	Change
29	154	604	450
30	101	336	235
31	412	855	443
32	134	325	191
33	464	1096	632
34	375	332	-43
35	171	535	364
36	48	67	19
37	747	614	-133
38	445	750	305
39	278	753	475
40	27	638	611
41	22	347	325
42	267	291	24
43	68	97	29
44	570	389	-181

Table 7 shows that the walking distances increased overall for most of the

smoking subjects. Only three subjects did not show an increase in walking distance. One

decreased by 43 meters, the other by 133 meters, and another decreased by 181 meters.

The greatest increase in walking distance was 632 meters.

Table 8   Ex-smoking Group Individual Baseline and Posttest Values for

Walking Distances (meters) Including Amount of Change.

Subject #	Walk 1	Walk 2	Change
45	245	204	-41
46	359	1205	846
47	299	321	22
48	376	543	167
49	37	587	550
50	945	1126	181
51	113	560	447
52	189	288	99
53	238	589	351

Table 8 shows that the walking distances increased overall for most of the ex-

smoking subjects. One subject did not show an increase in walking distance. This

subject decreased by 41 meters. The greatest increase in walking distance was 846

meters.

Statistical Analysis of Differences Between Groups at Baseline, Posttest, and

Change Between Baseline and Posttest

One-way analyses of variance (ANOVA) were performed to compare the

improvements in walking distance of the three groups initially, at posttest, and the

change. The level of significance was set at $p < .05$.

Table 9 displays the baseline, posttest, and the change in means and standard

deviations for the three groups on walking distances.

Table 9   Baseline, Posttest, and Change in Means and Standard Deviations for the

Three Groups on Walking Distances (meters).

GROUP	Baseline	Posttest	Change
Non-Smokers (n = 28)	304.68 (202.351)	446.68 (240.26)	142.000 (127.142)
Smokers (n = 16)	267.69 (215.704)	501.81 (278.91)	234.125 (257.813)
Ex-Smokers (n = 9)	311.22 (261.600)	602.56 (349.96)	291.333 (285.036)
Total (n = 53)	294.62 (213.391)	489.79 (272.95)	195.170 (208.940)

Tables 10 and 11 represent the change scores in walking distances among the

three groups.

Table 10 displays the summary of ANOVA between the three groups for baseline

walking distances. This table shows no significant differences between the three groups

in walking distance.

Table 10   Summary of ANOVA Between the Three Groups for Baseline Walking

Distances (meters).

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	16919.353	2	8459.676	.180	.836
Within Groups	2350937.1	50	47018.742		
Total	2367856.5	52			

Table 11 displays the summary of ANOVA between the three groups for change

in walking distances. This table shows no significant differences between the three

groups in walking distance.

Table 11   Summary of ANOVA Between the Three Groups for Change in Walking

Distances (meters).

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	186663.72	2	93331.861	2.240	.117
Within Groups	2083437.8	50	41668.755		
Total	2270101.5	52			

Hypotheses

In order to test these hypotheses, the Gardner Treadmill Protocol was administered initially, and after 3-months of exercise. This test examined how far the patient could walk until maximal claudication pain was present. The value that was recorded and compared from month to month was the distance, recorded in meters, at which the time to absolute claudication occurred.

There was no significant difference in changes in walking distance between the non-smoking, ex-smoking, and smoking groups before the commencement of the exercise program and after 3-months of exercise.

Hypothesis One

Since all three groups exercised for forty minutes, three times a week for three months, it was hypothesized that walking distances would improve for all three groups. It was also hypothesized that the non-smoking group and ex-smoking group would make the most improvements in walking. Paired sample t-tests were performed to determine if the difference in walking distance from the initial walk to posttest walk was significant in each of the three groups. The level of significance was set at $p < .05$. As shown in Table

12 and Figure 1, the groups as a whole significantly increased in walking distances. As shown in Table 13, the non-smoking group had a significant increase in walking distance, while the increase in distance by the smoking and ex-smoking groups was not significant (Tables 14 and 15).

Table 12 displays the difference in walking distance from the initial walk to posttest walk of all the groups as a whole.

Table 12 Difference in Walking Distance (meters) from the Initial Walk to Posttest Walk of all the Groups as a Whole.

Group (n = 53)	Mean	Standard Deviation	t	Significance
Walk 1	294.62	213.39	-6.800	.000
Walk 3	489.79	272.95		

Figure 1 displays the difference in walking distance from the initial walk to posttest walk of all the groups as a whole.
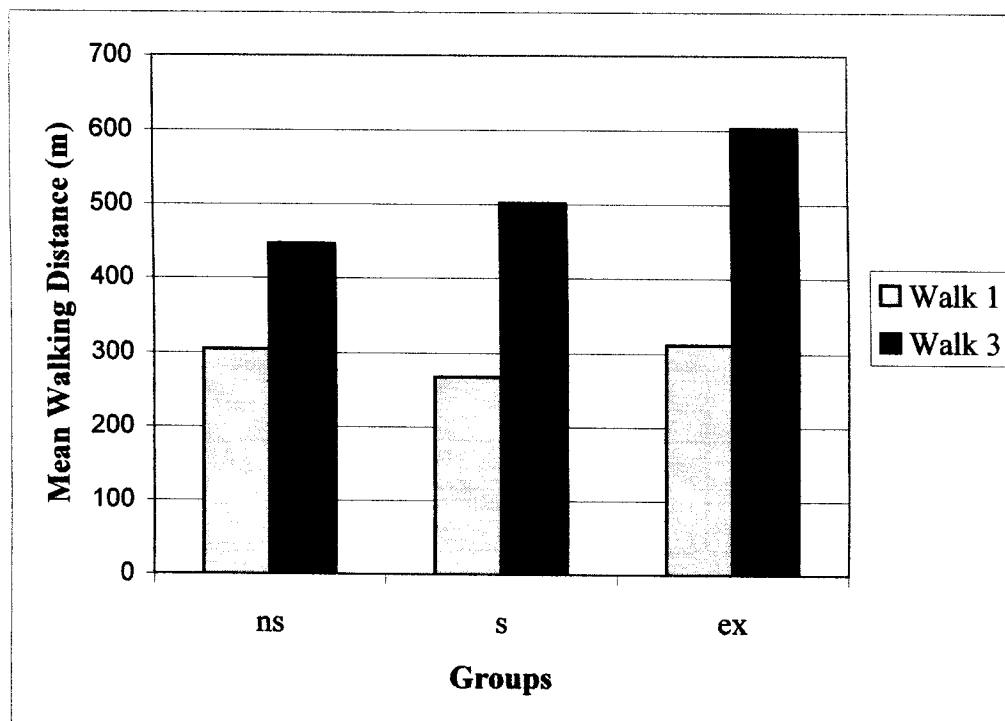
Figure 1   Difference in Walking Distance (meters) from the Initial Walk to

Posttest Walk of all the Groups as a Whole.

Table 13 displays the difference in walking distance from the initial walk to

posttest walk of the non-smoking group.

Table 13   Difference in Walking Distance (meters) from the Initial Walk to Posttest

Walk of the Non-smoking Group.

Non-smokers (n = 28)	Mean	Standard Deviation	t	Significance
Walk 1	304.68	202.35	-5.910	.000
Walk 3	446.68	240.26		

Table 14 displays the difference in walking distance from the initial walk to posttest walk of the smoking group.

Table 14   Difference in Walking Distance (meters) from the Initial Walk to Posttest Walk of the Smoking Group.

Smokers (n = 16)	Mean	Standard Deviation	t	Significance
Walk 1	267.69	215.70	-3.632	.059
Walk 3	501.81	278.91		

Table 15 displays the difference in walking distance from the initial walk to posttest walk of the ex-smoking group.

Table 15   Difference in Walking Distance (meters) from the Initial Walk to Posttest Walk of the Ex-smoking Group.

Ex-smokers (n = 9)	Mean	Standard Deviation	t	Significance
Walk 1	311.22	261.60	-3.066	.088
Walk 3	602.56	349.96		

<u>Hypothesis Two</u>

One risk factor of PVD is being male. PVD occurs more in males. Therefore, it was hypothesized that males would improve more in walking distance than females since they have more room for improvement. As shown in Tables 16 and 17, gender has no effect on improvements in walking distance.

Table 16 displays the baseline, posttest, and change of means and standard deviations for males and females on walking distances.

Table 16   Baseline, Posttest, and Change of Means and Standard Deviations for Males and Females on Walking Distances (meters).

Group	Baseline	Posttest	Change
Male (n = 25)	347.84 (214.624)	533.68 (298.58)	185.840 (195.561)
Female (n = 28)	247.11 (204.425)	450.61 (246.69)	203.500 (223.452)
Total (n = 53)	294.62 (213.391)	489.79 (272.95)	195.170 (208.940)

Table 17 displays the summary of ANOVA between males and females for baseline walking distances. This table shows no significant differences between males and females in walking distance.

Table 17   Summary of ANOVA Between Males and Females for Baseline Walking Distances (meters).

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	134018.41	1	134018.414	3.060	.086
Within Groups	2233838.0	51	43800.746		
Total	2367856.5	52			

Table 18 displays the summary of ANOVA between males and females for change in walking distances. This table shows no significant differences between males and females in walking distance.

Table 18   Summary of ANOVA Between Males and Females for Change in Walking

Distances (meters).

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4119.112	1	4119.112	.093	.762
Within Groups	2265982.4	51	44431.027		
Total	2270101.5	52			

Hypothesis Three

Pletal is a medication that many patients with PVD take. This medication, along with exercise therapy, tends to diminish the severity of claudication pain associated with PVD. Therefore, it was hypothesized that participants on the Pletal medication would have better improvements in walking distance. As shown in Tables 19 through 21, there was no significant change in walking distance between participants who were medicated with Pletal compared to participants who were not medicated.

Table 19 displays the baseline, posttest, and change of means and standard deviations for the medicated and non-medicated groups on walking distances.

Table 19   Baseline, Posttest, and Change of Means and Standard Deviations for the

Medicated and Non-medicated Groups on Walking Distances (meters).

Group	Baseline	Posttest	Change
Non-Medicated (n = 14)	266.07 (244.580)	458.50 (240.556)	192.429 (196.925)
Medicated (n = 39)	304.87 (203.567)	501.03 (285.762)	196.154 (215.567)
Total (n = 53)	294.62 (213.391)	489.79 (272.946)	195.170 (208.940)

Table 20 displays the summary of ANOVA between the medicated and non-medicated groups for baseline walking distances. This table shows no significant differences between the two groups in initial walking distance.

Table 20   Summary of ANOVA Between the Medicated and Non-medicated Groups for Baseline Walking Distances (meters).

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	15509.165	1	15509.165	.336	.565
Within Groups	2352347.3	51	46124.457		
Total	2367856.5	52			

Table 21 displays the summary of ANOVA between the medicated and non-medicated groups for change in walking distances. This table shows no significant differences between the two groups in walking distance improvement.

Table 21   Summary of ANOVA Between the Medicated and Non-medicated Groups for Change in Walking Distances (meters).

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	142.966	1	142.966	.003	.955
Within Groups	2269958.5	51	44508.990		
Total	2270101.5	52			

Conclusion

This data supports the hypothesis that states that walking distances will improve among all three groups over the three-month time span. However, the data refutes the hypothesis that the non-smokers and ex-smokers, men, and medicated participants would improve the most. They did increase in walking distance, however, there was no significant difference found between the groups.

CHAPTER V

DISCUSSION, SUMMARY, CONCLUSIONS, & RECOMMENDATIONS

Discussion

The purpose of this study was to determine the effects of smoking on walking improvements of patients with PVD by looking at patients in a cardiac rehabilitation setting who either currently smoke, quit smoking prior to beginning the exercise program, or do not smoke.

Very little research has been completed on the effects of smoking on walking improvements of patients with PVD within a cardiac rehabilitation setting. The researcher could find no study similar to hers. The majority of literature review focused primarily on the basics of PVD and the benefits of exercise programs on PVD patients. Although this study differs in design from previous studies, there was one study that was similar; however, the results contradict this study.

In this study, it was found that all three groups improved in walking distances overall; however, there was no single group that significantly improved more over the other. There was also no significant difference in walking improvements of men and women and no differences between patients on medication and those who are not medicated.

One similar study done by Gardner (1996) found that patients who smoke reach their time to claudication quicker than non-smokers and that the pain takes longer to

subside at rest longer than the non-smokers. The difference between Gardner's study and this study is that Gardner's study was a one time measurement, whereas, this study looked at improvements over time. Therefore, comparison between the studies should be limited.

All of the PVD articles reviewed, showed that patients in a walking program do improve their walking distances over time. These findings compared with the results from this study, however were not good comparisons since those studies did not break the groups up into the three groups such as this study.

This study also showed that there is no difference in walking distance between males and females. There was no single study that looked into this factor even though being male is a risk factor. It is assumed that being male is a risk factor because PVD is more frequently seen in males.

Pletal was another factor considered. This study showed that walking improvements were not affected by Pletal, which refutes a previous study that was presented by Otsuka America Pharmaceuticals (2003). They found that patients who were taking 100 mg of Pletal improved their walking distances and speed by 28% to 100%, 50 mg of Pletal improved their walking distances and speed by 20% to 60%, and the placebo group only changed –10% to 30%, however this study found no differences between patients who were medicated and non-medicated. This could be due to a small sample size of participants.

Summary

This study was conducted to determine the effects of smoking on walking improvements of patients with PVD within a cardiac rehab setting. It was performed to determine if there were differences in walking improvements among individuals who either smoke, do not smoke, or quit smoking prior to the exercise program.

There were fifty-three subjects divided into three groups, non-smoking, ex-smoking, and smoking. Their exercise program consisted of forty minutes a day, three times per week. The exercises that they performed were a warm-up on the bicycle, walking on the treadmill, and a cool-down on the arm ergometer. Walking distance was tested using the Gardner Treadmill Protocol.

Comparisons of change in walking distances were made within the three groups as well as between the three groups comparing the means and standard deviations for each of the tests. Comparisons of change in walking distances were also made between males and females and whether they were on medication or not.

A one-way analysis of variance (ANOVA) was used to determine any statistically significant differences between the changes in walking distances of the three groups. A probability level of 0.05 was used to denote statistical significance for this study. A one-way analysis of variance was also used to determine whether the three groups were significantly different prior to beginning the exercise program.

Summary

This study was conducted to determine the effects of smoking on walking improvements of patients with PVD within a cardiac rehab setting. It was performed to determine if there were differences in walking improvements among individuals who either smoke, do not smoke, or quit smoking prior to the exercise program.

There were fifty-three subjects divided into three groups, non-smoking, ex-smoking, and smoking. Their exercise program consisted of forty minutes a day, three times per week. The exercises that they performed were a warm-up on the bicycle, walking on the treadmill, and a cool-down on the arm ergometer. Walking distance was tested using the Gardner Treadmill Protocol.

Comparisons of change in walking distances were made within the three groups as well as between the three groups comparing the means and standard deviations for each of the tests. Comparisons of change in walking distances were also made between males and females and whether they were on medication or not.

A one-way analysis of variance (ANOVA) was used to determine any statistically significant differences between the changes in walking distances of the three groups. A probability level of 0.05 was used to denote statistical significance for this study. A one-way analysis of variance was also used to determine whether the three groups were significantly different prior to beginning the exercise program.

Conclusions

This study revealed that all three groups improved in walking distances over the three month time period. However, even though all three improved, no group significantly improved over the other. There was no significant difference in walking distance between the non-smoking, ex-smoking, and smoking groups before the commencement of the exercise program, and after 3-months of exercise. There was also no significant difference in the amount of change in walking distance between the three groups. There also was no significant difference between males and females and medicated and non-medicated.

Paired sample t-tests showed that the non-smoking group significantly improved from the initial test to 3-month test with a mean increase of 142.00 meters. The smoking group did not significantly improve even though they improved by 234.13 meters from the initial test to 3-month test. The ex-smoking group also did not significantly improve even though they improved by 291.33 meters. This probably did not show a significance because of the small sample size and large amount of variability. Overall, all three groups as a whole significantly improved (p = .000) from the initial test to 3-month test with a mean increase of 195.17 meters.

This study was specifically interested in the relationship between smoking and walking distance of patients with PVD. As stated before, this study revealed that all three groups improved in walking; however, no group improved significantly more than the other.

Recommendations

Based on the findings from this study the following are recommendations for further study in the area of smoking and PVD within a cardiac rehabilitation population.

1. Sample size:

    A large sample size is needed in order to adequately analyze data through a computing system. Significance was only displayed when there was a large change in walking distance. A small sample size made the t-test not as sensitive to pick up small changes that did occur in which most of these distances were very significant in change.

2. Limitations:

    Patient limitations such as other diseases need to be looked into because these could have more of a debilitating role on walking distance than perhaps PVD. Therefore, work is needed to refine which exercise program is appropriate for patients with other debilitating diseases along with PVD.

4. Exercise Programs:

    Further research is needed to refine which exercise regimens are most beneficial to patients with PVD.

5. Groups:

    When comparing different groups, the group size needs to be similar so that a comparison could be made easier. Age and gender may make a difference as well. Groups need to be coordinated in order to have subjects of the same age because if one group is primarily younger than the other, then age may possibly

be the biggest factor affecting PVD rather than disease severity caused by smoking. Gender would have the same effects as well. So further research should divide groups equally in size, with the same age and gender in order to make a perfect comparison. There should also be a control group to see if exercise plays in the role for improvement of walking.

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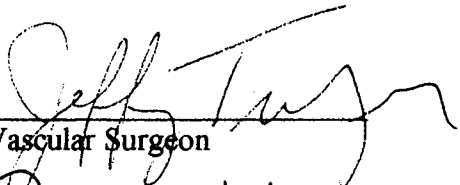
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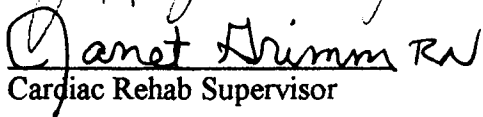
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APPENDICES

Appendix A

As medical supervisor of the Peripheral **Vascular Disease** exercise program of Decatur

Memorial Hospital's cardiac rehab allow **Rachelle Cook**, **Physical** Education graduate

student of Eastern Illinois University, to **use the exercise and** medical data of patients in

the peripheral vascular disease exercise **program for completion** of her thesis.

_____   12/1/03
Vascular Surgeon   Date

_____   11-24-03
Cardiac Rehab Supervisor   Date

Appendix B

Decatur Memorial Hospital
2300 North Edward Street
Decatur, Illinois 62526

1. Consent for Treatment. I am asking for and consent to care at Decatur Memorial Hospital. I agree to receive this care including (1) diagnostic procedures (which may include anatomic or clinical laboratory tests and X-ray examination), (2) surgical and medical treatment, and (3) blood transfusion. I permit the doctor who attends me, his or her associates and assistants, hospital-based physicians, the Hospital and its employees, and all other persons caring for me in the Hospital to treat me in ways they judge are beneficial to me. No guarantees have been made to me about the outcome of this care. If I should leave the Hospital without the consent of my attending doctor, the doctor and the Hospital are relieved of all responsibility for any ill effects which might result from my action.

You are notified that the hospital-based physicians, e.g., emergency physicians, pathologists, radiologists, and anesthesiologists, as well as other physicians, are independent contractors and not employees or agents of the Hospital. For a list of those physicians who are not employees or agents of the Hospital, please contact the Hospital's medical staff office at 217-876-2115.

The undersigned acknowledged that he/she has read the consent for treatment and conditions of admission listed above, receiving a copy of this form, and further acknowledges that he/she is the patient or is duly authorized by the patient as legal representative to execute and accept the terms as set forth above.

2. Release of Information. The Hospital may disclose all or any part of my hospital record to any person or corporation, including the Social Security Administration, which is or may be liable under a contract for all part of the Hospital's or other physician's charges. The Hospital may complete and submit any insurance forms submitted by me or others in connection with this hospitalization and may review my hospital records for purposes of discharge planning, clinical research and quality assurance.

3. Financial Disclosure Statement and Financial Agreement. This is a Financial Agreement obligating me to pay all Hospital and physician charges, including any professional component services. Professional component services are laboratory and other services that are non-patient specific services. I further understand I am personally responsible for any unpaid health insurance deductibles, co-insurance and non-covered services. There will be NO FINANCE CHARGE and NO ANNUAL PERCENTAGE RATE under this Financial Agreement, but I will be responsible for court costs and attorneys fees incurred by the Hospital or other physicians in connection with collection of the account. I agree, whether I sign as agent, relative or as patient, to pay the Hospital's and physician's account for services rendered to the patient in accordance with its regular terms.

4. Authorization to Pay Insurance Benefits. I certify that all information given by me in applying for payment under Title XVIII of the Social Security Act (Medicare) is correct, and I authorize release of any of this information needed to act on this request. I further request that payment of authorized benefits be made in my behalf. I hereby assign, transfer and set over to the following parties all of my rights, title, and interest to Medical Reimbursement Benefits (Basic and Major Medical) under the insurance policies listed on my admission form in an amount sufficient to pay my indebtedness to:

1. Decatur Memorial Hospital
2. Hospital Based Physicians and Other Physicians, e.g., independent contractors
3. Treating Physicians/Physician Extenders for whom Decatur Memorial Hospital is authorized to bill.

Signature of patient or legal representative if patient is a minor or physically unable to sign

Relationship

Witness

Date

Person Responsible for Payment

Relationship

Witness

Date

Appendix C

DECATUR MEMORIAL HOSPITAL
CENTRAL ILLINOIS HEART AND LUNG INSTITUTE
CARDIAC REHABILITATION
ADMISSION ASSESSMENT FORM
(Please Print and Complete Thoroughly in Black or Blue Ink)

NAME:	DATE:	DATE OF BIRTH:	AGE:

PHYSICIAN: CARDIOLOGIST:

ALLERGIES:

PAST MEDICAL HISTORY - Have you ever had any problems with the following? Check **Y** for **Yes** or **N** for **No**.

Y ☐ N ☐	Heart Attack Date	Y ☐ N ☐	High Blood Pressure	Y ☐ N ☐	High Cholesterol	Y ☐ N ☐	Peripheral Vascular Disease	Y ☐ N ☐	Stroke
Y ☐ N ☐	Chronic Lung Disease	Y ☐ N ☐	Asthma	Y ☐ N ☐	Emphysema	Y ☐ N ☐	Tuberculosis	Y ☐ N ☐	Kidney
Y ☐ N ☐	Anemia	Y ☐ N ☐	Blood Transfusions	Y ☐ N ☐	Hepatitis	Y ☐ N ☐	Diabetes	Y ☐ N ☐	Infectious Disease
Y ☐ N ☐	Thyroid	Y ☐ N ☐	Colon / Stoma	Y ☐ N ☐	Bladder / Prostate	Y ☐ N ☐	Hiatal Hernia	Y ☐ N ☐	GI reflux / Indigestion
Y ☐ N ☐	Cancer	Y ☐ N ☐	Arthritis-name joint affected:	Y ☐ N ☐	Epilepsy / Seizure	Y ☐ N ☐	Glaucoma	Y ☐ N ☐	Clinical Depression

CHECK BELOW IF YOU'VE HAD THE FOLLOWING PROCEDURES. WRITE THE DATE IN THE BOX PROVIDED.

	Date:		Date:		Date:
☐ Angioplasty (Balloon)		☐ Stent		☐ Bypass Surgery	
☐ Pacemaker		☐ Automatic Internal Defibrillator		☐ Heart Catherization Results:	

Other Surgeries and/or Procedures: _____

_____

MEDICATIONS	MEDICATIONS	
_____	_____	FOR STAFF ONLY Patient received medication education / pharmacy notified Date / Initial Verbal / written info provided Date / Initial
_____	_____	
_____	_____	
_____	_____	
_____	_____	

Do you wish to see to a Pharmacist about your medications? ☐ Yes ☐ No

Do you have chest discomfort? ☐ Yes ☐ No If yes, please describe: _____

Do you have Congestive Heart Failure? ☐ Yes ☐ No   If yes, please describe: _____

Has anyone in your family developed heart problems before the age of 60? ☐ Yes ☐ No
Who: _____

Have you had a recent stress test? ☐ Yes ☐ No Where? _____ Date: _____

ur vvomen.

Could you be pregnant? ☐ Yes ☐ No   When was your last period? _____

Have you had a recent onset of weakness or difficulty with walking? ☐ Yes ☐ No

Do you need assistance with stairs? ☐ Yes ☐ No   Walking? ☐ Yes ☐ No   Transfers? ☐ Yes ☐ No

	FOR STAFF ONLY
What physical activities are you currently doing at home and/or work?	
What exercise equipment do you own? _____ Do you have any muscle or bone problems? ☐ Yes ☐ No Explain: _____ Are you presently employed? ☐ Yes ☐ No Occupation: _____ When do you expect to return to work? _____ Will there be any work restrictions such as lifting or extreme temperature? _____ Are you retired? ☐ Yes ☐ No	If inactive, initiate teaching protocol. Date/initial
Have you ever smoked? ☐ Yes ☐ No Are you currently smoking? ☐ Yes ☐ No When did you quit? _____ If yes, how many packs a day? _____ How many years? _____ Do you need help to stop smoking? ☐ Yes ☐ No Would be interested in a smoking cessation program? ☐ Yes ☐ No Do you drink alcohol? ☐ Yes ☐ No If yes, how much in a week? _____ Do you take any non-prescribed medication or street drugs? ☐ Yes ☐ No	If smoking, provide education. Initiate teaching protocol. Date/initial
Are you hearing impaired? ☐ Yes ☐ No Do you have vision problems? ☐ Yes ☐ No Do you primarily speak a language other than English? ☐ Yes ☐ No Are there any special needs Pastoral Services can help with? ☐ Yes ☐ No Are you under a great deal of stress? ☐ Yes ☐ No	If stress, initiate teaching protocol. Date/initial. Pastoral Services consult. Date/initial
Do you need further education about your diet? ☐ Yes ☐ No Do you currently monitor cholesterol in your diet? ☐ Yes ☐ No What is your total cholesterol? _____ HDL _____ LDL _____ Triglycerides _____ Do you consider yourself overweight? ☐ Yes ☐ No	If elevated lipids and BMI > 25, initiate teaching protocol. Date/initial. Does pt appear emaciated? Dietary consult. Date/initial
Are you afraid of anyone? ☐ Yes ☐ No Do you feel safe with the person you live with? ☐ Yes ☐ No ☐ Live alone	Social Services consultation Date / Initial
What are your goals for Cardiac rehab? _____ Check Your Risk Factors for Heart Disease: ☐ High Blood Pressure ☐ High Cholesterol ☐ Smoking ☐ High Triglycerides (Lipids) ☐ Obesity ☐ Diabetes ☐ Inactive Lifestyle ☐ Family History ☐ Stress ☐ Menopause	High Risk Moderate Risk Low Risk refer to risk stratification tool.

Signature: _____   Date: _____

Reviewed by: _____   RN/EP