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IDENTIFICATION IN POST-MYOCARDIAL INFARCTION PATIENTS OF SIGNIFICANT CHARACTERISTICS THAT WOULD DIFFERENTIATE BETWEEN CARDIAC REHABILITATION PARTICIPANTS AND NONPARTICIPANTS IN A MEDIUM SIZED COMMUNITY HOSPITAL

A Dissertation

Presented for the

Doctor of Philosophy

Degree

The University of Tennessee, Knoxville

Mary Belle Hall

March 1979

1379296

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DEDICATED

TO

my husband, Bob, and to our sons,

Britt and Tim—for their love, help, and encouragement

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ABSTRACT

The purpose of this study was to determine and quantify from a pre-selected group the sets of variables that would best differentiate between cardiac rehabilitation participants and nonparticipants in a medium sized community hospital.

The sample consisted of all male patients who had been discharged with a diagnosis of myocardial infarction from East Tennessee Baptist Hospital between February 1, 1976, and September 1, 1977. Sixty-eight patients (20 who had participated in the Heart Center program and 48 who had not) agreed to participate in the study. Data were collected from the individuals at three times: Time One (hospital admission for myocardial infarction), Time Two (3 months post-myocardial infarction), and Time Three (6 months post-myocardial infarction). The following items of information were obtained when available from hospital charts and physicians' office records: age, number of myocardial infarctions, participation or nonparticipation in Heart Center program, presence of cigarette smoking, height, weight, systolic blood pressure, diastolic blood pressure, presence of angina, presence of diabetes, subsequent myocardial infarctions, electrocardiogram abnormalities, and blood measurements of creatinine phosphokinase, hemoglobin, hematocrit, blood glucose, and lipoproteins. Questionnaires were also sent to the participants.

The data were analyzed by regressing group participation and nonparticipation on sets of the independent variables using multiple

linear regression. This was done in order to determine and quantify the best predictor variables differentiating the groups. Chi-square was used on the non-numerical variables. In addition, the groups were compared over time to detect changes and differences in the changes. The responses from the questionnaires were compiled and comparisons made between the groups. This information gave some insight into the patient's present status, subjective feelings, and work status.

The variables from Time One that were most significantly related to eventual participation or nonparticipation represented by a relationship at the 0.01 level of significance were age and alpha (High Density Lipoproteins), beta (Low Density Lipoproteins), and pre-beta (Very Low Density Lipoproteins). Alpha, beta, and pre-beta represented the electrophoretic fractionalization of cholesterol. Phenotype (lipoprotein profile) contributed substantially to the regression model but not at the 0.01 level. R^2 for the equation was 0.675. A relationship was also demonstrated between the groups and the variables of subsequent myocardial infarctions (subsequent to Time Three up to completion of questionnaire), Q waves in the lateral location, and Q waves in the inferior location. This equation represented a level of significance at 0.0147 with an R^2 of 0.150.

There were no differences at the 0.01 level between the groups with respect to the non-numerical, indicator variables as demonstrated by Chi-square; however, there were differences at the 0.10 level or below with respect to Q waves in the inferior location, Q waves in the lateral location and CPKII enzyme.

There were no differences in the groups relative to the independent variables from Time One to Time Two and from Time One to Time Three; however, marked differences were present in the groups with respect to return to work and symptoms experienced. According to the questionnaire responses, 71 percent of the participants had returned to work within 6 months of their heart attack whereas this figure was 37 percent for the nonparticipants. Forty-seven percent of the Heart Center group stated they were having no symptoms of pain or shortness of breath; only 15 percent of the nonparticipants stated they were having no symptoms. The Heart Center group had had no subsequent myocardial infarctions whereas the nonparticipants' group had had 6. However, this difference was not significant.

Based on the analysis of the data, it was concluded that the most significant variables differentiating between the groups were age, alpha (HDL), beta (LDL), and pre-beta (VLDL) in that order. There were no significant differences in the groups over time. According to the questionnaire responses, the Heart Center group returned to work sooner and experienced fewer symptoms.

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CHAPTER I

INTRODUCTION

For more than 50 years cardiovascular diseases have been the major cause of death in this country. In 1975 they accounted for more than 50 percent of all deaths which was nearly three times the death rate from cancer, the second highest cause. Cardiovascular diseases cause two-thirds of all deaths among people over 65 years of age. Approximately 30 million persons in the United States have diseases of the heart and blood vessels; these diseases result in a tremendously high burden of acute and chronic disability and illness (78:2).

The further tragedy of heart disease is that loss of life is often during the years of peak production and responsibility. The annual cost of heart disease death and disability in the United States is estimated at more than $30 billion.

International statistics show that the United States is second only to Finland in the death rate from heart disease. On the other hand in Sweden, a country with many similarities to the United States and Finland, the death rate is less than one-half that of the United States. These statistics indicate that a high death rate from arteriosclerotic heart disease may not be necessary or inevitable (80:1-3).

The predominant form of heart disease in the adult population in the United States and the largest single cause of death from cardiovascular disease is that heart disease associated with arteriosclerosis of the coronary arteries. In 1975, coronary heart disease was responsible

for about 642,000 deaths in this country and was the leading cause of death in men over 40 and in women over 60. Approximately 170,000 persons below age 65 die each year of coronary heart disease with as many as 2.5 million Americans below the age of 65 being afflicted with chronic coronary disease (80:30,2).

One of the first symptoms occurring in coronary heart disease may be angina pectoris. This occurs when a deposit of fatty substances (cholesterol and fats) have built up within the wall of a vital coronary artery and the channel for the blood flow becomes occluded (66:92). The individual usually feels pain beneath the upper sternum which often is transferred to surface areas of the body, namely, the left arm and left shoulder. Frequently, the neck and even the side of the face may be involved (33:329). In the initial stages the pain may only occur during marked emotional stress or severe exertion which causes increased blood pressure and heart rate. This occlusion of coronary arteries also increases the work load of the heart and augments its need for oxygen. In a normal situation the coronary arteries open more widely to provide more blood to the heart to meet increasing demands. However, if the artery is narrowed, it is unable to widen further, and the area of heart muscle supplied by that artery receives insufficient oxygen. This causes the squeezing pain behind the breastbone (angina pectoris) or the pressure sensation. No permanent damage to the muscle is produced by this mechanism, although frequent attacks of angina indicate a likelihood of developing acute coronary occlusion (66:92,33:329).

Another major manifestation of coronary heart disease is a myocardial infarction or M.I. This occurs in the event that the

fatty deposit may become of sufficient size to completely block a coronary artery. This same condition may also occur if a blood clot forms at the site of a fatty deposit in the blood vessel wall. Thus, if the extreme narrowing or blockage occurs, the zone of heart muscle which is ordinarily supplied with blood by that particular artery is now deprived of its oxygen supply; it becomes permanently damaged or dies. At that time severe chest pain will usually be present and may last for several hours. In some instances death will occur, usually as a result of cardiac arrhythmias or cardiac arrest which may accompany the coronary artery obstruction (66:95-96).

The other manifestation of coronary occlusion is sudden death. It can occur from the following causes after an acute myocardial infarction: decreased cardiac output, fibrillation of the heart, and rupture of the heart.

Decreased cardiac output can occur when cardiac muscle fibers are either nonfunctioning or too weak to contract with much force. The overall pumping strength of the affected ventricle is decreased. Then when the normal portions of the ventricular muscle contract, the ischemic muscle is forced outward by the pressure that develops inside the ventricle. Thus much of the pumping force of the ventricle is dissipated by bulging of the nonfunctioning area. When the heart becomes incapable of contracting with enough force to pump blood into the system, cardiac failure and death results. This is usually called coronary shock or cardiac shock. Rupture of the infarcted area may occur from the degeneration of dead muscle fibers and the thinning of

the dead heart musculature. If this happens, the muscles are stretched beyond their capacity; the heart ruptures and the patient dies.

Many persons who die following a coronary occlusion die from ventricular fibrillation. This is especially common following a large infarction, but fibrillation may occur following a small occlusion. The four main factors that may lead to fibrillation are the following:

1. Acute loss of blood supply to the cardiac muscle causes rapid depletion of potassium from the ischemic heart musculature. This causes an increase of potassium concentration in the extracellular fluids surrounding the cardiac muscle fibers which in turn increases the irritability of the cardiac musculature.
2. Ischemia of the heart muscle causes an "injury current" which elicits abnormal impulses and can cause fibrillation.
3. Sympathetic reflexes following massive infarction occur because of the lack of adequate blood volume to the arterial tree. This sympathetic stimulation increases the irritability of the cardiac muscle.
4. The myocardial infarction itself can cause the ventricle to dilate excessively therefore causing abnormal conduction pathways around the damaged area of the heart (33:326-327).

Although some medical authorities believe that the incidence of coronary heart disease is still increasing rapidly (81), current estimates indicate that the death rate from the disease has decreased (82:99,56,83,14,29). From 1968 to 1975 the death rate from this

disease declined by 18 percent. The causes for this apparent favorable change were difficult to define although the recognition of better techniques of the management of in-hospital manifestations of coronary heart disease were important. Also important were the points made by Walker (83:1047):

> The Surgeon General's Report on Smoking and Health and the vigorous educational program against risk factors by the American Heart Association coincided with the onset of the change in mortality trend. This encouraging fact should lead to redoubled efforts to prevent atherosclerosis. However, the reported gains are small; the magnitude of the problem is vast.

Even though progress was being seen and some of the most recent data were encouraging, it was necessary to continue to stress research directed toward further improvements in the management of coronary heart disease. The National Heart, Blood and Lung Institute set a number of program goals for its research on coronary heart disease. Two of the goals are quoted as follows (78:60):

1. Develop information that will lead to improved diagnosis, prevention, therapy, rehabilitation and understanding of the mechanism resulting in symptomatic coronary disease.
2. Develop and evaluate rehabilitation methods used to improve cardiovascular function, to reduce physical and psychosocial disability, and to enhance and prolong the effective life of patients with cardiovascular disease.

I. PURPOSE

The purpose of this study was to identify (in post-myocardial infarction patients) significant characteristics that would differentiate between cardiac rehabilitation participants and nonparticipants in a medium sized community hospital.

II. PROBLEM

The problem was to determine and quantify from a pre-selected group the sets of variables that would best differentiate between participants and nonparticipants (in the cardiac rehabilitation program) for possible predictive purposes.

III. NEED FOR THE STUDY

In order to make progress in rehabilitation programs, evaluation must be used to assess their effectiveness. This evaluation should include both patient-oriented and program-oriented assessments (44). This patient-oriented study was done in order to determine the effect, if any, on individuals who had participated in the newly developed East Tennessee Baptist Hospital Health Center program as compared with those who had not. The investigation included the need to obtain both objective data from patients' charts and subjective information from questionnaires completed by patients. This type of study was needed in order to assist those involved in present and future planning of the programs for cardiac patients at East Tennessee Baptist Hospital.

IV. HYPOTHESES

The following null hypothesis was formulated and tested by the appropriate procedures: There were no significant differences between the cardiac rehabilitation participant group and nonparticipant group with respect to the following list of variables:

1. Age recorded in years
2. Number of myocardial infarctions (MI)
3. Cardiomegaly on chest X ray—No, Probable, or Definite—CAR
4. Systolic blood pressure—Millimeters Hg—SYS
5. Diastolic blood pressure—Millimeters Hg—DIA
6. Serum Cholesterol—mg/dl—CHOL
7. Beta Cholesterol—mg/percent—BCHOL
8. Chylomicrons—Percent—CHYLO
9. Beta—Percent—BETA
10. Prebeta—Percent—PBETA
11. Alpha—Percent—ALPHA
12. Phenotype—Normal, Type II, Type IV—PHENO
13. Cigarette smoking—No, Yes—CIG
14. Creatinine Phosphokinase (CPK)—Units/L—CPK
15. CPKII—Present, Trace, Absent—CPKII
16. Serum Triglyceride—Milligrams/dl—TRIG
17. Weight—Pounds—WT
18. Height—Inches—HT
19. Hematocrit—Percent—HCT
20. Hemoglobin—Grams—HGB
21. Presence of Angina—No, Yes—ANG
22. Fasting Blood Glucose—Milligrams/dl—GLU
23. ST Segment Depression—Present, Absent—ST
24. T Wave Inversions—Present, Absent—TW
25. Ventricular Conduction Defects—Present, Absent—VCD

26. Area of Ventricular Conduction Defects—Right Bundle, Left Bundle—VCDA
27. Q Waves—Present, Absent—QW
28. Area of Q Waves—Anterior, Posterior, Inferior, Lateral, Subendocardial—QAL, QPL, QIL, QLL, QSL
29. Subsequent Myocardial Infarctions—SMI

V. DEFINITIONS

The following terms were defined as follows:

1. Coronary Heart Disease (CHD) implies coronary artery disease which is severe enough to cause heart disease (42:985).
2. Angina pectoris is a clinical syndrome caused by inadequate oxygen to the heart, characteristically caused by exertion and relieved by nitroglycerin or rest (12:994).
3. Myocardial infarction is a clinical syndrome resulting from insufficient coronary arterial flow to the myocardium with eventual cellular death and necrosis. It is characterized by severe and intense chest pain and signs of myocardial damage including electrocardiographic changes and rises in various serum enzymes (12:1006-1007).
4. Atherosclerosis is a disease of large and medium sized arteries characterized by fatty deposits and thickening of the arterial wall (12:992). Coronary atherosclerotic heart disease indicates that the disease coronary atherosclerosis has reached a degree of severity to cause certain pathologic or clinical

abnormalities resulting from inadequate myocardial perfusion (42:985).

5. The terms alpha, beta and pre-beta represent the results of the fractionalization of blood cholesterol by electrophoresis. The alpha fraction corresponds to the High Density Lipoproteins (HDL), and the beta fraction corresponds to the Low Density Lipoproteins (LDL). The pre-beta fraction represents the Very Low Density Lipoproteins (VLDL). The fractions are expressed in percentages.
6. Beta cholesterol refers to the measurement of the beta portion of total cholesterol and is expressed in mg/percent.
7. Creatinine phosphokinase (CPK and CPKII) is an enzyme present in heart muscle and is helpful in determining the amount of damage to the myocardium.
8. Phenotype, expressed as Normal, Type II, or Type IV represents the relationship among cholesterol levels, triglyceride levels, and the electrophoretic fractionalization of cholesterol.
9. Indicator variables are variables which are categorical and non-numerical. They are also called dummy variables.

VI. DELIMITATIONS

The study was delimited to data collected from patient records housed at East Tennessee Baptist Hospital, East Tennessee Baptist Hospital Heart Center, and physicians' office records. These data were collected from male patients who had been discharged with a diagnosis of

myocardial infarction from the East Tennessee Baptist Hospital Cardiac Unit (5th Floor Unit) between February 1, 1976, and September 1, 1977.

VII. LIMITATIONS

This study may have been limited by:

1. The accuracy and reliability of the sources of the data,
2. The variability of diagnosis and treatment by different physicians,
3. The variability in follow-up by different physicians, and
4. Varying sample sizes which required selection of small groupings of variables rather than the use of the entire group of variables in the regression procedures.

CHAPTER II

REVIEW OF RELATED LITERATURE

This chapter provides a review of related literature as a background for the problem under investigation. The chapter is divided into sections to aid in the organization of the extensive research which was done in this area. The first section discusses historical developments in the study of coronary heart disease and its major manifestations and characteristics. The second section deals with epidemiological studies of coronary heart disease and the formulation of important risk factors. The third section discusses rehabilitation of CHD patients and prevention of recurrent attacks.

I. CORONARY HEART DISEASE

Although Hippocrates spoke of "palpitations" and Galen wrote of "arrhythmia," it was not until the early eighteenth century that the first descriptions of "ossified coronary arteries and narrowed orifices" were found in the writings of Vieussens and Lancisi. Senac, Heberden, Baille, Meckel and Corvisart related autopsy findings with physical signs (51:25). In 1772 Jenner (1749-1823) clearly related angina pectoris to coronary disease. His colleague, Parry (1775-1822), provided a clear conception of the relationship between myocardial ischemia and angina in a volume entitled Syncope Anginosa published in 1799. Cohnheim (1839-1884) perpetuated the notion that any coronary occlusion was a finding incompatible with life and seen only at the

autopsy table (39:1038). In 1912 James Herrick (1861-1954) presented the first complete clinical description of coronary insufficiency and coronary occlusion: he also emphasized that coronary occlusion did not always result in death (39). Since the turn of the century much research and improvement in technology have greatly increased the precision of the diagnosis and treatment of heart disease (66:2).

Confusion frequently exists concerning the precise meaning of coronary heart disease. The terms "arteriosclerosis" or "atherosclerosis" are used interchangeably to indicate a disease process that occurs specifically in arteries of the systemic circulation, almost never involving the veins of the body and seldom involving the blood vessels to the lungs. A stroke occurs when the disease involves the arteries supplying the brain, and leg pain or "claudication" occurs when it involves the arteries to the legs. Chest pain (angina pectoris) and heart attack can occur when the coronary arteries that supply the heart are affected. A process characterized by a progressive buildup of fatty materials or lipids—namely, triglycerides and cholesterol—within the walls of the arterial blood vessels is called atherosclerosis. This process leads to a narrowing or an actual blockage of the channels of the involved vessels.

Although in recent years many important facts have emerged, the ultimate cause of coronary heart disease is unknown. It is known that the disease becomes more common with increasing age and that there is a "silent period" while the fatty deposits gradually build up within the blood vessels. The concentration of these fatty substances in the blood

over a long period of time may be of great importance in producing the disease in susceptible individuals (66:88-89).

The major overt clinical manifestations of coronary heart disease are angina pectoris, myocardial infarction, and sudden death; these events occur after the disorder in the arteries has been present for many years, 10 to 40 or more. White and co-workers (85:39) in 1958 suggested that the prognosis of angina pectoris and myocardial infarction would improve significantly by the recognition of mild cases, better treatment and rehabilitation after recovery, and more understanding and cooperation from the patient. Their prediction was well founded.

Acute myocardial infarction is primarily a disease of the left ventricle and the interventricular septum, although the infarct occasionally extends into the right ventricle or the atria. The outstanding characteristic of acute myocardial infarction is prolonged intense pain similar to angina but more severe. The patient is usually apprehensive and restless with poor skin color and cyanosis. The temperature is usually elevated for the first three to five days after acute infarction apparently due to the myocardial necrosis (12:1007-1008). The most valuable laboratory tests of value in confirming a myocardial infarction may be divided into three groups: (1) electrocardiogram (EKG), (2) serum enzyme changes, and (3) nonspecific indexes of tissue damage in inflammation (88:1200). The earliest manifestations of cardiac injury identified by the EKG and occurring before actual necrosis are limited to the period of myocardial repolarization. The T waves may be unusually tall or they can be inverted with or without ST

segment deviation in leads where they are normally upright. More striking but still reversible findings of myocardial damage occur as predominant displacements of the ST segments and junctions. However, the abnormalities more commonly progress to the pattern of infarction which is best explained on the basis of irreversible tissue loss. Positive R deflections are converted into abnormally prominent negative Q waves (52:32).

The discovery that serum glutamic oxalacetic transaminase (SGOT) increased in concentration in myocardial infarction patients aided in the improved accuracy of the diagnosis of the condition. It was learned that when the myocardium was infarcted certain enzymes present in heart muscle in large quantities are released into the blood. The blood levels of two of the enzymes, creatinine phosphokinase (CPK) and SGOT, rise and fall rapidly while lactic dehydrogenase (LDH) rises later and stays up longer. Although these enzyme responses are helpful in determining the amount of damage to the myocardium, they must be carefully evaluated since the rise and fall of blood levels are fairly sensitive and sometimes short-lived (88:1200-1201).

The nonspecific reaction to myocardial injury is associated with leukocytosis (increased white blood cell count); the magnitude of the leukocytosis yields information about the size of the infarct. Elevation of the erythrocyte sedimentation rate is another nonspecific change although it rises more slowly than the white blood cell count (88:1200).

Mortality from myocardial infarction is greatest during the first few hours before most patients reach the hospital. Studies (12,30,25)

have revealed that approximately 50 percent of the deaths from acute myocardial infarction occurred within the first five hours after the onset of the illness and were due to the electrical instability of the heart, and not necessarily related to the size of the infarct or the development of heart failure.

The acute myocardial infarction patient who is admitted to the hospital has already survived a considerable risk. Prognosis after recovery depends upon many factors—including age, previous history of infarctions, presence of diabetes, presence of heart failure, mental attitude, success of rehabilitation, and many others. Patients who have survived ventricular fibrillation and successful resuscitation have a good prognosis if heart failure does not occur. However, the prognosis must be guarded in the presence of ventricular arrhythmias and persistent heart failure. If cardiac functions are well maintained for six weeks after acute infarction, many patients are able to return to preinfarction activity (12:1018-1019).

II. EPIDEMIOLOGY OF CORONARY HEART DISEASE AND THE FORMULATION OF RISK FACTORS

In the last 20 years a great deal of information has been derived from many epidemiologic studies of coronary artery disease and its clinical and pathological manifestations. These studies have varied in design, some of them being purely prevalence studies to provide geographic comparisons; others have been retrospective, and a few have been prospective. Some have been long-term and some short-term studies (14,30,35,25,54,69,58,49,48,57).

As a result of these and other efforts, an impressive body of data has had considerable consistency and has pointed to other more restricted and more definite laboratory or field investigations (14). Specific elements have emerged from this body of knowledge as being associated with coronary atherosclerosis: these associations have led to the formulation of a number of "risk factors"—some major, some minor, some reversible, and some irreversible (42:989).

Risk is a statistical expression of probability not to be confused with cause. Risk factors are not necessarily causes but associations. Certain risk factors have been identified as being associated with greater likelihood of developing coronary heart disease; this predisposition to coronary heart disease seems to increase with each additional risk factor to which a person is exposed (65). Table 1 contains one suggested method of outlining risk factors.

The strongest predictor of the primary risk factors is age with CHD incidence doubling in middle-aged individuals every seven or eight years (65). Although significant coronary disease in children has occurred in rare instances, the development of coronary atherosclerosis and its complications do not usually occur in children. In the United States, significant occlusive disease is uncommon in men in their 20's but almost universal in both sexes after the age of 60 (14:1039).

It is apparent that a difference of incidence and prevalence exists between the sexes with the male having an excess of the disease up to the middle 50's when the female starts to catch up (14:1039,40,42). The reasons for this sex difference in susceptibility is unknown

TABLE 1

RISK FACTORS FOR CORONARY ATHEROSCLEROTIC HEART DISEASE (CAHD)

I. Nonmodifiable Risk Factors

- A. Age
- B. Sex
- C. Familial History of Premature CAHD

II. Modifiable Risk Factors

- A. Major
  1. Elevated serum lipids (cholesterol and triglyceride)
  2. Habitual diet high in total calories, total fats, saturated fats, cholesterol, refined carbohydrates, and salt
  3. Hypertension
  4. Cigarette smoking
  5. Carbohydrate intolerance
- B. Minor
  1. Obesity
  2. Sedentary living
  3. Personality type
  4. Psychosocial tensions
  5. Others

Source: Hurst, The Heart (42:990).

although some reasons that have been proposed are the protective effect of estrogen on the beta and alpha lipoproteins, differences in blood lipids and hematocrit, reduced risk of cigarette smoking, and a more sheltered mode of living (42:990). Some indications exist that the sex difference in CHD incidence may be due to men around the age of 50 losing a factor that had previously put them at extra risk of developing CHD. If male sex hormones are the cause of extra risk for men, that risk may diminish when plasma testosterone concentrations diminish. Since testosterone has little effect on total cholesterol concentrations, the mechanism of the risk is not clear; however, this is a more plausible idea than of female sex hormones being protective since large doses of estrogen given to men for cancer of the prostate and the use of oral contraceptions containing estrogen and progesterone have both been shown to increase CHD risk (38).

Certain family groups have been shown to have a predisposition to premature CHD. Although the familial tendency may be transmitted genetically, it is unclear to what extent genetics act in combination with environmental factors such as socioeconomic status and nutrition (42:990,22).

Modifiable risk factors include elevated serum lipid levels. Many studies have shown a strong correlation between mortality and morbidity rates of CHD and levels of circulating lipids. Cholesterol, triglyceride, and beta pipoprotein serum levels have been found to be highly predictive of CHD (6,8,48,23,72,45,24,50). There does not appear to be a definite critical level of serum cholesterol that clearly

separates a low risk patient from one with a high risk. However, Faigel (24) defines hyperlipidemia as a blood cholesterol level greater than 200 mg/dl or triglyceride greater than 100 mg/dl. In addition it is apparent that patients with cholesterol levels higher than 300 mg/dl are found to have four times more risk of CHD than patients with levels less than 200 mg/dl. According to Fredrickson, cholesterol levels 220 mg/dl at any age should be considered abnormal (27).

Plasma lipoprotein patterns have been found to be associated with atherosclerotic disease in various cross-sectional studies. The high density lipoproteins (HDL) correspond to the alpha fraction in electrophoresis and are unique in that they are associated with reduced risk of CHD. The HDL are usually higher in women than in men and are increased by exercise. The low density lipoproteins (LDL) or beta lipoprotein are rich in cholesterol, and the very low density lipoproteins (VLDL) or beta lipoproteins are rich in triglycerides. Similar to triglycerides and plasma cholesterol, VLDL and LDL should predict CHD; however, the lipoprotein patterns are still under investigation and they are unlikely to contribute much more than the simple cholesterol and triglyceride determinations (43:16,21,55,68).

A number of studies in past years have given support to the idea that a diet high in total calories, total fats and saturated fats, refined carbohydrates, and salt is a major coronary risk factor. Although experts have conflicting opinions as to their recommendations for reducing this risk (77,15), almost all recommend reduction of saturated fats in the diet.

Hypertension has been found to be a very important risk factor, closely associated with coronary atherosclerosis. Prospective and retrospective studies have shown a definite association of hypertension and CHD (6,23,72,42,65,87). It is usually considered to be a risk factor in combination with other risk factors, but it is also considered to be of importance itself. Hsu, Rabkin, and Mathewson found that blood pressure along with body mass index (W/H^2) were the most important factors in men less than 40 years of age (41). Hypertension itself is considered to be a major fundamental cardiovascular problem in the United States. The National Heart, Lung, and Blood Institute has in recent years established a number of programs for the study of hypertension. The National High Blood Pressure Educational Program (NHBPEP) was established in 1972, and the National High Blood Pressure Education Research Program (NHBPERP) was an outgrowth of the first program (78:132-133). Another important hypertension study was the Hypertension Detection and Follow-up Program (HDFP), which was a community-based national trial involving persons aged 30-69 in fourteen communities. It was hoped that this trial would aid in determining whether special programs could improve the treatment of hypertensive individuals and reduce morbidity and mortality (75).

Another study, the Multiple Risk Factor Intervention Trial, primarily aimed at the prevention of first heart attacks among men aged 35-57 years, had hypertension as one of the three major risk factors (along with cigarette smoking and hypercholesterolemia) (79:56,4). This trial was begun in 1972 and was the largest primary prevention trial ever attempted by the NHLBI.

As already mentioned, cigarette smoking was considered to be one of the three major risk factors leading to coronary heart disease (64). Reid (64:84) makes the following statement:

> The reports by the Royal College of Physicians in London and the Surgeon General of the USPHS can leave no reasonable doubt about the specific and dominant role of cigarette smoking in both lung cancer and chronic obstructive lung disease. In the origin of arteriosclerotic heart disease, many factors may play a part and it is more difficult to assess the contribution made by the habit to disability and death from this cause. But, because coronary disease is the major cause of death in middle-aged men in developed countries, even a relatively small increase in the risk of such death attributable to cigarette smoking is of great public health importance.

Many studies have documented that cigarette smoking is a contributing factor in the development of coronary heart disease, particularly in young and middle-aged men (18,26,10,18). Heavy smokers have been found to have a higher incidence of myocardial infarctions and mortality from CHD than light smokers with a shorter survival time from the onset of acute coronary episodes. In addition, studies have indicated that both nicotine and carbon monoxide aggravate angina pectoris and contribute to CHD (5,71).

Apparently, diabetes also plays an important role in CHD. Coronary artery disease accounts for more than one-half of the deaths in diabetics and is the most hazardous and frequent condition in the diabetic population (67). The National Institutes of Health of the United States assembled a work group in February 1978 to classify and discuss diabetes in relation to pathogenesis and heredity (12). One of the factors discussed was atherosclerosis as a major complication of

diabetes. Many interrelated and complex factors appear to be present in this relationship leaving still much speculation; however, it was pointed out that the level of high density lipoproteins (HDL) which are alledgedly protective against atherosclerosis is decreased in individuals with diabetes and that the HDL level could be returned to normal with the use of insulin. Other data strongly suggest that the correction of insulin deficiency decreases a number of factors which alone are correlated with accelerated atherosclerosis.

Electrocardiogram abnormalities such as S-T depression and T-wave inversion represent a risk factor. An enlarged heart or left ventricular hypertrophy is also a risk factor (1:4,62).

As shown in Table 1 on page 17, Hurst (42) lists obesity, sedentary living, personality type, psychosocial tensions, and others which he considered as minor risk factors. Obesity has long been considered to be an important risk factor particularly in relation to hypertension, hyperlipidemia, and diabetes, which may account for the higher association between overweight and CHD risk (42:991). Ashley and Kannel (7) in the Framingham study indicated that changes over time for each of the atherogenic traits studied (serum cholesterol, blood glucose, uric acid, and systolic blood pressure), considered in relation to relative weight, were more strongly related to weight change than to the level of adiposity. For each 10 unit change in relative weight in men there was a change of 6.6 mm Hg in systolic blood pressure, 2.5 mg/dl in cholesterol, 2.5 mg/dl in glucose, and 0.33 mg/dl in uric acid. The changes in women were more modest. It was determined that

for each 10 percent reduction in weight in men about a 20 percent reduction in coronary incidence could be anticipated. For each 10 percent increase about a 30 percent increase in incidence could be expected. Again, the effect was slightly less in women and for older individuals.

The remainder of risk factors in Table 1 have been considered in investigations. Although the results are not final, evidence suggests that each one may enhance proneness to CHD (42:991).

It was clear from the literature that the risk factor problem was very complex with evidence that risk factors may act both independently and in combination with other risk factors in producing coronary artery diseases. Many studies have been done in trying to determine the most important risk factors and the most important combination of factors. The MRFIT (4) has already been discussed. Most studies agreed about the importance of three of the factors. Smoking, blood pressure, and blood cholesterol appeared to be the three key factors for identifying persons who need preventive advice on how to modify these risks (65). Table 2 shows the relative power of these factors.

In recent years several investigations have utilized multivariate statistical methods analysis for application to the problem of evaluating the impact of combinations of risk factors (72). One study utilizing the multiple logistic model was published in 1967 from the Framingham study. This method allowed the computation of a risk probability for each individual based on simultaneous evaluation of several findings, e.g., smoking habit, serum cholesterol, and blood pressure. Linear

TABLE 2

EQUIVALENT LEVELS OF THREE MAIN RISK FACTORS IN MIDDLE-AGED MEN

Relative Risk of CHD	Cigarettes per Day	Equivalent Level of Risk Factor	
		BP (Diast.)	Serum Cholesterol (mg/dl)
1	0	80	180
2	15	100	250
5	45	120	350

Source: Rose (65:452).

discriminant function to estimate coefficients was used with observed data from the Framingham population on risk factor levels and the 12-year CHD incidence. The seven risk factors entered into the equation were age, systolic blood pressure, serum cholesterol, relative weight, hemoglobin, cigarettes smoked per day, and electrocardiographic findings. The calculated risk values Y of all the individuals for a given age-sex group were ranked from low to high and placed into deciles. The method yielded close correspondence in the number of expected and observed cases. The ratios of risk for the upper two deciles compared with the lower were more than 40:1 for men (72,76). Another study (31) was for the purpose of predicting coronary heart disease in middle-aged and older persons and was conducted by Gordon and others, utilizing Framingham data. The set of characteristics which were found to be predictive of CHD at all ages were high-density lipoproteins (HDL) and low-density lipoproteins (LDL) cholesterol,

systolic blood pressure, left ventricular hypertrophy (LVH), and diabetes. They did find that with a small set of CHD risk factors they could distinguish between persons at high risk of CHD and persons at low risk even at very old ages. Gordon et al. (31:499) make the following statement:

> Since most of these characteristics are modifiable, there is some possibility that the CHD risk at these older ages can also be modified. Of course, the fact that it is possible to predict CHD does not mean per se that intervention will be fruitful, and if it is efficacious for one risk factor, it would not necessarily be so for another. But should it prove possible to modify CHD risk by risk-factor intervention at older ages, we may yet see a substantial gain in the quality, and to a lesser degree the quantity, of the later years of life.

The Coronary Drug Project was a nationwide collaborative study sponsored by NHLI; it was an extensive effort to assess long-term effectiveness of drugs influencing lipid metabolism among men who have survived one or more myocardial infarction episodes. One of the reports presented a broad overview of the relationships between 40 attributes measured at baseline and subsequent three-year mortality from all causes for one group of 2,800 men in the CDP. Examination of the 40 variables by univariate linear regression analysis showed that many variables were associated with increased risk of mortality. The variables were then examined simultaneously using linear and logistic models with the results that a smaller number of variables appeared to be independently and additively associated with three-year mortality. The men were then classified into quantiles of estimated risk which correspond closely to observed mortality in those quantiles. Predictive analyses were done, and it was found that by using as few as ten measured characteristics,

prognosis after recovery from myocardial infarction could be predicted (16). Dignan (17) utilized similar statistical techniques to derive the set of diagnostic procedures contributing most significantly to the detection of hypertension; they included age, hematocrit, serum cholesterol, and body weight.

III. CARDIAC REHABILITATION

Massive amounts of material have been written on cardiac rehabilitation after an acute M.I. (63,86). Kellermann in a comprehensive discussion of rehabilitation of patients with CHD reviewed data collected in his laboratories at Tel-Aviv University. He agreed with a WHO working group and experts of the International Society of Cardiology (46) who concluded:

> The rehabilitation of cardiac patients can be defined as the sum of activities required to insure them the best possible physical, mental, and social conditions, so that they may, by their own efforts, regain as normal as possible a place in the community and lead an active, productive life.

Kellermann emphasized that the concept of a rehabilitation program for the coronary patient is not an isolated form of therapy but a part of a complex management scheme (46). An outline of Kellermann's rehabilitation program is presented in Table 3. Kellermann found that patients who completed the program had an objective increase of their physical capabilities, a significant decrease in the frequency of anginal attacks, fewer complaints, and less fatigue. They also expressed a general feeling of well-being. He stated, however, that four months after their discharge, the patients' working capacity began

TABLE 3

REHABILITATION PROGRAM AT CARDIAC EVALUATION AND REHABILITATION INSTITUTE, TEL-AVIV UNIVERSITY

I. General Measures

- A. Weight control
- B. No cigarette smoking

II. Physical Measures: Physical Training Program

III. Frequency of Training: 2-3 Times/Week

IV. Duration of Each Session: Maximal 60 Minutes

V. Interval Training

VI. Intensity: Adapted to Individual Physical Capacity Peak Levels at Heart Rate 70 Percent of Maximal

VII. Caloric Expenditure: 2 Cal/Min-9 Cal/Min

VIII. Clinical Measures

- A. Drug therapy if indicated: (1) Antiarrhythmic, (2) Beta Blocker, (3) Nitrites, and (4) Antihyperlipemic
- B. Systematic follow-up examinations clinical and functional reassessment: 3-4 times/year

IX. Psychological Measures

- A. Group therapy is indicated
- B. Family counseling

X. Vocational Counselor: Occasionally

Source: Kellerman (46:311).

to decrease again and they had more complaints, the reason being that they did not continue any physical activity. Because of this, Kellermann established a continuous program to be conducted on an outpatient basis for the rest of the patient's life (46).

Much work has been done in evaluating cardiac rehabilitation programs and their importance. Rechnitzer and others (63) did a long-term follow-up study of survival and recurrence rates after a myocardial infarction of exercising and control subjects. Their data indicated that a training program would reduce the likelihood of recurrence and death in a selected group of patients who have survived an acute myocardial infarction. However, the authors suggested cautious interpretation of their results because there might have been other differences between the experimental and control groups which could have biased the study in favor of the exercising subjects. The problem of bias in the evaluation of rehabilitation programs has been commonly encountered because patients who enter these programs usually do so voluntarily and they may differ psychologically from those who do not, in a way that will affect prognosis.

One relatively well-controlled study was started in 1968 in Boteborg, Sweden, by Wilhelmsen and others (86). All patients born in 1913 or later who were hospitalized for a myocardial infarction during 1968-1970 were randomized to a training group and a control group. Other treatment was standarized for the two groups. Training started three months after the infarction and was scheduled for three times a week. After one year the training group had a higher physical working

capacity than the control group. Blood pressure was also found to be lower although there was no difference in blood lipid levels. No statistically significant differences in mortality between the training group and the control group were evident. The authors stated that a much larger series of patients would have to be studied in order to detect a significant effect on mortality or on reinfarction by physical training. Smoking after a previous infarction was found to be a significant predictor of a fatal recurrence. In the discussion, the authors concluded that any preventive effect in postinfarction patients was smaller than can be attained by stopping smoking. They also discussed the importance of beta-blocking drugs and suggested that antismoking device and treatment with beta-blocking drugs deserve higher priority than physical training in the secondary prevention of myocardial infarction. The authors stated, however, that physical training may be valuable as supportive treatment. The beneficial physiological and psychological effects from physical training were of clinical importance. They suggested that the value may be more connected to the quality of life than to longevity (86).

Nathan Pritikin of the Longevity Research Institute of Santa Monica, California, has reported some rather astounding results in treating coronary heart disease patients. The program at the Institute consisted of 26-30 day residential treatment. The medically supervised program stressed a low fat, low cholesterol, low sodium diet along with exercise and intensive patient education. The Institute diet was radically different from a typical American diet with a drastic decrease in fat

and an increase in complex carbohydrates. The protein allowance was about the same; however, most of the protein was obtained from vegetable sources. Two-thirds of the 893 patients suffered from atherosclerotic heart disease and one-third had a history of myocardial infarction.

The results of the study of these patients show the following changes:

1. Reduced levels of serum cholesterol and triglycerides
2. Lowered uric acid levels
3. Smoking stopped by 85 percent of the smokers during their stay at the Institute
4. Exercise enhancement with participants walking a distance of over six miles a day during the last two weeks
5. Weight loss
6. Decreased blood pressure
7. Decreased blood glucose levels

The participants were enrolled in a five-year follow-up to determine life style adherence (53).

Another study conducted by Kellermann et al. was to determine the proportion of patients who returned to work following a myocardial infarction and to assess whether the medically rehabilitated had an advantage over the self-rehabilitated, among the patients who returned to regular work. It was found that the coronary patient who returns to work without having undergone planned rehabilitation does not utilize his full potential capacity if compared with the patient who has benefited from a program of this type (47).

The cardiac rehabilitation program at East Tennessee Baptist Hospital used concepts and procedures derived in large part from the Myocardial Infarction Rehabilitation Program conducted at Grady Memorial Hospital and the Emory University School of Medicine in Atlanta, Georgia. The program broadly used phases as guidelines. Phase I included the time in the coronary care unit and Phase II included the remainder of the hospital stay. Various individual educational sessions were usually held with cardiac patients during Phase II. Research has indicated that patients are capable of learning during the early stages of recovery (61). Phase III was the convalescent period usually at home and usually two to eight weeks in duration. The outpatient rehabilitation program at the Heart Center was generally begun during this phase. Phase IV was considered the recovery and maintenance phase. The program at the Heart Center included efforts to enhance function, to decrease risk factors, and to prevent the progression or recurrence of disease (3,20) (see Appendix H).

Summary

This chapter has presented a review of literature related to the problem. It has focused on the problem of coronary heart disease, the defining of pertinent risk factors of coronary heart disease, and cardiac rehabilitation of CHD patients.

CHAPTER III

METHODOLOGY

The purpose of this chapter is to provide a description of the methodology used in the analysis of the research problem under investigation. The chapter includes:

1. A review of related literature
2. Selection of the risk factors or variables to be tested
3. Formulation of questionnaire and consent forms and determination of method of distribution
4. Data collection
5. Analysis of the data

I. REVIEW OF THE LITERATURE

An extensive review of literature pertinent to coronary heart disease, related risk factors, and cardiac rehabilitation was conducted, utilizing the libraries of the University of Tennessee, Knoxville, Tennessee, and Emory University Medical Library and the Center for Disease Control Library in Atlanta, Georgia.

II. SELECTION OF RISK FACTORS OR VARIABLES TO BE TESTED

As related in Chapter II, the risk factors that have been implied in the cause of coronary heart disease were numerous and varied. However, the literature revealed certain risk factors consistently (1). The decisions regarding the selection of risk factors also involved

practical limitations since the variables had to be limited to the ones which were systematically recorded on the patient's chart. After deliberation of these factors (1,74), it was decided to use the following variables:

1. Age recorded in years
2. Number of myocardial infarctions (MI)
3. Cardiomegaly on chest X ray—No, Probable, or Definite—CAR
4. Systolic blood pressure—Millimeters Hg—SYS
5. Diastolic blood pressure—Millimeters Hg—DIA
6. Serum Cholesterol—mg/dl—CHOL
7. Beta Cholesterol—mg/percent—BCHOL
8. Chylomicrons—percent—CHYLO
9. Beta—percent—BETA
10. Prebeta—percent—PBETA
11. Alpha—percent—ALPHA
12. Phenotype—Normal, Type II, Type IV—PHENO
13. Cigarette smoking—No, Yes—CIG
14. Creatinine Phosphokinase (CPK)—Units/L—CPK
15. CPKII—Present, Trace, Absent—CPKII
16. Serum Triglyceride—Milligrams/dl—TRIG
17. Weight—Pounds—WT
18. Height—Inches—HT
19. Hematocrit—percent—HCT
20. Hemoglobin—Grams—HGB
21. Presence of Angina—No, Yes—ANG

22. Fasting Blood Glucose—mg/dl—GLU
23. ST Segment Depression—Present, Absent—ST
24. T-Wave Inversions—Present, Absent—TW
25. Ventricular Conduction Defects—Present, Absent—VCD
26. Area of Ventricular Conduction Defects—Right Bundle, Left Fundle—VCDA
27. Q Waves—Present, Absent—QW
28. Area of Q Waves—Anterior, Posterior, Inferior, Lateral, Subendocardial—QAL, QPL, QIL, QLL, QSL
29. Subsequent Myocardial Infarctions—SMI

III. FORMULATION OF QUESTIONNAIRE AND DETERMINATION OF METHOD OF DISTRIBUTION

The questionnaire (see Appendix A) was developed utilizing cardiac rehabilitation model programs, a previous questionnaire that had been utilized by East Tennessee Baptist Hospital Heart Center, input from hospital and Heart Center staff, and physicians. The Physician Consent Form with cover letter (see Appendix B) and the Participant Consent Form with cover letter (see Appendix C) were devised. A list of all male patients who had been discharged with a diagnosis of myocardial infarction from February 1, 1976, through September 1, 1977, was obtained from East Tennessee Baptist Hospital Medical Records Department. This list also included each patient's admitting physician. Physician Consent Forms with cover letters were mailed to 29 physicians who had admitted any of the potential participants in order to obtain permission to contact the patients in the sample about the study. After

the signed Physician Consent Forms had been received, a small pilot study was conducted by sending the questionnaire and consent form to four randomly selected patients; these four patients were then interviewed by telephone regarding the clarity and appropriateness of the questions. The questionnaires, consent forms, and cover letters were then mailed to the selected sample of 140 patients. The original sample had consisted of 165 patients; however, 25 individuals had expired either during the initial admission or during another admission up to the time of the hospital printout of the sample.

IV. DATA COLLECTION

Upon receipt of the participants' completed questionnaires and consent forms, the baseline admission data were collected (Time One) from each patient's hospital chart. Three-month post-infarction (Time Two) data and six-month (Time Three) post-infarction data were obtained from each patient's physician office records and/or his hospital chart if he had been readmitted at those particular times. All data were recorded onto prepared data collection sheets (see Appendix D). To protect the anonymity of each patient, a code number was assigned.

The electrocardiogram abnormalities were obtained from the last EKG which the patient had while in the hospital for his initial heart attack. These EKG findings were evaluated and classified by Ronald F. Yatteau, M.D., a cardiologist at East Tennessee Baptist Hospital.

V. ANALYSIS OF THE DATA

Statistical treatment of the data was designed to describe the data collected and to test the hypothesis. The methods utilized to meet this objective were the following:

1. The data from the data collection sheets were transferred onto tabulation sheets for computerization and subsequently keypunched onto computer cards. The quantitative data were tabulated, and selected statistics were calculated to provide a summary of the characteristics of the groups (Heart Center Participant and Nonparticipant). These statistics included the mean, standard deviation, and range. They are listed by group and by time (Time One, Time Two, and Time Three) in Appendix E.

2. To select the variables that would best classify patients into one of two groups (Heart Center Participation and Nonparticipation), Pearson product-moment correlations by groups were obtained on the quantitative variables. This was done in order to examine any data that appeared to be erroneous and to learn more about the structure of the data (9:92-93). Where correlation between two variables in the Heart Center group varied widely with the correlation of the same two variables in the nonparticipating group at Time One, Fisher's Z Transformation was performed to determine if a difference existed between the groups (37). From this table of correlations, sets of five to seven variables were selected in order to obtain the most significant set of variables in relationship to the groups.

The dependent variables of participation in the Heart Center program and nonparticipation in the program were regressed separately on sets of independent variables to derive equations. All-Possibles R-Square Procedures, General Linear Models Procedures, and Stepwise Multiple Linear Regression Procedures were utilized. In this way, the potential of the sets of variables found to contribute to regression for distinguishing between participants and nonparticipants was quantified. Further regression procedures were used with the indicator variables, both alone and with the selected set of quantitative variables to indicate the strength of these combinations. From the tests of statistical significance obtained, the best set of variables for discriminating between the two groups was selected and quantified.

3. To determine any changes evident in the two groups from Time One through Time Three, the correlation matrix was once again examined. Fisher's Z Transformation was utilized to determine any differences between the two groups at Time One, Time Two, and Time Three. Mann-Whitney U Test was performed on the changes in the quantitative variables in the groups from Time One and Time Two and Time One and Time Three (60). Chi-Square Test was used to determine any differences between the groups relative to the indicator variables. Multiple linear regression was also performed on Time Two and Time Three variables. In addition, questionnaire results were compiled and comparisons made between the groups. This information gave some insight into the patient's present status, major lifestyle changes, subjective feelings, and work status.

Summary

This chapter provided a description of the methodology used in the analysis of the research problem under investigation.

CHAPTER IV

RESULTS

The purpose of this chapter is to present the results of the analysis of the data. It is divided into three sections: a description of the data, tests designed to obtain the best predictor variables, and tests designed to compare the two groups. All computer computations were done using an IBM 360-65 computer at the University of Tennessee, Knoxville.

I. DESCRIPTION OF THE DATA

The data were the information collected from the data sources as described in Chapter III. Of 140 questionnaires and consent forms mailed, 71 were returned. Of those, three were found not to have had heart attacks and were excluded. Of the remaining 72, it was determined by returned mail that 12 of them had expired. It was learned from the Knox County Health Department that five of the others had expired, leaving a total of 123 potential participants. The 68 who consented to participation represented a percentage of 56 percent. Of the 68 participants, 20 were Heart Center participants and 48 were nonparticipants.

The complete tables of the means, standard deviation, and ranges of the quantitative variables are listed in Appendix E. The adjacent table, Table 4, illustrates a comparison of the two groups with respect to selected variables at Time One. It was found that in comparing the

TABLE 4

SELECTED TIME ONE MEANS FOR GROUPS

Variable	Heart Center Participants	Nonparticipants
Wt1	179	176
Sys1	131	129
Chol1	216	205
BChol1	136	124
PBeta1	29	22
Alpha1	11	20
Trig1	140	139
CPK1	2006	1278
Glu1	136	113

two groups, individuals who later chose to enter the Heart Center rehabilitation program tended to show a slightly higher value for a majority of the variables. They were the following:

1. Weight—Wt1
2. Systolic pressure—Sys1
3. Cholesterol—Chol1
4. Beta Cholesterol—BChol1
5. Beta1—Low Density Lipoproteins
6. Pre-Beta-PBeta1—Very Low Density Lipoproteins
7. Alpha-Alpha1—High Density Lipoproteins (The lower number represented the higher risk.)
8. Triglycerides—Trig1
9. Creatinine Phosphokinase—CPK1 (Heart Muscle Enzyme)
10. Glucose—Glu1

This trend possibly represented a slightly more severe condition at a relatively young age which could be a motivating factor in the decision of choosing to participate in the Heart Center program or not. On the other hand, this trend might have been simply a function of age with these variables "normally" decreasing with age or at least ceasing to be as important as in the younger men.

II. BEST PREDICTOR VARIABLES

A table of correlations of quantitative data significant at the 0.10 level or below for each group and each Time is presented in Appendix F. Various combinations of correlations were selected from

Time One of both groups and Fisher's Z Transformation was performed on those r's. No significant differences were found. Some data appeared to indicate erroneous information. Systolic blood pressure and number of myocardial infarctions in Time One of the Nonparticipants were negatively correlated. It was decided to plot the individual measurements for these variables. The plot indicated that the probable reason for the correlation was that five individuals who had had two or three myocardial infarctions had relatively low systolic blood pressures. This apparently skewed the distribution.

The hypothesis was tested using the All Possibles, General Linear Model, and Stepwise Multiple Linear Regression (9,37). These procedures were utilized in order to determine the relationship between the dependent variables of Heart Center Participation and Nonparticipation and selected sets of independent variables. This procedure also enabled a priortization of the predictor variables as they influenced the dependent variables since independent variables are entered only if they meet certain statistical criteria. In the stepwise procedure the order of inclusion was determined by the respective contribution of each of the independent variables to explained variance (60:345).

From the All Possibles procedure, several sets of variables were chosen for further regression. Table 5 shows the overall regression for the test of significance of the relationship between the dependent variable group and the independent variables of Alphal, Betal, PBetal, and Age.

TABLE 5

GENERAL LINEAR MODELS OVERALL TEST OF REGRESSION, DEPENDENT VARIABLE GROUP

Source	DF	Sum of Squares	Mean Squares	F Value	P > F	R-Square
Model	4	3.59689045	0.89922261	10.10	0.0001	0.599482
Error	27	2.40310955	0.08900406			
Total	31	6.00000000				

As can be seen in Table 5, there was a significant regression of Group on the independent variables of Alphal, Betal, PBetal, and Age at the 0.0001 level of significance, with 0.599 of the regression explained. The relative contribution of each independent variable to overall regression adjusted for all other independent variables is listed in Table 6. Each of the variables was significant at the 0.01 level of significance and contributed to the overall statistical significance of Group on the independent variables.

TABLE 6

CONTRIBUTION OF EACH INDEPENDENT VARIABLE (ALPHA1, BETA1, PBETA1, AND AGE) TO OVERALL REGRESSION

Source	Partial Sums of Squares	F Value	P > F
Alphal	0.86181032	9.68	0.0044
Betal	0.73744000	8.29	0.0077
PBetal	0.73480328	8.26	0.0078
Age	1.24095382	13.94	0.0009

When these same variables were run in a stepwise regression procedure, Betal and PBetal did not meet inclusion criteria of 0.5000 level of significance. The results of this procedure are in Table 7 and Table 8.

TABLE 7

STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE GROUP

Source	DF	Sum of Squares	Mean Square	F	P > F	R-Square
Regression	2	2.85940667	1.4297033	13.20	0.0001	0.47656778
Error	29	3.14059333	0.10829632			
Total	31	6.00000000				

TABLE 8

CONTRIBUTION OF EACH INDEPENDENT VARIABLE (ALPHA, AGE) TO OVERALL REGRESSION

Source	Partial Sum of Squares	F	P > F	R-Square
Alphal	1.11658703	10.31	0.0032	0.47656778
Age	1.29904261	12.00	0.0017	

The squared multiple correlation coefficients (R^2) were moderately high in both procedures—0.599 in the General Linear Models Procedure with the four variables, Alphal, Age, Betal, and PBetal, and 0.477 in the stepwise procedure. The conclusion was that the best four classification predictors were Age, Alphal, Betal, and PBetal in that

order with only 40 percent of the variability in the model unexplained by the regression procedure. Furthermore, the best two predictors were Age and Alpha1 in that order with only 52 percent of the variation in the model unexplained.

Chi-square tests were performed on the indicator (categorical) variables by group. It was found that the groups did not differ on any of the variables at the 0.01 level of significance; however, three variables caused significant difference at the 0.10 level. QLL (Q waves in the lateral location) was different in the groups at the 0.0376 level of significance. Twenty-three percent of the Nonparticipants had QLL present whereas none of the Heart Center Group did. Eighty-four percent of the Nonparticipants had CPKII1 present or in trace amounts with all the Participants Group having CPKII1 either present or in trace amounts. This difference represented a level of significance at 0.0989. The groups also differed with QIL (Q waves present in inferior location). Forty-six percent of the Nonparticipants had QIL present while 75 percent of the Participants Group did; the level of significance was at 0.0888.

Further regression analyses were done with models using combinations of selected quantitative and indicator or dummy variables. These dummy variables were necessarily treated differently from the quantitative variables since they were non-numerical. The variable names preceded by D1 and D2 were renamed in order to satisfy the requirements of analyzing classification data by regression methods (59). The regression models solutions for two of the models are in Tables 9, 10, 11, and 12.

TABLE 9

OVERALL REGRESSION OF INDEPENDENT VARIABLES,
DEPENDENT VARIABLE GROUP

Source	DF	Sum of Squares	Mean Square	F Value	P > F	R-Square
Model	7	3.90479950	0.55782850	6.32	0.0003	0.657874
Error	23	2.03068437	0.08829062			
Total	30	5.93548387				

TABLE 10

CONTRIBUTION OF EACH INDEPENDENT VARIABLE,
DEPENDENT VARIABLE GROUP

Source	Partial Sums of Squares	F Value	P > F
CIG1	0.25184847	2.85	0.1047
SMI	0.10405427	1.18	0.2889
SYS1	0.00705096	0.08	0.7800
ALPHA1	0.91076283	10.32	0.0039
BETA1	0.78525774	8.89	0.0067
PBETA1	0.79649406	9.02	0.0063
AGE	1.45287241	16.46	0.0005

TABLE 11

OVERALL REGRESSION, DEPENDENT VARIABLE GROUP

Source	DF	Sum of Squares	Mean Square	F Value	P > F	R-Square
Model	8	3.25609498	0.40701187	4.05	0.0048	0.606726
Error	21	2.11057168	0.10050341			
Total	29	5.36666667				

TABLE 12

CONTRIBUTION OF EACH INDEPENDENT VARIABLE TO OVERALL REGRESSION

Source	Partial Sums of Squares	F Value	P > F
D1PHENO1	0.01129814	0.11	0.7407
D2PHENO1	0.58942071	5.86	0.0246
D1CPKII1	0.04678173	0.47	0.5025
D2CPKII1	0.07442973	0.74	0.3992
CIG1	0.21879824	2.18	0.1549
ALPHA1	0.50729877	5.05	0.0355
BETA1	0.46779542	4.65	0.0427
PBETA1	0.41278167	4.11	0.0556

Table 9 indicates the overall regression of CIG1, SMI, SYS1, ALPHA1, Beta1, PBeta1, and Age. The significance level was 0.0003 with an R-Square of 0.66. Alpha1, Beta1, PBeta1, and Age were the most significant variables in the model. Of the three remaining variables, CIG1 contributed the most to the set (see Table 10).

Table 11 and Table 12 illustrate the overall regression solution and the individual contribution, respectively, of another combination. This set consisted of D1PHENO1-D2PHENO1, D1CPKII1, D2CPKII1, CIG1, ALPHA1, BETA1, and PBETA1. Of the indicator variables in this set, D1PHENO1-D2PHENO1 and CIG1 made the most contribution.

When these two indicator variables were placed in a model with the four significant quantitative variables, CIG1 ceased to be a major contributor to the regression. It was, therefore, removed from the model. Table 13 illustrates the overall regression of the remaining model which consisted of Age, Alpha1, Beta1, PBeta1, and D1PHENO1-D2PHENO1. Although the overall significance level as seen in Table 14 was 0.0001 with 68 percent of the variability explained, D1PHENO-D2PHENO1 was not individually significant at the 0.01 level.

From the two models presented in these tables, of the indicator variables only D1PHENO1-D2PHENO1 (dummy variables for Phenotype at Time One) contributed to the discriminating ability of the model. Hence, the four quantitative variables Age, Alpha1, Beta1, and PBeta1 together with D1PHENO1-D2PHENO1 were the most discriminating variables.

TABLE 13

TOTAL REGRESSION, DEPENDENT VARIABLE GROUP

Source	DF	Sum of Squares	Mean Square	F Value	P > F	R-Square
Model	6	4.05062192	0.67510365	8.66	0.0001	0.675104
Error	25	1.94937808	0.07797512			
Total	31	6.00000000				

TABLE 14

CONTRIBUTION OF EACH INDEPENDENT VARIABLE (D1PHENO1, D2PHENO1, AGE, ALPHA1, BETA1, PBETA1) TO OVERALL REGRESSION

Source	Partial Sums of Squares	F Value	P > F
D1PHENO1	0.04430436	0.57	0.4580
D2PHENO1	0.40511228	5.20	0.0314
AGE	1.11291863	14.27	0.0009
ALPHA1	0.90444406	11.60	0.0022
BETA1	0.82188391	10.54	0.0033
PBETA1	0.80249622	10.29	0.0037

III. COMPARISON OF CHANGE IN GROUPS

The testing of the significant changes occurring in the groups over time from Time One through Time Three was limited due to the lack of data. Mann-Whitney U Test (60) was performed on the differences in the quantitative variables of Time One and Time Two by group; the test was also done on the differences between Time One and Time Three by group. No significant differences were found.

Additionally, multiple linear regression was run on Time Two and Time Three variables for which enough data were available. No significant regression was present except for the contribution of age which was discussed.

In examining the means of the groups in Time Two (which had more observations than in Time Three), the majority of the variables representing major modifiable risks—namely, weight, diastolic pressure, cholesterol, beta cholesterol, triglycerides, and glucose—all decreased from Time One in the Heart Center Group. While the Nonparticipation Group also had decreases in weight, systolic and diastolic blood pressure, beta cholesterol, beta fraction, and glucose, they had an increase in triglyceride levels (see Appendix E and graphs in Figures 1-6).

One other important finding was related to the number of myocardial infarctions subsequent to the six months period of time up to the completion of the questionnaire (SMI). The Participation Group had none while five of the Nonparticipation Group had six (see Table 15). A Chi-square test revealed no significant differences in

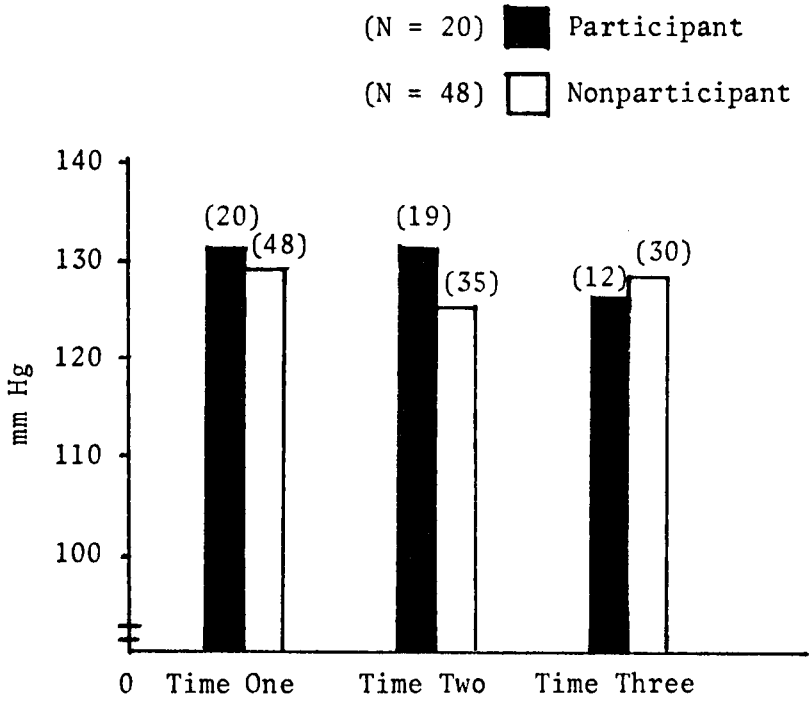


Figure 1. Mean Systolic Pressures of Groups at Time One, Time Two, and Time Three.

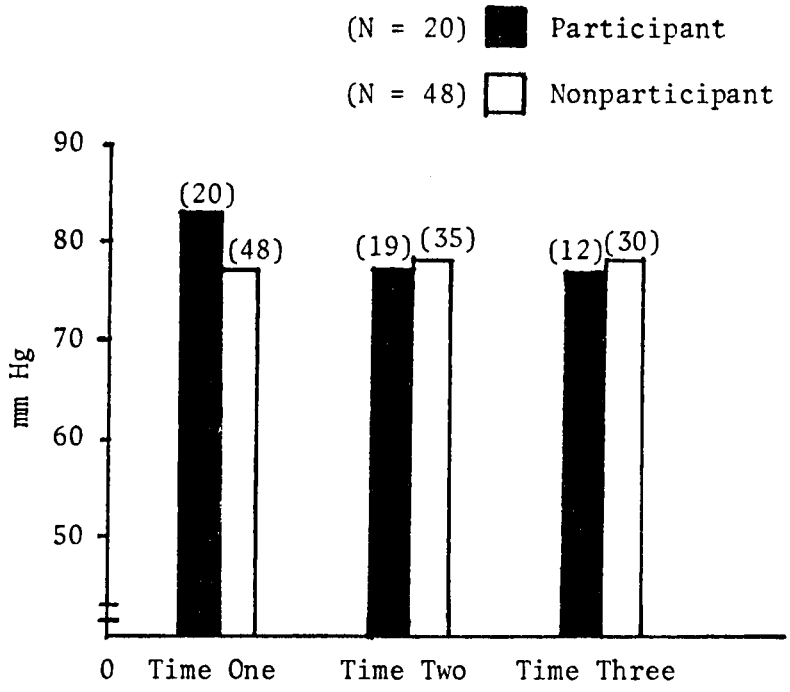


Figure 2. Mean Diastolic Pressures of Groups at Time One, Time Two, and Time Three.

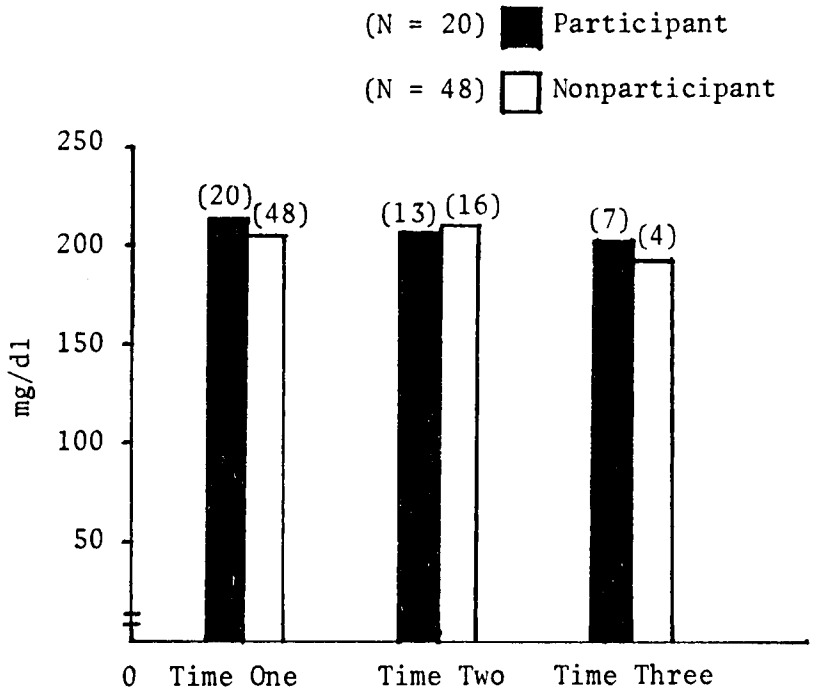


Figure 3. Mean Cholesterol Levels of Groups at Time One, Time Two, and Time Three.

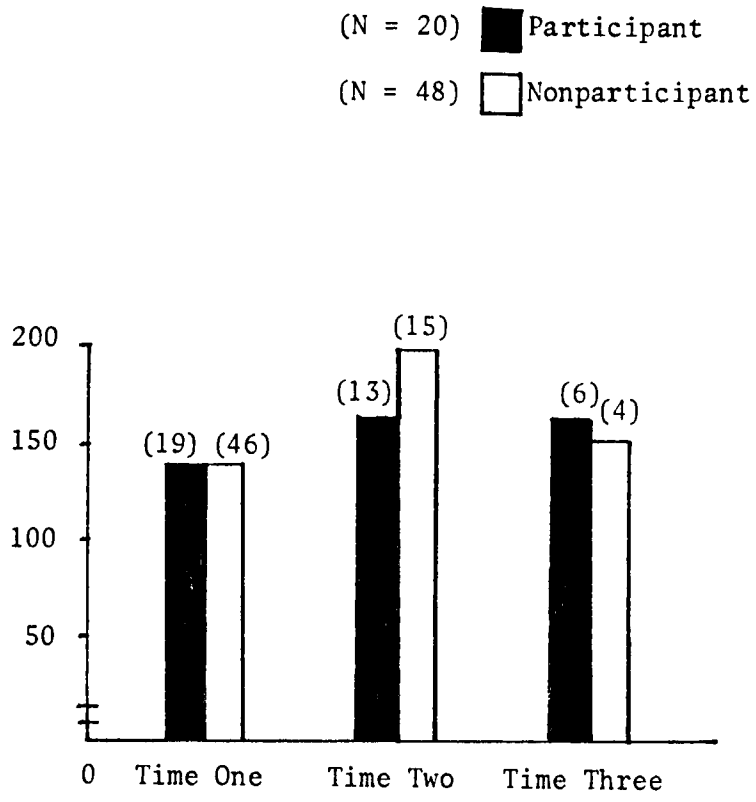


Figure 4. Mean Triglyceride Levels of Groups at Time One, Time Two, and Time Three.

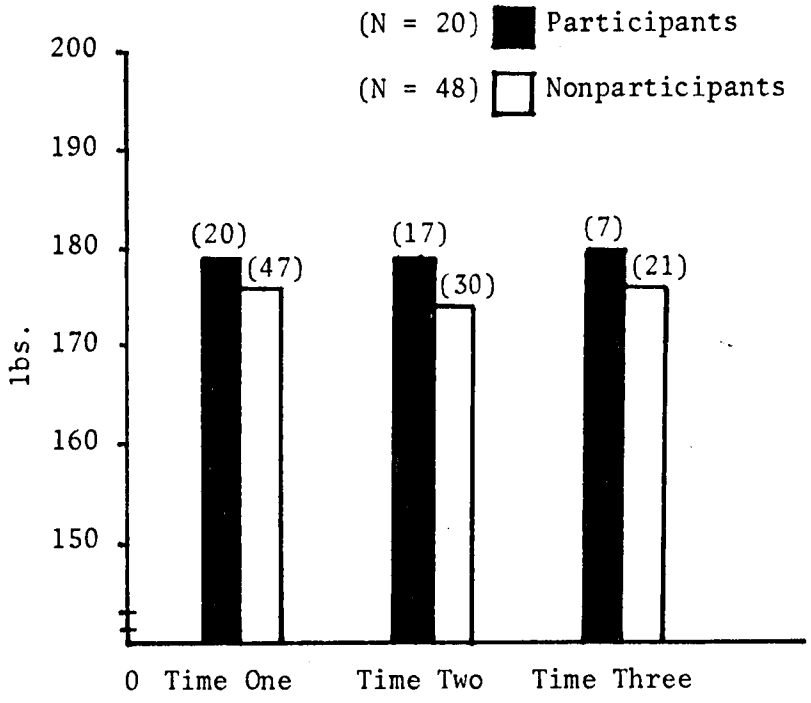


Figure 5. Mean Weights of Groups at Time One, Time Two, and Time Three.

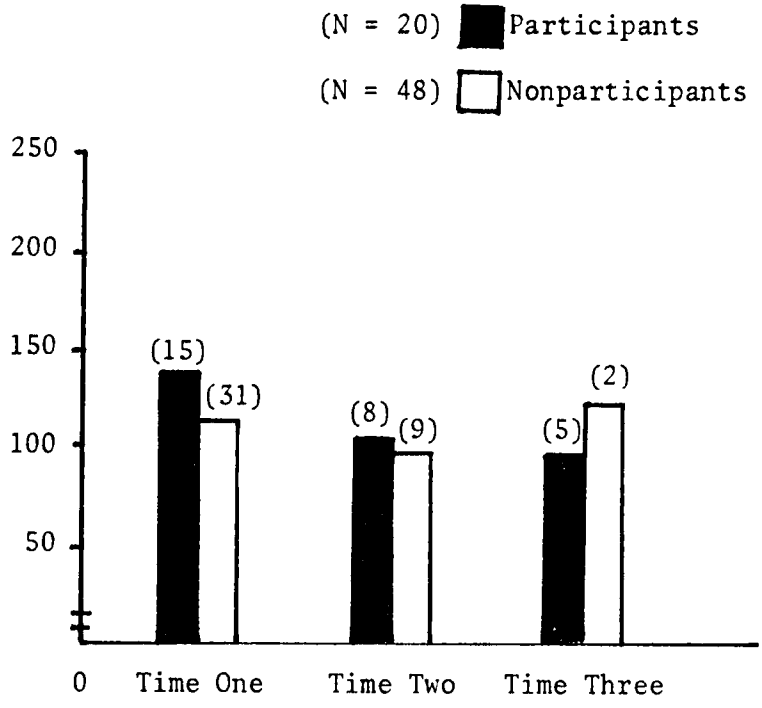


Figure 6. Mean Fasting Glucose Levels of Groups at Time One, Time Two, and Time Three.

TABLE 15

CLASSIFICATION OF SUBSEQUENT MYOCARDIAL INFARCTIONS BY GROUP

	Heart Center Participant	Nonparticipant	Total
SMI	0	5*	5*
No SMI	20	43	63
			N = 68

*One of the nonparticipants had 2 SMI's for a total of 6.

the groups and SMI; however, when SMI was run in a regression procedure with QLL and QIL, the overall significance level was 0.0147 with QIL individually contributing the most with a significance level of 0.0069. Next was QIL and SMI, in that order, but neither individually contributing at the 0.01 level. Also, the R-Square was very low, leaving about 85 percent of unexplained variation.

The fact that there were no subsequent myocardial infarctions in the Participation Group suggested that, had there been more individuals in the study, the likelihood of a significant difference would have been increased. The regression solution discussed above lends credibility to this likelihood.

Questionnaire Results

The questionnaire results are in Appendix G. Only 19 of the 20 Heart Center Participants' questionnaires were utilized since one of the individuals had participated in the pilot study for the questionnaire. Likewise, two of the questionnaires of the Nonparticipant Group were

not used for the same reason. One of the four persons in the pilot study chose not to participate at all.

As can be noted in the responses, there are few differences in the percentages of the responses. Probably the most important differences were length of time of return to work after the heart attack and symptoms experienced.

Eighty-nine percent of the Heart Center participants had returned to their former work (either part-time or full-time) at the time of completing the questionnaire, whereas only 54 percent of the nonparticipants had returned. This 54 percent does reflect the fact that some of these individuals had retired. Seventy-one percent of the participants had returned to full-time work within six months of their heart attack, whereas this figure was 37 percent for the nonparticipants.

One of the other differences was the percentage who were having various symptoms. Forty-seven percent of the Heart Center participants were not having any symptoms of pain or shortness of breath; on the other hand, only 15 percent of the nonparticipants were not having symptoms.

The other responses did not vary significantly between the groups; however, some figures pointed out some interesting information. Although more than half of the individuals in both groups who had smoked before their attack had stopped smoking, about 30 percent of both groups were still smoking at the time of the completion of the questionnaire.

More than half of the individuals in the Heart Center Group had had an angiogram and 32 percent had had coronary bypass surgery. Less than one-half as many of the other group had had these procedures.

Forty-seven percent of the Heart Center participants were on an exercise program and 35 percent of the other group exercised. The description of the feeling of the overall condition as compared with before the heart attack was about the same in both groups. Slightly more of the nonparticipants indicated they felt better than the other group.

None of the individuals in either group belonged to the East Tennessee Coronary Club. Sixty-eight percent of the Heart Center participants knew about the club, and only 24 percent of nonparticipants knew about it.

Summary

This chapter has presented the data and its analysis. The multiple linear regression procedures revealed that Age, Alphal, Betal, PBetal, and D1PHENO1-D2PHENO1, in that order, contributed to a significant regression on group. This procedure demonstrated that this set of independent variables was capable of classifying individuals into the Heart Center Participation Group or the Nonparticipation Group in a pattern that differed from classification by chance alone. The only other set of variables that approached significant regression were QLL, QIL, and SMI at 0.0147. The groups did not differ over time.

The questionnaire responses were summarized with differences in the groups discussed, particularly with respect to time to return to work and symptoms experienced.

CHAPTER V

SUMMARY, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

I. SUMMARY

The problem was to determine and quantify from a pre-selected group the sets of variables that would best differentiate between participants and nonparticipants (in the Heart Center rehabilitation program) for possible predictive purposes.

The methodology began with a review of related literature and selection of the risk factors or variables to be tested. The development of the questionnaire and consent forms followed along with the determination of the method of distribution. The data were collected from patients' hospital charts and physician office records utilizing measures to assure anonymity of the subjects. Analysis of the data involved descriptions of the data and procedures that would test the stated hypothesis.

II. FINDINGS

The tests of the stated hypothesis produced the following findings:

1. There was a difference between the Heart Center Participation Group and the Nonparticipation Group represented by a relationship at 0.01 level of significance and the independent variables of Age, Alphal, Betal, and PBetal. D1PHENO1-D2PHENO1

contributed substantially to the regression but not at the 0.01 level.

2. There was a difference between the Heart Center Participation Group and the Nonparticipation Group represented by a relationship at 0.0147 level of significance between the groups and the set of independent variables of QLL, QIL, and SMI in that order of importance.
3. There were differences between the Heart Center Participation Group and the Nonparticipation Group at a level of 0.10 or below with respect to QIL (Q Waves in Inferior Area), QLL (Q Waves in Lateral Area), and CPKIII.
4. There was not a difference at the 0.01 level of significance between the Heart Center Participation Group and the Nonparticipation Group in relation to the listed set of variables from Time One to Time Two and from Time One to Time Three.
5. There was a difference in the groups with respect to the following obtained from the questionnaire responses:
   a. Eighty-nine percent of the Heart Center Group had returned to their former work, either full-time or part-time, whereas only 54 percent of the other group had. Seventy-one percent of the participants returned to full-time work within six months of their M.I.; this figure was 37 percent for the nonparticipants.
   b. Forty-seven percent of the Heart Center Group stated that they were having no symptoms of pain or shortness of

breath; only 15 percent of the nonparticipants were having no symptoms.

c. Fifty-three percent of the Heart Center Group had had an angiogram and 32 percent of them had had coronary bypass surgery. Twenty-eight percent of the other group had had an angiogram and 11 percent of them had had surgery.

III. CONCLUSIONS

The following conclusions were made:

1. The Heart Center participants were generally younger than the nonparticipants. They also had lower Alpha (HDL), higher Beta (LDL), higher Prebeta (VLDL), and more abnormal phenotypes, all of which indicated higher risk of CHD. These variables could have represented motivating factors for entering the rehabilitation program; however, they were probably a function of age with those variables ceasing to be as important in the older men as in the younger men.
2. Other differentiating variables of lesser significance were QLL (Q Waves in Lateral Location), QIL (Q Waves in Inferior Location), and SMI (Subsequent Myocardial Infarction). None of the participants had Q waves in the lateral location, whereas 23 percent of the nonparticipants had QLL. More of the participants had Q waves in the inferior location than the nonparticipants. The nonparticipants had had 6 SMI's while none of the Heart Center group had SMI's. The location of the

Q waves may possibly be predictive of future M.I.'s. All these variables warrant more research.

3. Except for the return to work and symptoms being experienced, the questionnaire responses showed very little differences in the two groups. This was particularly true for smoking and exercising. This lack of difference indicates the need for more attention being given to the areas of smoking and exercising and the need for some means of follow-up and reinforcement after the participant has completed the program.

IV. RECOMMENDATIONS

The following recommendations were made:

1. A study should be conducted of the significant predictor variables obtained in this study.
2. A study should be conducted of the criteria for selection into rehabilitation programs on the part of patients, physicians, and third-party payment groups.
3. A study should be conducted of comparisons between questionnaire responses and physical findings.
4. Accurate evaluation of the progress of a rehabilitation participant should be incorporated into programs by systematically obtaining and recording all the major modifiable risks including blood levels of cholesterol, triglycerides, lipoproteins, and glucose, if possible.

5. Some means of follow-up should be incorporated into rehabilitation programs to help the participant continue what he learns in the program.
6. Consideration should be given to the idea of concentrating rehabilitation programs over a shorter period of time. Longevity Research Institute has shown that changes in the risks are possible within a month. Perhaps a variation of that resident-type program would be feasible.
7. Every means possible should be used to share the goals of rehabilitation programs with the local medical community. It appeared from the questionnaire that 37 percent of the participants stated that physician recommendation was the reason for joining the program. On the other hand, the reasons given for not participating were for the most part related to not knowing about the program. Other reasons were lack of transportation and living too far away.
8. Computerization of patient records in cardiac rehabilitation programs would simplify collection of data in evaluation of patient progress and of the program.

Summary

This chapter has provided a description of the findings, conclusions, and recommendations in the analysis of the research problem under investigation.

CHAPTER VI

IMPLICATIONS

More hospitals throughout the country are incorporating cardiac rehabilitation programs in an effort to provide additional services to cardiac patients. These services are aimed toward improving the physical and emotional status of the patient.

East Tennessee Baptist Hospital Heart Center Rehabilitation Program was selected for study in an effort to assist those involved in present and future program planning. The study was designed to make comparisons between post-myocardial infarction patients who had participated in the East Tennessee Heart Center Cardiac Rehabilitation Program and those who had not. The purpose of the study was to identify the set of characteristics that differentiated between the two groups.

Since the study was retrospective in nature, certain problems were encountered. These were:

1. Obtaining consent forms from physicians and patients;
2. Location of potential participants;
3. Determination of status of potential participants, whether they were living or had subsequently died; and
4. Time necessary to obtain the data from noncomputerized sources (hospital records and physicians' office records).

Although this was a patient-oriented study, it was hoped that it would provide a basis for evaluating the goals of rehabilitation. The

end points of a successful rehabilitation program for patients after a myocardial infarction include:

1. Improvement of the quality of life for patients who survive myocardial infarction;
2. Return to gainful employment or to independent living (self-care or successful retirement);
3. Reduction of the economic burden on the patients and their families through the decreased need for convalescent care and a more rapid return to work; and
4. Reduction of the risk of recurrent myocardial infarction, complications, or premature death (73).

Ideally, every post-myocardial infarction patient could benefit and participate in an organized program that would be altered to the individual with consideration given to any contraindications which might be present (74,3). Apparently, for many reasons this is not the case. Selection and choice of entering the rehabilitation program appear to be heavily influenced by age since age was the primary variable which differentiated between the groups. The attitude seems to exist that the younger men will benefit more from rehabilitation than the older men; this opinion probably is held by patients, physicians, and third-party payment groups.

Possibly the third-party payment groups, such as state vocational rehabilitation programs, set the standards for who enters rehabilitation programs. Ordinarily, the goal of such groups is to pay for rehabilitation programs of individuals who are of working age and have

a number of "productive working years." The physician is likely to promote this idea that rehabilitation is only for the younger people, particularly if he/she sees the patient not interested in anything that will not be paid by insurance, Medicare, Medicaid, vocational rehabilitation, and so forth. Therefore, the ultimate responsibility for a patient's rehabilitation belongs to the patient himself. Regardless of age, it is likely that a rehabilitation program would be beneficial either to help the patient return to work sooner or to help the individual have a "successful retirement"; however, if the individual will not (or cannot) participate in programs because a third-party group will not pay for it, he ends up losing the benefits of the program.

The next significant characteristics, after age, were the lipoproteins and the phenotype. These factors are highly related to each other and possibly are a reflection of age; however, their sensitivity could provide practical indicators of progress in a program. Whichever the case, they warrant more investigation. The other characteristics suggestive of some differences were Q waves in the lateral and inferior locations and the CPKII; these factors also need further investigation.

The major difference which occurred in the groups over time was the time to return to work. The Heart Center participants returned to work sooner than the other group. Some of the nonparticipants retired after their heart attacks, but whether this retirement was "forced upon" them by their condition or whether it was by true choice was unknown. Just

because they retired did not necessarily mean that they entered a "successful retirement" of independent and enjoyable living.

The Heart Center Group also reported experiencing fewer symptoms than the other group, although they reported "feeling" about the same as the nonparticipants when asked about their "overall general feeling." However, it was important to note that none of the nonparticipants had had a myocardial infarction subsequent to the collection of data at Time Three up to the time of completion of the questionnaire. Whether this would have held true if the sample had been larger is unknown; however, the trend was present.

Where significant differences might have been hoped for in the modifiable characteristics, they were not present in the Heart Center Group. Although there were decreases in weight, blood pressure, cholesterol levels, and triglyceride levels, they were not significant. The groups also did not strongly differ on smoking and amount of exercise according to the questionnaire. Caution must be used in making concrete conclusions from this apparent lack of differences in the groups because of the following: (1) the relatively small sample; (2) the lack of consistent data available on the sample at Time One, Time Two, and Time Three; and (3) the variability of the time the individuals participated in the rehabilitation program during the six months after the heart attack. However, enough information was obtained to indicate the need for program review.

Many difficulties and problems exist for cardiac rehabilitation program directors and personnel, as they do for everyone engaged in

health education. Life-long habits and patterns are being dealt with. Many tend to think that the imparting of knowledge is all that is necessary. Obviously, this passive transfer of knowledge is not working optimally in any setting.

From correlational data the assertion is that health is highly related to lifestyle. Many studies link social class and its related values and lifestyle to mortality and morbidity. One dramatic example is the difference in death rates at each age between residents of Utah and Nevada. For persons aged 40-49 years the Nevada rate is 50 percent higher than Utah. The difference in the two very similar States appears to be due to the Mormon-oriented lifestyle in Utah and hard-living style in Nevada (34).

Even with the knowledge that specific diseases are linked with habits, health education has been lacking in bringing about much change in behavior. In the past, most health education has relied on the transfer of knowledge to achieve behavior change and most has been unsuccessful. Somewhat greater success has been achieved in patient education programs because of the highly motivated sick patients to change their behavior. Studies by Lewin and others have emphasized the importance of active involvement in the learning process if behavior change is desired. Seminar-type programs and public acceptance of new behaviors resulted in greater changes than passive learning. Post-myocardial infarction clubs have been shown to be an invaluable tool for all post-M.I. patients. These types of clubs provide much help in the adaptive problems and rehabilitation processes once the acute phase has

passed (32). The Seventh Day Adventists have reported great success with their five-day sessions of group discussions, the use of nonsmoking models as teachers, self-reinforcement, and a buddy system reinforcement with follow-up calls even after the course (34). Pritiken (53) has demonstrated the importance of involvement on the part of the cardiac patient by having a resident-type program. The individual is removed from his own environment in hopes that a more healthful lifestyle can be developed by intensive programs at the Longevity Institute.

To further complicate matters present in this realm of individual lifestyle are beliefs about health. Certain health beliefs that are relevant to chronic heart disease are the following: (1) the perceived threat components, namely, seriousness of consequences, susceptibility, and importance of health matters; and (2) expected net benefit of action, namely, perceived effectiveness or barriers (10:106).

Halhuber (36) has suggested reasons for the discrepancy between the efforts put into cardiac rehabilitation and the low efficiency of health education. Some of these are:

1. Isolated cognitive material is not enough because of the interrelationship of attitudes, behavior patterns, and interests.
2. Media information is rarely enough. Intensive interaction and communication processes between the instructor and patient must be present.
3. Very little intercommunication is usually found in the group discussions that are held.

4. Often, there is a lack of trustworthiness and confidence towards health educators. Obviously, health educators should be good models.
5. Health education actions are usually of short duration. Repetition of even simple information is necessary.

The need is obviously present in health education generally and in cardiac rehabilitation groups specifically to provide programs that involve the patient and his/her family as much as possible. Perhaps resident-type programs such as Pritikin uses could be modified for cardiac rehabilitation. Also concentrated seminar-type programs might be used. These would consist of not only the imparting knowledge but also the use of techniques that would involve the patient and his family in helping to formulate his/her own plans. This would hopefully enhance motivation and commitment.

William Glasser (28), a psychiatrist who has been very successful in dealing with all kinds of troubled individuals, chooses to call the behavior of alcohol and drug abuse "negative addictions." He states that these behaviors weaken an individual emotionally and physically; he encourages the adapting of "positive addictions" which he states strengthens the individual to be a healthier, more rationally motivated person. His "negative addiction" idea can be expanded to include overeating, inactivity, smoking, and poor methods of handling stress, many of which are seen in CHD patients. When certain behaviors, such as these "negative activities" are taken away, it makes sense to try to replace them with other acceptable practices. Certainly the

need exists for innovative techniques to change individuals' patterns in ways that will provide a satisfying and more enjoyable lifestyle.

Another factor was the lack of participation in the East Tennessee Coronary Club. This Club could be an invaluable tool for all post-heart attack individuals, both Heart Center participants and nonparticipants. These types of clubs have been shown to provide much help in the adaptive problems and rehabilitation processes once the acute phase of the condition has passed; they also seem to be helpful in the maintenance of well care (32).

One last suggestion is that hospitals and cardiac rehabilitation centers do all that is possible within their boundaries of finances and personnel to aid in the education of the surrounding community regarding risk factors associated with coronary heart disease. Surveys have shown widespread lack of information about CHD and about the three major risk factors of high blood pressure, elevated blood cholesterol, and cigarette smoking. Furthermore, this lack of knowledge regarding heart disease was supported by health practices (84,80). Our communities need to establish sustained community-wide educational programs for reducing coronary risk and subsequent heart disease.

LIST OF REFERENCES

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1. American Heart Association, Coronary Risk Handbook. New York: American Heart Association, 1973.

2. American Heart Association, Heart Facts—1978. New York: American Heart Association, 1977.

3. American Heart Association, Rehabilitation After Myocardial Infarction. New York: American Heart Association, 1973.

4. ANON., "The Multiple Risk Factor Intervention Trial (MRFIT). A National Study of Primary Prevention of Coronary Heart Disease," JAMA 235:825-827, 1976.

5. Aronow, W. S., "Cigarette Smoking, Carbon Monoxide, Nicotine and Coronary Disease," Preventive Medicine 4:95-99, 1975.

6. Arteriosclerosis: A Report by the National Task Force on Arteriosclerosis, Vol. 2, DHEW Publication Number (NIH) 72-219. Bethesda, Maryland: National Institutes of Health, 1972.

7. Ashley, R. W., Jr., and W. B. Kannel, "Relation of Weight Change to Changes in Atherogenic Traits: The Framingham Study," Journal of Chronic Disease 27:103-114, 1974.

8. Atherosclerosis Study Group and Epidemiology Study Group, "Primary Prevention of the Atherosclerotic Diseases," Circulation 42:A53-A95, 1970.

9. Barr, A. J., J. H. Goodnight, J. P. Sall, and J. T. Helwig, A User's Guide to SAS76. Raleigh: SAS Institute, Inc., 1976.

10. Bain, C., C. H. Hennekins, B. Rosner, F. E. Speizer, and M. J. Jesse, "Cigarette Consumption and Deaths from Coronary Heart Disease," Lancet 1 (8073):1087-8, May 20, 1978.

11. Becker, Marshall H., Editor. The Health Belief Model and Personal Health Behavior. Thorofare, New Jersey: Charles B. Slack, Inc., 1974.

12. Beeson, P. B., and W. McDermott, Editors. Textbook of Medicine. Philadelphia: W. B. Saunders Co., 1975.

13. Cahill, G. F., Jr., "Diabetes Mellitus: A Brief Overview," The Johns Hopkins Medical Journal 143(5);155-159, 1978.

14. Conn, H. L., Jr., and O. Horwitz, Editors. Cardiac and Vascular Disease. Philadelphia: Lea and Febiger, 1971.

15. Connor, W. E., and S. L. Connor, "The Key Role of Nutritional Factors in the Prevention of Coronary Heart Disease," Preventive Medicine 1:49-83, 1972.

16. Coronary Drug Project Research Group. "Factors Influencing Long-Term Prognosis After Recovery from Myocardial Infarction: Three-Year Findings of the Coronary Drug Project," Journal of Chronic Disease 27:267-285, 1974.

17. Dignan, M. B., "Efficacy of Selected Diagnostic Procedures for the Detection of Hypertension." Unpublished Dissertation, University of Tennessee, Knoxville, 1977.

18. Doyle, J. T., et al., "The Relationship of Cigarette Smoking to Coronary Heart Disease. The Second Report of the Combined Experience of the Albany, New York, and Framingham, Mass., Studies," JAMA 190:886-890, 1964.

19. Draper, N. R., and H. Smith, Applied Regression Analysis. New York: John Wiley and Sons, Inc., 1966.

20. East Tennessee Baptist Hospital, East Tennessee Baptist Heart Center Cardiac Rehabilitation and Exercise Program. East Tennessee Baptist Hospital, Knoxville, Tennessee.

21. Eaton, R. P., "High Density Lipoprotein-Key to Antiatherogenesis," Editorial, Journal of Chronic Disease 31(3):131-135, 1978.

22. Epstein, F. H., "Hereditary Aspects of Coronary Heart Disease," American Heart Journal 67:445-456, 1964.

23. Epstein, F. H., "The Epidemiology of Coronary Heart Disease: A Review," Journal of Chronic Disease 18:735-774, 1965.

24. Faigel, H. C., "Hyperlipidemia," The Practitioner 218:243, 1977.

25. Feinleib, M., and M. J. Davidson, "Coronary Heart Disease Mortality A Community Perspective," JAMA 222(9):1129-1134, 1972.

26. Frank, C. W., E. Weinblatt, S. Shapiro, and R. V. Sager, "Myocardial Infarction in Men: Role of Physical Activity and Smoking in Incidence and Mortality," JAMA 198:1241-1245, 1966.

27. Fredrickson, D. S., "A Physician's Guide to Hyperlipidemia," Modern Concepts of Cardiovascular Disease 41:31-36, 1972.

28. Glasser, W., Positive Addiction. New York: Harper and Row, 1976.

29. Gordon, T., and T. Thom, "The Recent Decrease in CHD Mortality," Preventive Medicine 4:115-125, 1975.

30. Gordon, T., and W. B. Kannel, "Premature Mortality from Coronary Heart Disease the Framingham Study," JAMA 215(10):1617-1625, 1971.

31. Gordon, T., et al., "The Framingham Study: Predicting Coronary Heart Disease in Middle-Aged and Older Persons," JAMA 238(6): 497-499, 1977.

32. Gussow, Z., and G. S. Tracy, "The Role of Self-Help Clubs in Adaptation to Chronic Illness and Disability," Social Science and Medicine, 10:407-414, 1974.

33. Guyton, Arthur C., Textbook of Medical Physiology. Philadelphia: W. B. Saunder Co., 1976.

34. Haggerty, F. J., "Changing Lifestyle to Improve Health," Preventive Medicine 6:276-289, 1977.

35. Hagstrom, R. M., C. F. Federspiel, and Yaw Chin Ho, "Incidence of Myocardial Infarction and Sudden Death from Coronary Heart Disease in Nashville, Tennessee," Circulation 44:890, 1971.

36. Halhuber, M. J., "Health Education in Cardiac Rehabilitation," Advances in Cardiology, 24:35, 146-152, 1978.

37. Hays, W. L., Statistics for the Social Sciences. New York: Holt, Rinehart, and Winston, Inc., 1973.

38. Heller, R. F., and H. S. Jacobs, "Coronary Heart Disease in Relation to Age, Sex, and the Menopause," British Medical Journal 1(6111):472-474, 1978.

39. Herrick, J. B., "Clinical Features of Sudden Obstruction of the Coronary Arteries," JAMA 59:2015-2020, 1912.

40. Higano, N., R. W. Robinson, and W. D. Cohen, "Increased Incidence of Cardiovascular Disease in Castrated Women," New England Journal of Medicine 268:1123-1125, 1963.

41. Hsu, P. H., S. W. Rabkin, and F. A. L. Mathewson, "Relationship Between Age, Blood Pressure, Body Weight and 26 Year Incidence of Ischemic Heart Disease." Paper presented at the 8th Annual Meeting of the Society for Epidemiologic Research. Albany, New York: June 1975. Abstract. American Journal of Epidemiology 102:441-442, 1975.

42. Hurst, J. W., R. B. Logue, R. C. Schlant, and N. K. Wenger, Editors. The Heart. New York: McGraw-Hill Co., 1974.

43. James, E., and E. A. Amsterdam, Editors. Coronary Heart Disease, Exercise Testing, and Cardiac Rehabilitation. New York: Stratton Intercontinental Medical Book Corporation, 1977.

44. Jessop, P., "Stepping Stones: A Road to Coronary Rehabilitation Programs," The Canadian Nurse 72(11);18-21, November 1976.

45. Kannel, W. B., W. P. Castelli, T. Gordon, and P. M. McNamara, "Serum Cholesterol, Lipoproteins and the Risk of Coronary Heart Disease: The Framingham Study," Annals of Internal Medicine 74:1-12, 1971.

46. Kellerman, J. J., "Rehabilitation of Patients with Coronary Heart Disease," Progress in Cardiovascular Diseases 17(4):303-328, 1975.

47. Kellerman, J. J., B. Modan, M. Levy, S. Feldman, and I. Kariv, "Return to Work After Myocardial Infarction," Geriatrics 23(3): 151-156, March 1968.

48. Keys, A., Editor. "Coronary Heart Disease in Seven Countries," American Heart Association Monograph Number 29, Circulation 41(4) Supplement No. 1: I1-I211, 1970.

49. Kuller, L., M. Cooper, and J. Perper, "Myocardial Infarction and Sudden Death in an Urban Community," Bulletin New York Academy of Medicine 49:532-543, 1973.

50. Lewis, B., "The Common Hyperlipidemias," Postgraduate Medical Journal 52(609):433-437, July 1976.

51. Likoff, W., and J. H. Moyer, Coronary Heart Disease. New York: Crune and Stratton, 1963.

52. Littmann, D., Examination of the Heart, Part Five, The Electrocardiagram. New York: American Heart Association, 1973.

53. Longevity Research Institute, Evaluation of Longevity Center 26-30 Day Inpatient Program—An Analysis of 893 Patients. Santa Monica, California: Longevity Research Institute, April 1978.

54. Margolis, J. R., R. F. Gillum, M. Feinleib, R. Brasch, and R. Fabsitz, "Community Surveillance for Coronary Heart Disease: The Framingham Cardiovascular Disease Survey—Comparisons with the Framingham Heart Study and Previous Short-Term Studies," The American Journal of Cardiology 37:61-67, 1976.

55. Medical World News, "Risk Factors in Heart Disease," Medical Heart News 18(22):41-48, 1977.

56. Metropolitan Life Insurance Co., Statistical Bulletin, Volume 54. New York: Metropolitan Life Insurance Co., 1973.

57. Morris, J. N., et al., "Incidence and Prediction of Ischemic Heart Disease in London Busmen," Lancet 2:553-559, 1966.

58. Most, A. S., and D. R. Peterson, "Myocardial Infarction Surveillance in a Metropolitan Community," JAMA 208:2433-2438, 1969.

59. Neter, J., and W. Wasserman, Applied Linear Statistical Models. Homewood, Illinois: Richard D. Irwin, Inc., 1974.

60. Nie, N. H., et al., Statistical Package for the Social Sciences, Second Edition. New York: McGraw-Hill Book Co., 1975.

61. Owens, J. F., C. S. McCann, and C. M. Hutelmyer, "Cardiac Rehabilitation: A Patient Education Program," Nursing Research 27(3):148-150, 1978.

62. Pooling Project Research Group. "Relationship of Blood Pressure, Serum Cholesterol, Smoking Habit, Relative Weight, and ECG Abnormalities to Incidence of Major Coronary Events: Final Report of the Pooling Project," Journal of Chronic Disease 31(4):201-306, 1978.

63. Rechnitzer, P. A., et al., "Long-term Followup Study of Survival and Recurrence Rates Following Myocardial Infarction in Exercising and Control Subjects," Circulation 45:853-857, 1972.

64. Reid, D. D., "Smoking and Ischemic Heart Disease Prevention—Problems and Potential," Preventive Medicine 1:84-91, 1972.

65. Rose, G., "Detection of High Coronary Risk," Postgraduate Medical Journal 52(609):452-455, 1976.

66. Ross, J., Jr., and R. A. O'Rourke, Understanding the Heart and Its Disease. New York: McGraw-Hill Book Co., 1976.

67. Scott, R. S., "Diabetes and the Heart," American Heart Journal 90:283-289, 1975.

68. Scott, D. W., A. M. Gotto, J. S. Cole, and G. A. Gorry, "Plasma Lipids as Collateral Risk Factors in Coronary Artery Disease—A Study of 371 Males with Chest Pain," Journal of Chronic Disease 31(5):337-345, 1978.

69. Shapiro, S., E. Weinblatt, and C. W. Frank, "Incidence of Coronary Heart Disease in a Population Insured for Medical Care (HIP)," American Journal of Public Health, Supplement 2:1-101, 1969.

70. Shekelle, R. B., and S. C. Liu, "Public Beliefs About Causes and Prevention of Heart Attacks," JAMA 240(8):756-8, 1978.

71. Sparrow, D. S., T. R. Dawber, and T. Colton, "The Influence of Cigarette Smoking on Prognosis After a First Myocardial Infarction," Journal of Chronic Disease 31(6/7):425-432, 1978.

72. Stamler, J., D. M. Berkson, and H. A. Lindbert, "Coronary Risk Factors: Their Impact and Their Therapy in the Prevention of Coronary Heart Disease," Medical Clinic of North America 50:229-254, 1966.

73. Stamler, J., and F. H. Epstein, "Coronary Heart Disease: Risk Factors as Guides to Preventive Action," Preventive Medicine 1:27-48, 1972.

74. Tennessee Heart Association Physical Exercise Committee, Physician's Handbook for Evaluation of Cardiovascular and Physical Fitness, Tennessee Heart Association, Nashville, Tennessee, 1972.

75. The Hypertension Detection and Follow-Up Program Cooperative Group, "Blood Pressure in 14 Communities: A Two-State Screen for Hypertension," JAMA 237(22):2385-2391, 1977.

76. Truett, J., J. Cornfield, and W. Kannel, "A Multivariate Analysis of the Risk of Coronary Heart Disease in Framingham," Journal of Chronic Disease 20:511-524, 1967.

77. Truswell, A. S., "Diet in the Pathogenesis of Ischemic Heart Disease," Postgraduate Medical Journal 52:424-431, 1976.

78. U.S. Department of HEW, National Heart, Blood Vessel, Lung and Blood Program, Fourth Report of the Director of the National Heart, Lung and Blood Institute, DHEW Publication Number (NIH) 77-1170. Bethesda, Maryland: National Institutes of Health, March 1, 1977.

79. U.S. Department of HEW, National Heart, Blood Vessel, Lung and Blood Program, Volume IV, Panel Reports, Part 1, Report of the Heart and Blood Vessel Diseases Panel, PHS, NIH, National Heart and Lung Institute, DHEW Publication Number (NIH) 73-518. Bethesda, Maryland: National Institutes of Health, April 6, 1973.

80. U.S. Department of HEW, Second Annual Report of the Director of the National Heart and Lung Institute, PHS, NIH, National Heart and Lung Institute, DHEW Publications Number (NIH) 75-748. Bethesda, Maryland: National Institutes of Health, March 10, 1975.

81. Wagner, H. N., and H. W. Strauss, "A New Approach to Coronary Heart Disease," Circulation 48:229-231, 1973.

82. Walker, W. J., "Coronary Mortality: What is Going On?, JAMA 227: 1045-1046, 1974.

83. Walker, W. J., "Success Story: The Program Against Major Cardiovascular Risk Factors," Geriatrics 31(3):97-104, 1976.

84. Weaver, F. J., K. L. Herrick, A. G. Ramirez, and D. A. Deatrick, "Establishing a Community Data Base for Cardiovascular Health Education Programs," Health Values: Achieving High Level Wellness 2(5):249-256, 1978.

85. White, P. D., E. F. Bland, and S. A. Levine, "Further Observations Concerning the Prognosis of Myocardial Infarction Due to Coronary Thrombosis," Annals of Internal Medicine 48:39-49, 1958.

86. Wilhelmsen, L., et al., "A Controlled Trial of Physical Training After Myocardial Infarction," Preventive Medicine 4:491-508, 1975.

87. Wilhelmsen, C., et al., "Hypertension and Myocardial Infarction," Journal of Chronic Disease 31:157-163, March 1978.

88. Wintrobe, M. W., et al., Editors, Harrison's Principles of Internal Medicine Seventh Edition. New York: McGraw-Hill Book Co., 1974.

APPENDIXES

APPENDIX A

QUESTIONNAIRE

QUESTIONNAIRE

1. How many heart attacks have you had? _____

   Dates of heart attacks? _____

2. While you were hospitalized for your latest heart attack, did you have special education sessions with the nurses? _____ yes or _____ no

3. Do you smoke cigarettes now? _____ yes or _____ no

   Did you smoke cigarettes before your heart attack? _____ yes or _____ no

4. Were you overweight when you had your heart attack? (More than five pounds) _____ yes or _____ no

5. Do you have high cholesterol or high triglycerides (fat in the blood)? _____ yes or _____ no

   What medication or medications, if any, are you taking for high cholesterol? _____

   Are you on a low fat diet? _____ yes or _____ no

   Did you receive diet instructions while hospitalized? _____ yes or _____ no

6. Do you have hypertension (high blood pressure)? _____ yes or _____ no

   Are you on a low salt diet? _____ yes or _____ no

   Do you regularly take medication for hypertension? _____ yes or _____ no

   What medication or medications for your heart are you presently taking, if any? _____

7. Please circle any of the following symptoms which you experience often:

   headache leg pain arm pain chest pain neck pain shortness of breath other symptons: _____

   If you take nitroglycerin, about how often do you get your nitroglycerin prescription refilled? _____

8. Did you have an angiogram (heart catherization)? _____ yes or _____ no

   Did you have heart surgery? _____ yes or _____ no

9. Are you currently on an exercise program? _____ yes or _____ no

   Who prescribed the program? _____

   How far do you walk each day? _____

   What sports, if any, do you participate in? _____

---

10. Have you returned to your former work, either part-time or full-time? _____ yes or _____ no

    If yes, how soon after heart attack did you return to work on a part-time basis? _____
    On a full-time basis? _____

    If no, have you changed jobs since your heart attack? _____ yes or _____ no

    What type of work are you presently engaged in? _____

---

11. Which of the following best describes the amount of sleep which you get now as compared with before your heart attack?

_____	_____	_____	_____	_____
much less	less	about the same	more	much more

Do you take medication or tranquilizers to help you sleep? _____ yes or _____ no

12. Which of the following best describes the amount of sexual activity which you participate in now as compared with before your heart attack?

_____ much less _____ less _____ about the same _____ more _____ much more

13. Since your heart attack, have you undergone any major changes in your immediate family situation? _____ yes or _____ no

If yes, which type?

_____ marriage _____ separation _____ divorce _____ remarriage _____ other

14. Are you under extreme emotional stress? _____ yes or _____ no

If yes, how do you handle this stress? _____

_____

15. How often do you return to your physician for a check-up?

_____ weekly _____ every two weeks _____ monthly _____ every three months _____ yearly

16. Did you participate in the outpatient cardiac rehabilitation program? _____ yes or _____ no

If yes, what were your reasons for participating? _____

_____

If no, what were your reasons for not participating? _____

_____

17. Which of the following best describes your overall condition and how you feel now as compared to before your heart attack?

_____	_____	_____	_____	_____
feel much worse	feel worse	feel about the same	feel better	feel much better

18. Are you aware of the East Tennessee Coronary Club? _____ yes or _____ no

Do you belong to the East Tennessee Coronary Club? _____ yes or _____ no

19. What do you think about the cardiac care which you received at East Tennessee Baptist Hospital? _____

_____

_____

20. What suggestions do you have for improving cardiac care at East Tennessee Baptist Hospital?

_____

_____

_____

_____

APPENDIX B

COVER LETTER AND PHYSICIAN CONSENT FORM

COVER LETTER

Dear Dr.

East Tennessee Baptist Hospital is participating in a study on the hospital's cardiac care units and cardiac rehabilitation unit. The study, entitled the East Tennessee Baptist Hospital Cardiac Care Study Project, will be directed by Mary B. Hall, a University of Tennessee doctoral candidate in Health Education, who will utilize the project as a dissertation.

The sample for the study will be all male patients discharged from ETBH with a diagnosis of myocardial infarction during the time interval from February 1, 1976, through September 1, 1977. This sample includes some of your patients. Enclosed is a description of the study along with the information needed on each patient, and the questionnaire and consent form to be sent each patient. If you wish your patients to be contacted about participation in this project, please sign the consent form attached and return, at your earliest convenience, in the enclosed envelope.

If you have any questions regarding this study, please call Mrs. Hall at 584-8906. Thank you.

Sincerely,

George Mathews
Senior Vice President
ETBH

(Mrs.) Mary B. "Mimi" Hall
Project Director
ETBH Cardiac Care Study Project

PHYSICIAN CONSENT FORM

I give my consent to Mary B. Hall, Project Director, ETBA Cardiac Care Study Project, to contact any of my patients who are in the described sample of the Project. I understand that each patient will also give his consent for any release of information.

SIGNATURE_____

DATE_____

APPENDIX C

COVER LETTER AND PARTICIPANT CONSENT FORM

COVER LETTER

Dear Mr.

East Tennessee Baptist Hospital is participating in a study on the hospital's cardiac care units and cardiac rehabilitation unit. We are interested in knowing what you think about the care you received at the hospital and how you have progressed in the period since your heart attack. In order to do this, we are asking for your help in three ways:

(1) To read and complete the enclosed questionnaire;

(2) To read and sign the consent form at the beginning of the questionnaire; and

(3) To return to us within five days, or at your earliest convenience, the questionnaire and the signed consent from in the stamped, self-addressed envelope.

The study is being directed by Mary B. Hall, a University of Tennessee doctoral candidate in Health Education, who will utilize the project as a dissertation. Names of participants and information obtained will not be identifiable in the findings or in the reports of the study. Only summary information will be utilized.

Your admitting physician is cooperating in this study by consenting to our contacting you about your participation in the project; however, if you choose not to participate your relationship with your physician or physicians will in no way be affected. Your cooperation and participation will aid us in our continuing efforts to improve care of cardiac patients. In addition, it will hopefully increase medical knowledge and progress. Please feel free to call me at (telephone 632-5081) if you have any questions concerning the project.

Sincerely,

George Mathews
Senior Vice President

(Mrs.) Mary B. Hall
Project Director
East Tennessee Baptist Hospital
Cardiac Care Study Project

EAST TENNESSEE BAPTIST HOSPITAL CARDIAC CARE STUDY PROJECT

INFORMATION CONSENT FORM

I authorize any hospital or physician to release to Mary B. Hall, Project Director of ETBH Cardiac Care Study Project, the following items of information: age, number of myocardial infarctions, participation or nonparticipation in ETBH Cardiac Rehabilitation Program, presence of cigarette smoking, height, weight, systolic blood pressure, diastolic blood pressure, presence of angina, presence of diabetes, electrocardiogram abnormalities, and the following blood measurements: creatinine phosphokinase, hemoglobin, hematocrit, blood glucose, and lipoproteins. This information will be obtained at three different times: at time of hospitalization, at three months post-myocardial infarction, and at six months post-myocardial infarction. I also authorize the information in the questionnaire below to be utilized in the Project. I understand that all information will only be utilized in summary form in the reporting of the findings and that no individual participant will be identifiable. I understand that I am free to withdraw my consent and my participation in the project at any time during the study.

SIGNATURE_____

DATE_____

APPENDIX D

DATA COLLECTION SHEETS

EAST TENNESSEE BAPTIST HOSPITAL CARDIAC CARE STUDY PROJECT

Patient's Name _____

Physician _____

	Hospital Admission	Three Months Post-Myocardial Infarction	Six Months Post-Myocardial Infarction
Date			
Height			
Weight			
Number of M.I.'s			
Cardiomegaly (No, Probably, or Definite)			
Systolic BP			
Diastolic BP			
Blood Cholesterol (Mg/dl)			
Beta Cholesterol If Done (Mg%)			
Triglyceride Level (Mg/dl)			
Lipoprotein Phenotype (If Done)			
CPK U/L			
CPK II (Present, Absent, or Trace)			
Hemoglobin (Gm.)			
Hematocrit (%)			
Cigarette Smoking (Yes or No)			
Blood Glucose (Mg/dl) Fasting Only			
Presence of Periodic Angina (Yes or No)			

	Hospital Admission	Three Months Post-Myocardial Infarction	Six Months Post-Myocardial Infarction
Presence of Diabetes (Yes or No)			
EKG Abnormalities ST Segment Depression (Present, Absent)			
T Wave Inversions (Present, Absent)			
Ventricular Conductive Defects (VCD) (Present, Absent)			
Area of VCD (Right Bundle, Left Bundle)			
Q Waves (Present, Absent)			

APPENDIX E

SELECTED STATISTICS TABLES FOR QUANTITATIVE DATA

TABLE A-1

HEART CENTER PARTICIPANTS TIME ONE

Variable	N	Mean	Standard Deviation	Minimum	Maximum
AGE	20	49.80000000	7.68867931	38.00000000	65.00000000
HT	20	69.85000000	2.08440323	66.00000000	73.00000000
WT1	20	179.35000000	24.61337890	150.00000000	250.00000000
MI1	20	1.15000000	0.36634755	1.00000000	2.00000000
SYS1	20	131.10000000	32.87280111	90.00000000	210.00000000
DIA1	20	83.30000000	16.35494453	50.00000000	110.00000000
CHOL1	20	216.10000000	33.24534000	177.00000000	291.00000000
BCHOL1	20	135.75000000	32.40999683	88.00000000	214.00000000
CHYLO1	8	0	0	0	0
BETA1	8	58.23750000	4.16273862	52.10000000	64.30000000
PBETA1	8	29.48750000	7.32265321	17.00000000	37.00000000
ALPHA1	8	11.32500000	6.84788810	5.00000000	22.50000000
TRIG1	19	140.31578947	58.46561443	45.00000000	268.00000000
CPK1	19	2006.21052632	1511.90636023	73.00000000	5990.00000000
HGB1	20	15.27000000	1.24524358	13.00000000	17.50000000
HCT1	20	44.49500000	3.41089200	38.10000000	51.00000000
GLU1	15	136.06666667	50.80138731	93.00000000	287.00000000
SMI	20	0	0	0	0

TABLE A-2

HEART CENTER PARTICIPANTS TIME TWO

Variable	N	Mean	Standard Deviation	Minimum	Maximum
AGE	20	49.80000000	7.68867931	38.00000000	65.00000000
HT	20	69.85000000	2.08440323	66.00000000	73.00000000
WT2	17	178.58823529	20.54585975	145.00000000	227.00000000
MI2	20	1.20000000	0.41039134	1.00000000	2.00000000
SYS2	19	131.10526316	16.44821752	100.00000000	154.00000000
DIA2	19	77.52631579	7.89070072	60.00000000	95.00000000
CHOL2	13	210.61538462	31.31969152	146.00000000	275.00000000
BCHOL2	9	117.11111111	50.07106062	52.00000000	185.00000000
CHYLO2	1	0	0	0	0
BETA2	1	54.70000000	0	54.70000000	54.70000000
PBETA2	1	29.90000000	0	29.90000000	29.90000000
ALPHA2	1	15.40000000	0	15.40000000	15.40000000
TRIG2	13	160.84615385	57.41202858	89.00000000	239.00000000
CPK2	13	91.61538462	157.68509677	13.00000000	608.00000000
HGB2	13	15.43076923	0.94197011	14.00000000	16.90000000
HCT2	13	45.32307692	2.52558701	41.80000000	49.70000000
GLU2	8	102.62500000	17.04563203	82.00000000	134.00000000
SMI	20	0	0	0	0

TABLE A-3

HEART CENTER PARTICIPANTS TIME THREE

Variable	N	Mean	Standard Deviation	Minimum	Maximum
AGE	20	49.80000000	7.68867931	38.00000000	65.00000000
HT	20	69.85000000	2.08440323	66.00000000	73.00000000
WT3	7	179.71428571	12.56601615	157.00000000	197.00000000
MI3	20	1.20000000	0.41039134	1.00000000	2.00000000
SYS3	12	126.50000000	16.34013464	102.00000000	152.00000000
DIA3	12	77.16666667	9.35981093	62.00000000	90.00000000
CHOL3	7	202.85714286	30.96464958	172.00000000	260.00000000
BCHOL3	3	89.00000000	19.97498436	66.00000000	102.00000000
CHYLO3	2	0	0	0	0
BETA3	2	60.55000000	7.84888527	55.00000000	66.10000000
PBETA	2	32.45000000	5.02045815	28.90000000	36.00000000
ALPHA3	2	5.95000000	1.48492424	4.90000000	7.00000000
TRIG3	6	162.83333333	58.06691542	93.00000000	236.00000000
CPK3	4	159.50000000	183.38393241	40.00000000	432.00000000
HGB3	5	14.78000000	0.58051701	14.10000000	15.70000000
HCT3	5	42.44000000	2.70795126	40.10000000	47.10000000
GLU3	5	97.20000000	9.01110426	91.00000000	113.00000000
SMI	20	0	0	0	0

TABLE A-4

NONPARTICIPANTS TIME ONE

Variable	N	Mean	Standard Deviation	Minimum	Maximum
AGE	48	60.68750000	9.66493167	38.00000000	85.00000000
HT	47	68.74468085	3.07492018	60.00000000	73.00000000
WT1	47	175.85106383	23.23320218	125.00000000	229.00000000
MI1	48	1.12500000	0.39275351	1.00000000	3.00000000
SYS1	48	129.18750000	21.77413677	84.00000000	192.00000000
DIA1	48	83.64583333	14.15039220	50.00000000	112.00000000
CHOL1	48	205.35416667	38.28031525	125.00000000	294.00000000
BCHOL1	32	123.96875000	37.89330043	57.00000000	212.00000000
CHYLO1	24	0	0	0	0
BETA1	24	57.26250000	8.96276416	42.60000000	79.30000000
PBETA1	24	22.34166667	8.70731410	7.70000000	44.40000000
ALPHA1	24	20.32083333	6.76711866	8.70000000	37.70000000
TRIG1	46	139.84782609	63.09673962	50.00000000	310.00000000
CPK1	48	1278.81250000	935.62209720	20.00000000	3750.00000000
HGB1	47	14.81702128	1.26856974	11.20000000	17.60000000
HCT1	47	43.62553191	3.36403407	33.60000000	52.40000000
GLU1	31	113.19354839	31.63270392	63.00000000	223.00000000
SMI	48	0.12500000	0.39275351	0	2.00000000

TABLE A-5

NONPARTICIPANTS TIME TWO

Variable	N	Mean	Standard Deviation	Minimum	Maximum
AGE	48	60.68750000	9.66493167	38.00000000	85.00000000
HT	47	68.74468085	3.07492018	60.00000000	73.00000000
WT2	30	173.93333333	19.18859815	118.00000000	208.00000000
MI2	48	1.66666667	0.42941491	1.00000000	3.00000000
SYS2	35	125.31428571	18.52148423	90.00000000	170.00000000
DIA2	35	77.94285714	10.45422194	54.00000000	100.00000000
CHOL2	16	212.25000000	40.30632705	137.00000000	270.00000000
BCHOL2	12	80.50000000	46.68949658	40.00000000	182.00000000
CHYLO2	6	0	0	0	0
BETA2	6	46.41666667	7.26977762	39.60000000	56.40000000
PBETA2	6	31.45000000	11.21886804	21.60000000	52.40000000
ALPHA2	6	22.03333333	10.06214026	8.00000000	36.60000000
TRIG2	15	196.00000000	108.63964023	53.00000000	463.00000000
CPK2	14	95.28571429	146.05237658	25.00000000	559.00000000
HGB2	16	15.11250000	1.29453982	13.00000000	17.80000000
HCT2	15	45.22000000	4.15111001	38.90000000	55.90000000
GLU2	9	97.33333333	14.30908802	81.00000000	125.00000000
SMI	48	0.12500000	0.39275351	0	2.00000000

TABLE A-6

NONPARTICIPANTS TIME THREE

Variable	N	Mean	Standard Deviation	Minimum	Maximum
AGE	48	60.68750000	9.66493167	38.00000000	85.00000000
HT	47	68.74468085	3.07492018	60.00000000	73.00000000
WT3	21	175.85714286	20.66224991	116.00000000	208.00000000
MI3	48	1.20833333	0.54415006	1.00000000	3.00000000
SYS3	30	127.60000000	15.93434807	104.00000000	178.00000000
DIA3	30	77.60000000	11.65480514	40.00000000	100.00000000
CHOL3	4	191.00000000	45.49725266	133.00000000	242.00000000
BCHOL3	3	70.00000000	36.38681080	48.00000000	112.00000000
CHYLO3	1	0	0	0	0
BETA3	1	50.70000000	0	50.70000000	50.70000000
PBETA3	1	21.10000000	0	21.10000000	21.10000000
ALPHA3	1	28.20000000	0	28.20000000	28.20000000
TRIG3	4	151.00000000	86.97509222	79.00000000	276.00000000
CPK3	4	66.25000000	23.34345019	37.00000000	93.00000000
HGB3	4	15.80000000	1.83121089	13.90000000	18.30000000
HCT3	4	46.87500000	5.28228170	40.40000000	53.30000000
GLU3	2	120.50000000	27.57716447	101.00000000	140.00000000
SMI	48	0.12500000	0.39275351	0	2.00000000

APPENDIX F

CORRELATION TABLE

TABLE A-7

CORRELATION TABLE

Heart Center Participants

TIME 1		TIME 2		TIME 3	
AGE, BETA 1	0.64774 0.0824 8	GLU2,HCT2	0.72518 0.0418 8	WT3,HT	0.70383 0.0776 7
SYS 1, DIA 1	0.87826 0.0001 20	TRIG2,CPK2	0.47627 0.0999 13	SYS3,DIA	0.51587 0.0860 12
TRIG 1, WT 1	0.45366 0.0511 19	TRIG2,WT2	0.52884 0.0771 12	HT,CPK3	-0.94913 0.0509 4
CHOL 1, BCHOL 1	0.94624 0.0001 20	CHOL2,BETA2	0.70407 0.0343 9	SYS3,CPK3	0.94744 0.0526 4
SYS 1, ALPHA 1	0.63166 0.0930 8	MI2,DIA2	0.55294 0.0141 19	MI3,CPK3	0.99064 0.0094 4
CHOL 1, BETA 1	0.77208 0.0248 8	GLU2,HT	0.68492 0.0609 8		
BCHOL 1, BETA 1	0.77878 0.0228 8	WT2,HGB2	0.51285 0.0882 12		
PBETA 1, TRIG 1	0.73721 0.0587 7	HGB2,GLU2	0.70329 0.0516 8	HGB3,GLU3	0.97717 0.0228
AGE,HT	-0.60296 0.0049 20	BCHOL2,AGE	-0.66625 0.0501 9		
CHOL 1, PBETA 1	-0.67698 0.0652 8	HGB2,AGE	-0.52167 0.0675 13		
BCHOL 1, PBETA 1	-0.76625 0.0266 8	GLU2,AGE	-0.71025 0.0484 8		
PBETA 1, ALPHA 1	-0.82085 0.0125 8				

TABLE A-7 (Continued)

Nonparticipants

TIME 1				TIME 2		TIME 3	
SYS1,MI1	-0.26155 0.0725 48	HGB1,AGE	-0.24747 0.0935 47	AGE,WT2	-0.43588 0.0161 30	AGE,WT3	-0.55107 0.0096 21
CHOL1,WT1	0.24471 0.0974 47	HCT1,HT	0.25092 0.0926 46	WT2,HT	0.41725 0.0243 29	HT,WT3	0.48134 0.0272 21
DIA1,SYS1	0.5.627 0.0002 48	MI1,HCT1	-0.24530 0.0965 47	HI,MI2	-0.27665 0.0598 47	HT,MI3	-0.36622 0.0114 47
BCHOL1,SYS1	0.44369 0.0110 32	DIA1,HGB1	0.26410 0.0728 47	WT2,MI2	0.36632 0.0465 30	AGE,DIA3	-0.32574 0.0790 30
DIA1,CHOL1	0.43460 0.0129 32	SYS1,CPK1	0.27110 0.0623 48	DIA2,AGE	-0.48197 0.0034 35	HT,DIA3	0.44172 0.0164 29
CHOL1,BCHOL1	0.93919 0.0001 32	HGB1,WT1	0.40143 0.0057 46	DIA2,WT2	0.47343 0.0082 30	HT,CHOL3	0.97881 0.0212 4
BETA1,CHOL1	0.38958 0.0599 24	HGB1,MI1	-0.26369 0.0733 47	DIA2,MI2	0.33318 0.0505 35	WT3,BCHOL3	0.99962 0.0175 3
BCHOL1,BETA1	0.47452 0.0297 21	HCT1,WT1	0.28192 0.0577 46	SYS2,DIA2	0.65113 0.0001 35	SYS3,DIA3	0.33407 0.0712 30
MI1,ALPHA1	0.35780 0.0860 24	TRIG1,CPK1	-0.25322 0.0895 46	HT,BETA2	-0.75569 0.0822 6	HCT3,DIA3	0.92448 0.0755 4
CHOL1,ALPHA1	-0.36222 0.0820 24	HCT1,HGB1	0.85683 0.0001 47	TRIG2,SYS2	0.57225 0.0325 14	SMI,SYS3	-0.35142 0.0569 30
PBETA1,BETA1	-0.70908 0.0001 24			PBETA2,ALPHA2	-0.77459 0.0705 6	HCT3HGB3	0.98040 0.0196 4
BETA1,ALPHA1	-0.41167 0.0456 24			PBETA2,TRIG2	0.87885 0.0211 6		
PBETA1,ALPHA	-0.35023 0.0934 24			CPK2,SYS2	0.56496 0.0353 14		
TRIG1,BETA1	-0.42552 0.0382 24			CHOL2,CPK2	-0.50415 0.0660 14		
PBETA1,TRIG1	0.70094 0.0001 24			HCT2,HGB2	0.94766 0.0001 15		
TRIG1.ALPHA	-0.34496 0.0988 24						

APPENDIX G

SUMMARY OF QUESTIONNAIRE RESPONSES

TABLE A-8

SUMMARY OF QUESTIONNAIRE RESPONSES

Question Number			Heart Center Participants (N = 19)	Non-Participants (N = 46)
1.	Number of Heart Attacks	1	74%	74%
		2	21%	20%
		3	5%	4%
		4	0	2%
2.	Inpatient Education	Yes	95%	76%
		No	5%	20%
		N/A*	0	2%
	Smoke Before Attack	Yes	68%	61%
		No	32%	39%
4.	Overweight at Time of Heart Attack	Yes	37%	35%
		No	63%	65%
5.	High Cholesterol or High Triglycerides in Blood	Yes	53%	30%
		No	47%	52%
		N/A	0	17%
	Medication for High Cholesterol	Yes	0	0
		No	100%	100%
	On Low Fat Diet	Yes	84%	54%
		No	11%	28%
		N/A	5%	17%
	Diet Instruction in Hospital	Yes	95%	80%
		No	5%	18%
		N/A	0	2%
6.	Hypertension	Yes	21%	24%
		No	79%	72%
		N/A	0	4%
	On Low Salt Diet	Yes	63%	72%
		No	37%	26%
		N/A	0	2%

TABLE A-8 (Continued)

Question Number			Heart Center Participants (N = 19)	Non-Participants (N = 46)
	On Medication for Hypertension	Yes	32%	24%
		No	63%	70%
		N/A	5%	6%
	On Heart Medication	Yes	63%	70%
		No	37%	33%
	List of Heart Medications:		Isordil Quinidine Inderal Nitrol-Ointment Nitro-glycerine Digoxin	Inderal Isordil Nitrol-Ointment Digoxin Sorbitrate Quinidine
7.	Symptoms	Headache	5%	20%
		Leg Pain	26%	22%
		Arm Pain	26%	26%
		Chest Pain	26%	28%
		Neck Pain	21%	20%
		Shortness of Breath	32%	61%
		Other	11%	13%
		None	47%	15%
8.	Angiogram	Yes	53%	28%
		No	42%	50%
		N/A	5%	22%
	Heart Surgery (Coronary Bypass Surgery)	Yes	32%	11%
		No	68%	85%
		N/A	0	4%
9.	On Exercise Program	Yes	47%	35%
		No	47%	61%
		N/A	5%	4%
	Who Prescribed Program	Physician	63%	43%
		Other	5%	55%
		N/A	32%	2%

TABLE A-8 (Continued)

Question Number			Heart Center Participants (N = 19)	Non-Participants (N = 46)
	Distance Walked Per Day	None	15%	48%
		1/2 Mile	11%	9%
		1 Mile	11%	15%
		2 Miles	42%	20%
		3 Miles	5%	4%
		4 Miles	11%	4%
		4-1/2 Miles	5%	0
	Sports Participated in Weekly	None	63%	88%
		Hunting & Fishing	16%	4%
		Golf	16%	2%
		Bowling	5%	0%
		Swimming	0	4%
		Biking	0	2%
10.	Returned to Former Work	Yes	89%	54%
		No	11%	44%
		N/A	0	2%
	Time to Part-Time Basis	0	43%	78%
		3 Months	37%	11%
		6 Months	52%	22%
	Time to Full-Time Basis	0	26%	63%
		3 Months	33%	16%
		6 Months	71%	37%
11.	Amount of Sleep as Compared with Before Heart Attack	Much Less	0	2%
		Less	21%	9%
		Same	58%	52%
		More	16%	30%
		Much More	5%	4%
		N/A	0	2%
	Need Medicine to Sleep	Yes	21%	15%
		No	79%	76%
		N/A	0	9%

TABLE A-8 (Continued)

Question Number			Heart Center Participants (N = 19)	Non-Participants (N = 46)
12.	Amount of Sexual Activity as Compared with Before Heart Attack	Much Less	11%	17%
		Less	37%	35%
		Same	42%	42%
		More	5%	2%
		Much More	0	0
		N/A	5%	4%
13.	Major Family Changes Since Heart Attack	Yes	4%	11%
		No	94%	84%
		N/A	2%	5%
14.	Under Extreme Emotional Stress	Yes	11%	11%
		No	88%	89%
		N/A	2%	0
	Methods of Handling Stress:			
	Worry it out			
	A Day at a Time			
	Take Valium			
	Work, Walking, Helping Others, Doing Church Work			
15.	Checkups	Weekly	0	0
		Every Two Weeks	5%	0
		Monthly	10%	24%
		3 Months	53%	54%
		6 Months	16%	9%
		Yearly	16%	11%
		N/A	0	2%
16.	Participation in Heart Center Program	Yes	100%	0
		No	0	100%
	Reasons for Participating:			
	Physician Recommendation		37%	
	Gain Knowledge About Condition		11%	
	To Improve General Condition		5%	
	To Help in Gaining Strength		16%	
	Needed the Exercise		11%	

TABLE A-8 (Continued)

Question Number			Heart Center Participants (N = 19)	Non-Participants (N = 46)
	To Build up Heart Muscle		5%	
	To Find Out Capability		5%	
	Thought It Was Good Idea		10%	
	Reasons for Not Participating:			
	Did Not Have Time			2%
	Regular Work Was Physical			2%
	Did Not Know About It			10%
	Physician Did Not Recommend It			2%
	Not Covered by Insurance			2%
	Did Not Feel It Was Necessary			2%
	Lived Too Far Away			7%
	No Transportation			7%
	Did Not Ask For It			2%
	Was Not Able To			5%
	Was Not Asked to Participate			7%
	Used Common Sense Treatment			2%
	No Answer			48%
17.	Description of Feeling of Overall Condition as Compared with Before Heart Attack	Feel Much Worse	4%	5%
		Feel Worse	30%	26%
		Feel Same	36%	32%
		Feel Better	15%	26%
		Feel Much Better	13%	11%
		N/A	2%	0
18.	Aware of East Tennessee Coronary Club	Yes	68%	24%
		No	32%	74%
		N/A	0	2%
	Do You Belong to East Tennessee Coronary Club	Yes	0	0
		No	99%	100%
		N/A	1%	0

TABLE A-8 (Continued)

Question Number	Heart Center Participants (N = 19)	Non-Participants (N = 46)
19. Opinions of Cardiac Care at ETBH:		
Efficient		
The Best		
Excellent		
Extremely Nice Staff		
First Class		
Coronary Care Unit Was Too Noisy		
Coronary Care Unit Was Too Small		
Outstanding, Very Informed and Efficient Personnel		
Some Nurses Were Very Impersonal and Seemed to Dislike Their Work		
Need Lighter Monitors		
20. Suggestions for Improvement:		
Expand Coronary Care Unit		
Cut Down on Noise in Coronary Care Unit		
Feel That Heart Patients Should Go Directly to Coronary Care Unit Instead of Emergency Room When Entering Hospital		
Need Lighter Monitors		
More Psychological Help		

*No Answer

APPENDIX H

THE EAST TENNESSEE BAPTIST HEART CENTER

CARDIAC REHABILITATION PROGRAM

THE EAST TENNESSEE BAPTIST HEART CENTER

CARDIAC REHABILITATION PROGRAM

The Cardiac Rehabilitation Program is designed for patients in need of medically supervised exercise therapy, and the program functions only on referral of the attending physician. The patient continues to see his own physician on a regular basis.

The Heart Center is staffed with personnel who are trained in exercise therapy and physiology. Physicians supervise the program and are present at the time of an exercise stress test. This test is a standardized test performed on a stationary treadmill with blood pressure, heart rate and electrocardiograph monitoring. The treadmill test provides for an accurate initial exercise prescription.

Therapy sessions at the Center are scheduled three times a week. A second stress test is performed approximately three months after myocardial infarction and therapy sessions taper off as improvement is seen.

In addition to the basic exercise treatment program, dietary counseling is available using the physician-prescribed diet. Also an educational program utilizing audiovisual aids is designed to provide insight into the basic causes of coronary disease and the general measures helpful in overcoming it.

In summary, the program seeks to aid in disease prevention, diagnosis, medical and surgical care, functional assessment, provision of education, medical services, training and other means to enhance function (20).

VITA

Mary Belle "Mimi" Hall is the daughter of C. Mayo Holman and Helen Marie Holman. She was born in Mayfield, Kentucky, where she attended elementary schools. She graduated from Mayfield High School in May 1956. She enrolled at the University of Tennessee College of Nursing in Memphis, Tennessee, and graduated in March 1960, receiving a Bachelor of Science degree with a major in nursing.

After working as a staff nurse at John Gaston Hospital in Memphis, Tennessee, for several months, she became an instructor at the City of Memphis Hospitals School of Nursing. She held this position for three years from 1960-1963. In December 1960, she was married to Robert Edmund Hall of Knoxville, Tennessee.

From 1963-1964 she worked as a Public Health Nurse for the Los Angeles County Health Department. For the next several years while her husband was in the U.S. Public Health Service in Norfolk, Virginia, and in an ophthalmology residency in Memphis, Tennessee, she worked in the home taking care of their two sons, Britton Robert Hall and Timothy Holman Hall. It was during this time that she gained valuable experience in interpersonal relations and organizational skills.

In 1971, she began attending classes part-time at the University of Tennessee. In June 1975, she received a Master of Science degree with a major in school health education. She entered the doctoral program in September 1975. During her doctoral program, she completed the requirements for the Master of Public Health. She received this

degree in June 1978. During the last six months of her doctoral program, she was employed as a Graduate Teaching Assistant. She received a Doctor of Philosophy degree with a major in health education in March 1979.

She is a member of Sigma Theta Tau, Phi Kappa Phi, Pi Lambda Theta, the American Public Health Association, and the Alliance for the Advancement of Health Education.

Her husband, Robert E. Hall, M.D., is an ophthalmologist in Knoxville, Tennessee.