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RELATIONSHIPS BETWEEN POST MYOCARDIAL INFARCTION PATIENT KNOWLEDGE AT HOSPITAL DISCHARGE, AND KNOWLEDGE AND COMPLIANCE SIX WEEKS AFTER DISCHARGE

By

Janet Hogan Finkbeiner

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ABSTRACT

RELATIONSHIPS BETWEEN POST MYOCARDIAL INFARCTION
PATIENT KNOWLEDGE AT HOSPITAL DISCHARGE,
AND KNOWLEDGE AND COMPLIANCE
SIX WEEKS AFTER DISCHARGE

By

Janet Hogan Finkbeiner

A descriptive study of 11 post myocardial infarction patients was undertaken to identify the relationships between knowledge at hospital discharge, and knowledge and compliance six weeks after discharge. Levels of knowledge and compliance were identified. Factors that potentially affected the levels of knowledge and compliance, the knowledge relationships, and knowledge and compliance relationships were discussed.

Data analyses consisted of a combination of statistical and case study techniques which suggested indications and trends of larger populations.

The findings indicated that a relationship existed between total knowledge at hospital discharge and compliance. No relationship existed between knowledge at two points in time. A significant relationship existed between total diet knowledge and total diet compliance. Other categories of knowledge and compliance six weeks after hospital discharge were not significantly correlated.

Major implications are that current educational encounters or programs, especially in the six week interval, may not be providing patients with the information that is needed to assist with compliance.

To Gary and Misty

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CHAPTER I

THE PROBLEM

Introduction

Diseases of the heart are ranked as the number one cause of mortality in the United States (U.S. Department HEW, 1968). Each year approximately 1,300,000 persons are diagnosed as having a myocardial infarction and about half of these people return home after a period of hospitalization (Smith and Lilienfeld, 1969; Treitel, 1970; National Heart and Lung Institute, 1974). During the first year following hospitalization there is approximately a 10 percent chance of a heart related death occurring (Bishop, 1978).

Current therapy for post myocardial infarction patients involves prescriptions of medical and health regimens which may include medications, activity limitations, and reduction of modifiable risk factors such as hypercholesterolemia, hypertension, smoking, sedentary living, obesity, hyperlipidemia, diabetes mellitis, personality type, and life-style. Significant risk factors unable to be modified include family history, aging, and male sex (American Heart Association Report, 1970; Simborg, 1970; McAlister et al., 1976; Glass, 1977; Thorn et al., 1977). It is widely accepted that if post myocardial infarction patients comply with these prescribed treatment regimens, morbidity and mortality will

decrease and the outcome status will improve (Frank et al., 1966; Weinblatt et al., 1968; Kannel and Gordon, 1974; Werko, 1976).

Compliance or adherence to prescribed recommendations is often difficult, especially if it involves complex behavioral changes. Davis (1966) in his review of the literature estimates that the incidence of noncompliance with prescribed treatment regimens is approximately 30-35 percent. Since post myocardial infarction patients are frequently placed on treatment regimens that involve significant changes in behavior, compliance with these treatments may be exceedingly difficult.

Knowledge is one factor frequently implicated as being influential in compliant behavior (Caldwell et al., 1970; Woodwark and Gautheir, 1972; Hulka et al., 1976). Patients need knowledge in order to make the behavioral changes that are required by treatment regimens. Educational programs which incorporate information of disease entity and treatment recommendations are, therefore, initiated during hospitalization. The purpose of the educational programs is to increase patient knowledge and thus potentially increase compliant behavior and health status. Periodic educational reinforcement and evaluation is accomplished in follow-up office and clinic visits.

Patient education is deemed an integral component of the nursing role. As a result, nursing makes a substantial contribution to patient education in a variety of health care settings. Much of this education is focused on self-care concepts which reinforce compliance with treatment regimens.

Purpose

A review of the literature reflects conflicting reports regarding the effect of knowledge on patient compliance with the recommended treatment regimens. Minimal information exists concerning the knowledge of disease entity, the knowledge of treatment regimens, and their subsequent relationship to compliant behavior.

The purpose of this research is to study the relationships between post myocardial infarction patient knowledge at the time of discharge from the hospital, and knowledge and patient stated compliance with treatment regimens six weeks after hospital discharge. An understanding of these relationships will assist the nursing profession in the development of myocardial infarction programs better suited to meet the educational needs of the patient and thus increase compliance with treatment regimens. This increased compliance will, in turn, increase patient health status and well-being.

Statement of the Problem

The central focus of this research project is a study of the relationships between post myocardial infarction patient knowledge at the time of discharge from the hospital, and knowledge and stated compliance six weeks after hospital discharge.

Research Questions

The following section includes the questions studied relative to the problem statement. These questions specifically focus on the patterns of knowledge and the patterns of compliance.

The research questions developed for this study include the following:

Research Question I.

What are the patterns of knowledge in the study population?

A. What are the levels of knowledge at two points in time?

B. What are the factors that affect the levels of knowledge?

C. What is the relationship between knowledge at hospital discharge and knowledge six weeks after hospital discharge?

1. What is the relationship between total knowledge at hospital discharge and total knowledge six weeks after hospital discharge?

2. What is the relationship between knowledge of disease entity at hospital discharge and knowledge of disease entity six weeks after hospital discharge?

3. What is the relationship between knowledge of total treatment regimens at hospital discharge and knowledge of total treatment regimens six weeks after hospital discharge (refer to Figure 1 for a schematic representation of the knowledge relationships studied).

D. What are the factors that affect the relationship between knowledge at hospital discharge and knowledge six weeks after hospital discharge?

Research Question II.

What are the patterns of compliance in the study population?

A. What are the levels of stated compliance six weeks after hospital discharge?

B. What are the factors that affect the levels of stated compliance?

C. What is the relationship between knowledge at hospital discharge and stated compliance six weeks after hospital discharge?

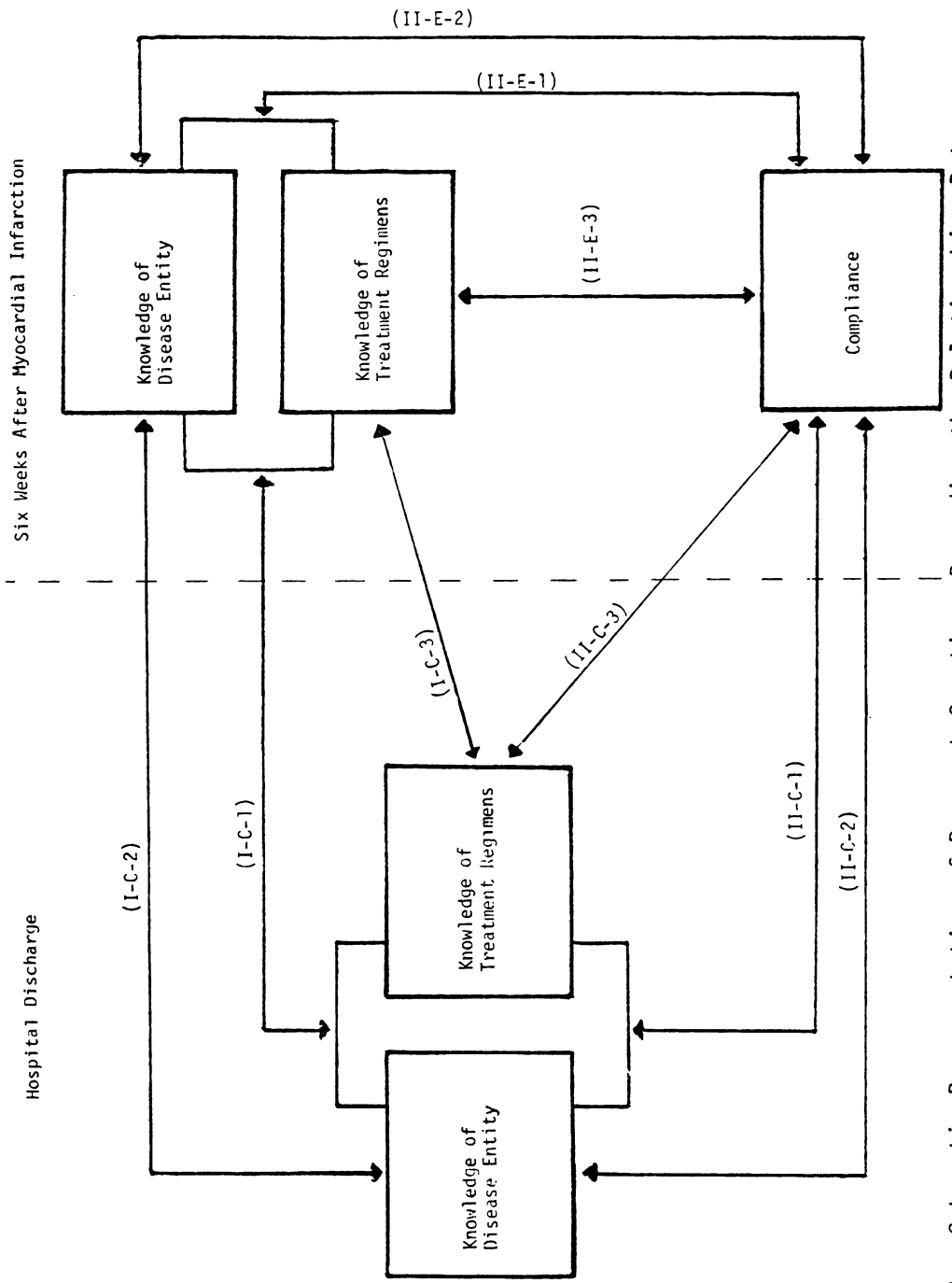

Figure 1.--Schematic Representation of Research Questions Regarding the Relationships Between Knowledge and Compliance.

1. What is the relationship between total knowledge at hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge?

2. What is the relationship between knowledge of disease entity at hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge?

3. What is the relationship between knowledge of total treatment regimens at hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge? (Refer to Figure 1 for a schematic representation of the knowledge and compliance relationships studied.)

D. What are the factors that affect the relationship between knowledge at hospital discharge and stated compliance six weeks after hospital discharge?

E. What is the relationship between knowledge six weeks after hospital discharge and stated compliance six weeks after hospital discharge?

1. What is the relationship between total knowledge six weeks after hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge?

2. What is the relationship between knowledge of disease entity six weeks after hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge?

3. What is the relationship between knowledge of total treatment regimens six weeks after hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge? (Refer to Figure 1 for a schematic representation of the knowledge and compliance relationships studied.)

F. What are the factors that affect the relationship between knowledge six weeks after hospital discharge and stated compliance six weeks after hospital discharge?

Definition of Terms

The terms utilized in the research questions are defined both theoretically and operationally. The theoretical definitions are presented first and, when appropriate, are followed by the items from the questionnaire in which they are operationalized.

Knowledge

Knowledge is defined for this study as information or input processed cognitively by the patient that can be recalled and/or applied as factual information in future situations. This recall and application is evaluated by the administration of a written instrument to each patient at hospital discharge and six weeks after hospital discharge (see Questionnaire, Appendix A). The content of the instrument consists of total knowledge which in turn is divided into two major categories: knowledge of disease entity, and knowledge of treatment regimens. These categories are selected based on information from the review of the literature which substantiates their importance in patient education.

1. Total knowledge refers to the knowledge of disease entity and knowledge of treatment regimens as measured by the knowledge instrument.
    a. Knowledge of disease entity includes: normal functions of the heart, etiology of the disease, the healing process, signs or symptoms of recurrence or complications, and risk factors leading to heart disease (see Appendix A, questions 1-7).

b. Knowledge of total treatment regimens is a summation of all treatment regimen knowledge which includes physical activity, total diet, and medication knowledge (see Appendix A, questions 8-48).

(1) Physical activity knowledge includes: projected activity, progressive activity, methods of monitoring body response to activity, actions to be taken if monitoring relates abnormal body response, effects of exercise, and exercise methodology (see Appendix A, questions 14-20).

(2) Total diet knowledge is a summation of general and specific diet knowledge (see Appendix A, questions 8-13 and 21-28).

(a) General diet knowledge includes: general information related to the role and composition of nutritionally balanced meals, rationale for spacing meals, strategies for weight maintenance and control, and the relationship between food ingestion, digestion, and physical activity (see Appendix A, questions 8-13).

(b) Specific diet knowledge refers to low salt/sodium diet knowledge and/or low cholesterol/saturated fat diet knowledge. This specific diet knowledge includes: definitions of low salt/sodium diets and/or low cholesterol/saturated fat diets, rationale for following

diet prescriptions, common foods included and excluded, and appropriate methods of food preparation (see Appendix A, questions 21-28).

(3) Medication knowledge includes: action, purpose, desired results, side effects, and pertinent information related to the medication (see Appendix A, questions 29-48).

Type of knowledge refers to the knowledge of disease entity or knowledge of treatment regimens as determined by the knowledge instrument.

Levels of knowledge refer to the amount of patient knowledge measured by the knowledge instrument which is displayed as a proportion score for hospital discharge and six weeks after discharge. The levels are displayed as: mean and range percent correct scores; the number of patients increasing, decreasing or remaining the same in knowledge; and the number of patients with less than 70 percent total or specific knowledge.

Factors that affect the levels of knowledge and knowledge relationships are the demographic, and personal and environmental supportive variables which emerged from a review of the literature. These variables influence knowledge in a direct or indirect manner, and include: age; sex; marital status; race; social position; history of chronic illness; past experience of spouse or self with a myocardial infarction; prior diet, medication, or activity prescriptions or restrictions; past exercise patterns; risk factor assessment; family history of cardiovascular disease; severity of the

myocardial infarction; symptoms since discharge; number of days in the Intensive Care/Coronary Care Unit; number of days in the hospital; number of visits to the emergency room or physician since discharge; readmission to the hospital since discharge; sources of information since discharge; environment during knowledge questionnaire administration; and patient request for knowledge results.

Patterns of knowledge consist of the relationships between knowledge at hospital discharge and knowledge six weeks after discharge, levels of knowledge, and factors that affect levels of knowledge and knowledge relationships.

Compliance

Stated compliance, as defined in this study, exists when a patient relates the extent to which medical and health regimens advised by health care workers and educational literature are implemented. For purposes of this study, the determination of compliance is obtained by administration of a written Likert scale instrument to myocardial infarction patients six weeks after hospital discharge (see Questionnaire, Appendix B). The instrument is composed of statements regarding physical activity, general and specific diets, and medications.

1. Total treatment regimen compliance refers to the summation of physical activity compliance, total diet compliance, and medication compliance as measured by the compliance instrument. Compliance in these specific areas is determined by statements related to the following:

a. Physical activity compliance includes: engaging in physical activity at an appropriate level, assessing body response to physical activities, taking appropriate action in relation to assessment, utilizing progressive activity, and utilizing appropriate exercise methodology (see Appendix B, statements 2, 4, 6, 7, 9, 11 and 13).

b. Total diet compliance is a summation of general and specific diet compliance (see Appendix B, statements 1, 3, 5, 8, 10, 12 and 19-22).

   (1) General diet compliance includes: spacing meals throughout the day, eating small and nutritionally balanced meals, avoiding physical activity immediately after meals, and taking measures to lose or control weight (see Appendix B, statements 1, 3, 5, 8, 10 and 12).

   (2) Specific diet compliance includes: following the prescribed low salt/sodium diet and/or low cholesterol/saturated fat diet, and adhering to appropriate methods of food preparation (see Appendix B, statements 19-22).

c. Medication compliance includes: administration of prescribed medication, administration of prescribed dosage and frequency, assessing for side effects, and following necessary actions or precautions based on medication desired results, side effects, or pertinent information (see Appendix B, statements 14-18).

Levels of compliance refer to the amount of patient compliance at six weeks after hospital discharge measured by the compliance instrument which is displayed as a proportion score. The levels are displayed as mean and range percent compliance scores and the number of patients with less than 75 percent total or specific compliance.

Factors that affect the levels of compliance and the knowledge and compliance relationship are the demographic, and personal and environmental supportive variables which emerged from a review of the literature. These variables influence compliance in a direct or indirect manner and include: age; sex; marital status; race; social position; history of chronic illness; past experience of self or spouse with a myocardial infarction; prior diet, medication, or activity prescriptions or restrictions; past exercise patterns; risk factor assessment; family history of cardiovascular disease; severity of the myocardial infarction; symptoms since discharge; number of days in Intensive Care/Coronary Care Unit; number of days in the hospital; number of visits to the emergency room or physician since discharge; readmission to hospital since discharge; sources of information since discharge; environment during compliance questionnaire administration; and patient request for knowledge results.

Patterns of compliance consist of the relationships between knowledge at hospital discharge and compliance six weeks after discharge, knowledge six weeks after discharge and compliance six weeks after discharge, levels of compliance, and factors that affect levels

of compliance and the relationships between knowledge and compliance.

Limitations of the Study

The identified limitations of the study include the following:

1. The number of patients admitted to the study is small due to availability. Results are, therefore, not generalizable to larger populations, but only to a population with the same characteristics as the study population.

2. The selection of the patient population is based on availability and randomization is not employed. Therefore, variables not measured cannot be assumed to have been normally distributed and a potential for systematic bias exists.

3. Only one setting is utilized for obtaining the patient population, therefore, results are generalizable to settings with similar characteristics.

4. There is a lack of standardization of the information that patients receive from health care providers or others during their hospitalization or during the six week interval.

5. The education and counseling services received by the patient may have been modified by the presence of patient testing and potential indirect evaluation of the educational program (Hawthorne effect).

6. The numbers of knowledge questions and compliance statements differ from patient to patient depending on their specific

diet restrictions and medications. This is done in order to enable all myocardial infarction patients to participate, and yet individualize to their situations. Therefore, some patients had more questions to answer than others and this may have affected test taking abilities.

7. The patients may be sensitive to the second administration of the knowledge instrument due to the initial encounter although a significant period of time will have elapsed between testing (six weeks).

8. The knowledge instrument is not keyed for specific factual versus application questions. A mixture of these questions was utilized throughout the instrument. Therefore, knowledge loss may be a function of the type of question utilized rather than the absolute knowledge decline.

9. Due to the small sample size the knowledge instrument and the compliance instrument were not assessed for reliability. Therefore, the actual reliability of the instruments was not determined.

10. Compliance is not measured directly or based on what was specifically prescribed by the health care provider but by self report of adherence to patient identified regimens. Therefore, compliance deals with the patient's perception of reality which was not validated.

11. Patients may not truthfully record noncompliant behavior due to possible reprisals or fears of effects on furthur care. In an attempt to decrease this effect, a statement on the confidentiality

of responses was included in a verbal and written introduction to the patient prior to the administration of the compliance questionnaire.

12. This study addresses neither the psychosocial aspects of post myocardial infarction rehabilitation nor attitudes, values, or motivations of the patient. These are major aspects of recovery and rehabilitation but are beyond the scope of this study.

Assumptions of the Study

The researcher is making the following assumptions in this study:

1. That all patients have had some exposure to post myocardial infarction education which includes information on disease entity and prescribed treatment regimens.
2. That the measurement scales developed for knowledge and compliance are sensitive enough to determine variations in these variables.
3. That patients are knowledgeable about their prescribed treatment regimens.
4. That compliance questions will be answered honestly.

Overview of the Chapters

This study is organized into six distinct chapters. Chapter I includes an introduction, statement of the purpose, statement of the problem, presentation of research questions, definitions of terms, and limitations and assumptions related to this study.

In Chapter II the concepts and theories are integrated to formulate a conceptual framework for viewing the research question.

In the literature review, Chapter III, the source of ideas relative to the research questions are documented and the developed rationale is substantiated.

The methodology and procedures utilized in this study are presented in Chapter IV. Included in this chapter are discussions of the population, setting, instruments, data collection procedures, scoring of data, procedures for data analysis, and human rights protection.

The data collected relative to the research questions and the descriptive data of the population are presented in Chapter V.

In Chapter VI, the summary and interpretation of findings are presented. In addition, limitations and problems encountered, implications for nursing and other health related professions, and recommendations for further research are included.

CHAPTER II

CONCEPTUAL FRAMEWORK

Introduction

The conceptual framework for this study is based on the concepts of knowledge, compliance, and the relationship between knowledge and compliance. These concepts are further discussed in relation to how they interface with a selected nursing theory. The nursing theory discussed was developed by Dorothea Orem (1971).

Compliance

A major goal of health care professionals is to maintain or improve the health status of individuals. The measurement of health status determinants, or outcomes, has been undertaken by many researchers in an attempt to isolate factors that contribute to improved status (Starfield and Scheff, 1972; Caplan et al., 1976; Given, 1976; Inui, Yourtee, and Williamson, 1976; Podell, Kent, and Keller, 1976; Given, Given, and Simoni, 1978). These studies relate that improvements in patients' health status are related to compliance or adherence with recommended treatment regimens.

Due to this relationship of compliant behavior and health status, health care providers have become increasingly concerned with the incidence of patient noncompliance with prescribed treatment regimens. Davis (1966) estimates that the range of compliance

is 15-93 percent and that approximately 30-35 percent of all patients fail to follow the medical recommendations of their physicians. In addition, Matthews (1975) relates that physicians actually tend to overestimate patient compliance. Since compliance with treatment regimens seems essential if patients are to maintain or attain health, providers of health care must be cogniziant of and intervene based on this low compliance rate.

An important aspect of compliant behavior is that compliance must be initiated and implemented by each patient. Providers cannot force patients to comply. Due to the emphasis of patient involvement, much research has been completed in an attempt to isolate specific factors which are perceived as influential in prompting individual compliant behavior.

Factors which have been studied in relation to their influence on compliance include:

1. Demographic data: age, sex, socioeconomic status, education, marital status, and race.

2. Disease characteristics: disease severity, acuteness versus chronicity of illness, duration of hospitalization, symptoms, and family history.

3. Regimen characteristics: duration of the regimen, complexity of the regimen, types of regimens, and prior experience with regimens.

4. Psychosocial-behavioral characteristics: patient perception of disease, attitudes and values, work orientation, support or influence from family or friends, provider-patient relationship, and knowledge.

Although most of the studies have provided conflicting data concerning factors affecting compliance, some significant relationships have been identified. These relationships include the following: Compliant behavior increases for those who identify a positive family history of the disease. Feelings of susceptability to disease and efficacy of therapy are factors that positively affect compliance. Patients who demonstrate positive health practices also are more compliant. Chronically ill patients comply less with their recommended treatment regimens than those with acute illnesses. Increased difficulty with adhering to treatment regimens has been demonstrated when adherence requires significant behavioral changes. Prescribing complex treatment regimens results in more noncompliance. Patient adherence to sick role behaviors, increased patient satisfaction, and support or influence from family or friends increases compliance. Furthermore, the provider-patient relationship positively affects compliance, but there is uncertainty and confusion as to how or what aspects of the relationship are most influential (Elling, Whittemore, and Green, 1960; Heinzelmann, 1962; Davis and Eichhorn, 1963; Donabedian and Rosenfeld, 1964; Glick, 1965; Lipman et al., 1965; Davis, 1966, 1968a; Johannsen, Hellmuth, and Sorauf, 1966; Charney et al., 1967; Watkins et al., 1967; Willis and Dunsmore, 1967; Neeley and Patrick, 1968; Francis, Korsch, and Morris, 1969; Caldwell et al., 1970; Marston, 1970; Vincent, 1971; McKenny et al., 1973; Hecht, 1974; Caplan et al., 1976; Hulka et al., 1976; Bille, 1977a). For the purposes of this study only selected variables from demographic data, disease

characteristics, regimen characteristics, and psychosocial-behavioral characteristics will be analyzed.

Relationship Between Knowledge and Compliance

There are significant differing opinions that exist regarding the relationship of knowledge to compliant behavior. However, one of the first steps toward behavior change is knowledge attainment. Feldman (1966) relates that health education is the obvious mechanism through which desired modifications in behavior are achieved. It seems essential that a minimum amount of information must be presented and retained in order for treatment regimens to be implemented. Information may be presented to the patient in the hospital, but the amount of information retained over time and the way the information is utilized at home is essentially unknown. In studies with post myocardial infarction patients, Woodwark and Gautheir (1972) identified that increased knowledge of disease and treatments was positively related to increased compliance with treatment regimens. Bille (1977a) assessed knowledge at hospital discharge after a one-to-one educational encounter. Bille's results, however, indicate that knowledge was inversely related to compliance one month after hospital discharge. Therefore, previous research identifies conflicting views concerning knowledge of the disease and treatment regimens associated with increased compliant behavior.

Post myocardial infarction patients are frequently required to make significant and permanent changes or modifications in

life-style based on prescribed treatment regimens. Recommendations involving restrictions on behavior or changes in personal habits are the most difficult to follow (Davis and Eichhorn, 1963; Davis, 1966). It can, therefore, be anticipated that compliance of the post myocardial infarction patient may be exceedingly difficult due to the type of prescribed treatment regimen.

In summary, compliant behavior in the post myocardial infarction patient may be increasingly difficult because significant changes in life-style are often required. Knowledge about the disease entity and/or treatment regimens may be significant factors that affect the degree of compliance or life-style changes of the post myocardial infarction patient. However, the extent or specific dimensions of this knowledge are unclear.

Knowledge

Currently most hospitals have educational programs available for the myocardial infarction patients prior to discharge (Powell and Winslow, 1973; Rahe, Scalzi, and Shine, 1975; Bille, 1977a). Patients receive information concerning the cardiovascular system, cardiac disease, and treatment regimens through a variety of educational approaches. Some of these approaches utilize one-to-one education, group discussion, lecture, audiovisual experiences, program learning, and written materials. Structured and unstructured methodology is used.

The type of educational encounter, incorporating different approaches and structured or unstructured methodology, may

influence the amount learned. Other specific factors that may exert influence on the amount learned include anxiety, readiness for content, and the meaningfulness of the content. Intense anxiety levels may significantly limit the amount learned (Montague, 1953). The hospital experience for a myocardial infarction patient can be extremely anxiety provoking. This may influence the amount and type of information which might be learned from a typical in-hospital educational program.

Readiness for content may also affect learning (Cronbach, 1977). The time for conducting educational programs in the hospital and out-patient settings is not easily manipulated. Educational programs are often completed when staff are available, and not necessarily when the patient is receptive. Most program content is presented to all patients in the same sequential order. Therefore, due to time elements and program structure, some education may be attempted prematurely or supplied too late for some indivudal patients.

An additional factor that may affect learning is the meaningfulness of the content (Cronbach, 1977). Educational content must be meaningful to the learner. Some of the content in myocardial infarction programs may not focus on the major concern for the individual post myocardial infarction patient at that time. Patients may initially be more concerned about survival rather than life-style changes. However, they may be more interested in information related to following treatment regimens than in information related to the disease per se. In further substantiation of this latter

view, Bille (1977a) identified that at hospital discharge many patients answered questions concerning anatomy and physiology incorrectly while answering questions related to self-care and treatments more correctly. It seems that information related to disease may be more readily accepted at six weeks post hospital discharge after initial patient concerns have been addressed.

Therefore, situational and personal factors affect not only what is learned but the amount that is learned. Regardless of how specifically the patient learned the information, there may be a relationship between the amount and type of knowledge at hospital discharge and compliance at a later time.

The amount of knowledge six weeks after hospital discharge might be significantly different than at the time of discharge. The patient may seek out additional sources of information in the interim, or may choose to rely solely upon information obtained in the hospital. Seeking behavior may be influenced by the type of information needed or desired by the patients when implementing necessary life-style changes in the home environment. The patients may be more interested in learning about the treatment regimens because they apply specifically to their necessary and everyday activities. However, they may want to learn about their disease entity in order to view it concomitantly with treatment regimens and thereby add a dimension of understanding and purpose to these regimens. Possible increases in adherence to treatment regimens may thus result from an increased understanding of the potential interrelationships between the disease and treatment regimens.

Knowledge may also be influenced by the extent of patient adherence to regimens. Those who comply may seek more information regarding the treatment regimen. Also, patients who comply are applying knowledge which may reinforce previously obtained knowledge.

Differences in knowledge from hospital discharge to six weeks after discharge may result from properties of retention. Ebbinghaus (1913) relates that most of what is learned is rapidly forgotten and a small remainder of learned material dwindles away as time goes by. The amount and type of information retained over a significant period of time is dependent upon whether the information is in the form of facts or application. A taxonomy of educational objectives related to learning has been developed by Bloom et al. (1956). He identifies that fact learning is at a lower level than application learning. Tyler (1933) reports that facts are retained for a shorter period of time than application information. Differences in retention may also result from prior experiences. Retention is greater for information which is relearned rather than for information which is learned for the first time (Craig, Mehrens, and Clarigio, 1975). Thus, patients who have had previous myocardial infarctions may retain more information from educational encounters or readings.

In summary, it appears that knowledge six weeks after hospital discharge might reflect differences from knowledge at discharge. It also seems that compliance may be affected by these changes in knowledge. It may be the type of information or knowledge sought, concerning disease entity or treatment regimens, that influences

compliance. Therefore, there is a need to understand the relationship of disease entity knowledge and treatment regimen knowledge at two points in time and their subsequent relationships to compliance.

Nursing Theory

Knowledge and compliance concepts are important to a nursing framework. Knowledge and compliance with recommended treatments can be viewed as components of self-care activities for the post myocardial infarction patient. Orem (1971, p. 13) relates that self-care "is a practice of activities that individuals personally initiate and perform on their own behalf in maintaining life, health and well being." Self-care is accomplished in the home environment by the post myocardial infarction patient because he takes personal responsibility for adhering to prescribed treatment regimens. According to Orem (1971, p. 28), the type of self-care implemented in this situation, due to the previous myocardial disease state, is "health deviation self-care."

Orem (1971) relates that nursing can intervene at three system levels: (1) Wholly Compensatory System; (2) Partly Compensatory System; or (3) Supportive-Educative System. In wholly compensatory systems the nurse undertakes activities that the patient cannot, or acts directly on behalf of the patient. At this systems level the patient is not active in care. The partly compensatory system describes situations where the patient or the nurse have the major role in performance of care measures or actions. The patient

may complete aspects of self-care and the nurse assists where necessary. In the supportive-educative system the nurse assists the patient to overcome self-care limitations so that he can accomplish self-care. Assistance can be in the form of support, guidance, provision of a developmental environment, or teaching.

The type of system utilized, as discussed by Orem (1971), is totally dependent upon the health status and individuality of each patient. Post myocardial infarction patients have progressed from the partly or wholly compensatory system of nursing assistance, which is initially administered in the hospital, to the supportive-educative system at and beyond the time of discharge.

Utilization of the wholly compensatory system of nursing assistance for the myocardial infarction patient is rare, but may result during hospitalization if major complications arise such as cardiogenic shock, cardiac arrest, or congestive heart failure. During this time nursing completes activities that the patient is unable to accomplish and functions as a patient advocate.

The majority of myocardial infarction patients admitted to the hospital initially utilize the partly compensatory system of nursing intervention. Activities are restricted at this time and nursing assists the patient in completing self-care activities as determined by the individual patient condition. The major emphasis is on promoting self-care when possible.

As the patient begins to recover from the disease process and has become more independent in performing activities, the supportive-educative system of nursing intervention is utilized.

During this rehabilitation, whether in the hospital prior to discharge or in follow-up contacts after discharge, nursing assists myocardial infarction patients by offering support and encouraging verbalizations of feelings. This support can facilitate acceptance of the disease process and treatment. Nursing also assists the patient in adjusting or adapting to changes in life-style that have been imposed due to the myocardial infarction. Some of the major strategies employed by the nurse at this time include counseling, listening, education, anticipatory guidance, and assisting the patient with behavior modification techniques.

Since self-care is referred to as "deliberate action" by the patient (Orem, 1971, p. 31), it implies a result seeking activity and is based on informed judgments about outcomes. For the post myocardial infarction patient, self-care "deliberate action" implies implementing prescribed activities or recommendations based on knowledge of the disease, treatments, and potential consequences. Nursing during the supportive-educative system can contribute to the process of self-care "deliberate action" (Orem, 1971). This can be accomplished by supplying information and educating the post myocardial infarction patients concerning the disease entity, consequences, and treatment regimens. By supplying this information and by offering support, nursing assists patients in making informed judgments and increasing their problem solving abilities in relation to their treatment regimens.

Education is instituted in an attempt to increase compliant behavior. It is speculated that information or knowledge will

positively affect self-care and compliance of the post myocardial infarction patient because nursing provides them with the knowledge and skills to take better care of themselves. The ultimate goal of nursing is to assist the patient in accomplishing increased self-care and to reach a state of optimal health and well being. This goal can be facilitated by helping the patient attain knowledge which will influence their compliant behavior.

Summary

Compliance with recommended treatments is important to insure improvements in patient health status. Many factors have been identified which influence compliant behavior. Knowledge has been identified as one such factor but differing results exist regarding the knowledge and compliance relationship.

Knowledge changes over time based on a variety of factors. Situational and personal factors affect not only what is learned but the amount learned.

Types of knowledge may also influence compliance. Knowledge about the disease entity and/or treatment regimens may be significant factors that affect the degree of compliance.

Therefore, the purpose of this project is to study the relationships between post myocardial infarction patient knowledge at the time of discharge from the hospital, and knowledge and patient stated compliance with treatment regimens six weeks after hospital discharge. An understanding of these relationships will assist the nursing profession in the development of myocardial infarction

patient educational programs better suited to meet the educational needs of the patient. In this manner, nursing will significantly assist patients in the implementation of self-care activities and in the identification of strategies that are needed to improve compliance with treatment regimens. Hence, improved patient health status and well being will inevitably result.

In Chapter III, the literature review, the source of ideas related to the research questions are documented and the developed rationale is substantiated.

CHAPTER III

REVIEW OF THE LITERATURE

Introduction

The concepts of knowledge, compliance, and the relationship between knowledge and compliance are synthesized in this review of the literature. The source of ideas relative to the research questions is documented and the developed rationale is substantiated. The review is initiated with the discussion of knowledge. This discussion provides a background of myocardial infarction patient educational programs, knowledge measurement categories, and the results of knowledge measured at different points in time.

The compliance literature review is presented next. Compliance is divided into two areas and focuses on compliance methodology and variables that potentially influence compliance.

In conclusion, the literature regarding the relationships between knowledge and compliance is reviewed. The relationships between knowledge and compliance categories at various time intervals are discussed.

Knowledge

In relation to knowledge, emphasis was placed on reviewing the literature with respect to myocardial infarction patient

educational programs, knowledge measurement categories, and knowledge measurement at different points in time.

Patient Educational Programs

Cardiac rehabilitation programs included educational programs as an integral component of the rehabilitation process. Most of these educational programs were provided in the hospital. The content from several patient educational programs was reviewed in an attempt to determine the generalized information presented to post myocardial infarction patients. Also, the approaches utilized for presenting material were reviewed.

In Cardiovascular Nursing O'Brien and associates (1977) related that the myocardial infarction patient educational programs should include information regarding the nature of the disease, medications, nutrition and weight control, physical activity and exercise, smoking, control of other risk factors, and response to recurrent or new symptoms.

The programs at two Milwaukee metropolitan hospitals stressed the significant risk factors such as diet, obesity, hypertension, diabetes, cigarette smoking, exercise, personal temperament, emotional stress, age, sex, and heredity. Special emphasis was placed on those risk factors which the patient could control. These programs were presented in a structured one-to-one educational setting (Bille, 1977a).

At the Thomas Jefferson University Hospital in Philadelphia, Pennsylvania, the patient educational program was conducted by group

education and presented information concerning anatomy and physiology, dietary management, appropriate activity programs, the adjustment process, risk factors, and signs and symptoms of complications and therapy. Education regarding medications was implemented on an individual basis (Owens, McCann, and Hutelmyer, 1978).

A Cardiac Nurse Rehabilitator at the Baltimore City Hospitals provided educational experiences for myocardial infarction patients in group sessions and on an individual basis. Educational content included information about a myocardial infarction and it's treatment, diets, medications, risk factors, early warning signs and symptoms of myocardial infarctions, plans for activity function, and plans for minimizing anxiety. Written literature was distributed which reinforced this educational experience (Pozen et al., 1977).

Woodwark and Gautheir (1972) discussed a patient educational program that utilized a series of tape recorded lectures synchronized with slides. The program content included the areas previously discussed with the addition of information on how to modify life-style to reduce stress and strain.

At the UCLA Medical Center a booklet was designed and presented to myocardial infarction patients. In addition, this booklet was supplemented with one-to-one educational encounters. The content areas included the nature of coronary heart disease, emergency care, information regarding diet and cigarette smoking, psychological factors of importance in coronary disease, information related to a schedule for resumption of physical activity, and the return to home and work (Rahe, Scalzi, and Shine, 1975).

A program at Ingham Medical Center, Lansing, Michigan, used an interdisciplinary approach for myocardial infarction patient education. The content areas identified in the Nurses Teaching Manual for the Heart Attack Patient (Ingham Medical Center Nurses, 1977) included anatomy and physiology of the heart, diet modifications for low cholesterol/low saturated fats and no added salt diets, appropriate activity levels, monitoring of activities, and information regarding medications. In addition, the team members also emphasized the psychosocial aspects of stress and patient adaptation to a life threatening chronic illness.

In summary, the educational approaches utilized in the myocardial infarction patient educational programs surveyed included one-to-one or group encounters with nurses or interdisciplinary team members. These encounters were supplemented by audiovisual and written materials. Similarities exist regarding the content presented. In general, the major areas were categorized into the following: disease process, treatment regimens, and the psychological adjustment to a life threatening chronic illness and long term behavioral changes. Sexual activity after a myocardial infarction was frequently not addressed or was addressed indirectly in the areas identified.

Knowledge Measurement Categories

The areas identified as educational program content, with the exception of psychological adjustment, were the categories used for the measurement of knowledge. These areas were consolidated

into three general categories. The categories included knowledge of the disease, knowledge of treatment regimens, and total knowledge. Total knowledge incorporated both disease knowledge and treatment regimen knowledge.

A general literature review of chronic illness knowledge reflected considerable ambiguities and inconsistencies regarding the categories of knowledge measured. The type of knowledge measured, disease knowledge or treatment regimen knowledge, was variable in reported results and often was not explicitly defined. There was frequently no differentiation made between the measurements of disease knowledge and treatment regimen knowledge. This resulted in total knowledge being assessed.

Some studies reported the knowledge measured as a total knowledge category. Tagliacozzo et al. (1974), in a study with chronically ill patients, tested the amount of knowledge these patients had obtained in relation to their current primary diagnosis. Testing included knowledge of symptoms, causes of the disease, complications, nature of diets, and the characteristics of the methods concerning treatment and control. In a study with patients on rheumatic fever prophylaxis, knowledge and beliefs were viewed concomitantly. They were measured by specific questions regarding causes and consequences of the disease and methods for preventing recurrence (Heinzelmann, 1962). Caplan and associates (1976) discussed utilizing a test for hypertensive patients that included information pertaining to hypertensive disease and general treatments. However, they reported only total knowledge measurement.

Post myocardial infarction patient knowledge of disease and treatments, excluding medication, was evaluated by Bille (1977a, 1977b) and Woodwark and Gautheir (1972). Bille (1977a, 1977b) made reference to low knowledge of anatomy and physiology but the remainder of knowledge scores presented actually reflected total knowledge measurement. In another study indices of knowledge were based on both the understanding of the cardiac illness and management regimen by the post myocardial infarction patient (Woodwark and Gautheir, 1972).

In reviewing research studies which measured knowledge, considerable difficulties existed in differentiating disease related questions from treatment regimen questions. Some studies did not relate specific categories of questions utilized and presented findings using global terms or categories such as understanding of the disease, and increased knowledge of hypertension, arthritis, diabetes, and cancer (Carpenter and Davis, 1976; Tagliacozzo et al., 1974).

In further studies of post myocardial infarction patients' knowledge, many individual areas categorized as the knowledge of the disease were measured. Examples from the study by Owens, McCann, and Hutelmyer (1978) included understanding of the illness and the causes of the illness, knowledge of the risk factors, and knowledge of the signs and symptoms of complications or progression of the disease. Pozen and colleagues' (1977) assessment of disease knowledge incorporated only knowledge of the causes of a myocardial infarction and related signs and symptoms.

Specific knowledge tests utilized for measuring knowledge of disease were reviewed. Rahe, Scalzi, and Shine (1975) categorized disease questions as the nature of the disease. Bille (1977b) did not specifically differentiate or categorize disease process questions in his analysis. However, some areas included in Bille's instrument were anatomy and physiology, the healing process, risk factors, and warning signs and symptoms.

Other investigators studying the knowledge of chronic illness patients demonstrated variations in the method of assessing knowledge of treatment regimens (Donabedian and Rosenfeld, 1964; Rosenberg, 1971; Vincent, 1971; Rahe, Scalzi, and Shine, 1975; Caplan et al., 1976; Bille, 1977a, 1977b; Croog, Lipson, and Levine, 1972; and Owens, McCann, and Hutelmyer, 1978). The results were categorized into two general categories. The first category was the knowledge of specific treatments which was defined as recall of specific individualized recommendations. The second category was the knowledge of general information concerning treatments which included quantitative and qualitative generalized treatment regimen knowledge and the purpose of the recommended treatments.

A frequent type of treatment knowledge measured was the recall of specific recommendations previously prescribed (Donabedian and Rosenfeld, 1964; Rosenberg, 1971; Caplan et al., 1976; Bille, 1977a; Croog, Lipson, and Levine, 1977). In a few cases where more than one type of specific recommendation was made, the results of knowledge tests were not analyzed separately but presented as a whole (Donabedian and Rosenfeld, 1964). Total recall

knowledge presentation created difficulty when analyzing data because changes in specific knowledge recall areas were not well delineated for comparison.

General information regarding treatment regimens was measured by some investigators. General treatment regimens for glaucoma were measured by Vincent (1971) without requesting specifics of the prescribed recommendations from the patient. Owens, McCann, and Hutelmyer's (1978) knowledge testing included assessing the understanding of the appropriate life-style changes, understanding of the medication therapy, understanding of the diet therapy, knowledge of when to notify the physician, and understanding of the importance of continuing medical contact. The preceding were classified as general treatment regimen information.

Some investigators assessed general treatment regimen information in knowledge tests (Rahe, Scalzi, and Shine, 1975; Bille, 1977b). Included in these tests was information concerning activity and exercise, diet, smoking, and return to home and work.

In a study by Rosenberg (1971), both knowledge of specific recommendations and knowledge of general information regarding treatment regimens for chronic illness patients were measured separately. Given, Given, and Simoni (1978) measured both recall of specific recommendations and generalized knowledge related to hypertensive medications as a composite score.

In addition, Pozen et al. (1977) reported the testing of cardiac medication knowledge. They did not specify whether the test

measured recalled prescriptions, general information regarding treatments, or both.

In summary, generalizations about patient knowledge were difficult to compare due to the discrepancies and variations in definitions of knowledge, measurement methodology, and analysis of data pertaining to disease treatments, and/or total knowledge.

Knowledge Measurement at Different Points in Time

Mindful of discrepancies that exist in relation to knowledge measurement and analysis, the following discussion presents specific studies of patient knowledge and corresponding results. Patient knowledge was measured at different intervals: during hospitalization, after discharge, on out-patient basis, or any combination of the above. The following discussion focuses on knowledge measurements at these various intervals.

Bille (1977a, 1977b), in a study of 24 hospitalized post myocardial infarction patients, determined the knowledge of control and experimental patient groups at hospital discharge after utilizing a structured teaching method. Results indicated that a structured educational format was not more effective than an unstructured program. There were virtually no differences in knowledge of the two groups. The mean correct for the control group was 28 and for the experimental group 30.42. The results suggest that structured programs may have been too organized and may not have necessarily answered questions patients had at the time. Conversely, the possibility exists that patients may attempt to have their questions

answered regardless of specific content presented. Furthermore, it may be that the content presented in structured education is not important to patients. It was reported by Bille (1977a) that at hospital discharge questions related to anatomy and physiology were more often answered incorrectly than questions related to rehabilitation and self-care. This could have resulted because patients perceived the immediate relevancy of the rehabilitation and self-care information regarding home management of the disease.

Other studies pertaining to post myocardial infarction patients at hospital discharge reported significantly different results. Rahe, Scalzi, and Shine (1975) conducted a knowledge test at UCLA using a pretest-posttest design with 24 patients after completion of educational experiences. The results indicated that patients were able to answer information concerning emergency treatment (74 percent, 77 percent), psychological factors (71 percent, 75 percent), and the nature of disease (68 percent, 69 percent) at both administrations more correctly than other areas tested. These other areas included information regarding treatments such as physical activity (62 percent, 60 percent), diet and smoking (65 percent, 68 percent). All sections, except physical activity, demonstrated percent correct scores somewhat higher on the second test administration. The results indicated success of the program in increasing knowledge of disease information but had questionable effects upon certain treatment regimen knowledge. The greatest changes in knowledge were related to home and work (57 percent, 66 percent). These results contradict those of Bille (1977a) who

reported that at hospital discharge knowledge of disease was lower than knowledge of treatment regimens concerning rehabilitation and self-care. Bille (1977a) further reports that knowledge of home and work demonstrated more significant increases than all other areas including physical activity. The results of increased knowledge regarding home and work may have reflected the patients perceived relevancy of the information, the influence of past patient experiences, or the differences in areas emphasized within each program. Woodwark and Gautheir (1972), in a study with 38 post myocardial infarction patients after hospital discharge, reported that after a teaching program all patients in the experimental group received high total knowledge scores and all patients in the control group received low total knowledge scores. These results of knowledge reflected the possible extent of influence experimental treatment had on the level of knowledge and contradicted the effects of program education discussed by Bille (1977a, 1977b). Similar studies utilizing chronic illness populations and outpatient settings also reported increases in knowledge after experimental treatments (Rosenberg, 1971; Tagliacozzo et al., 1974; Caplan et al., 1976).

Two studies were reviewed which reported the implementation of educational treatments for post Coronary Care Unit patients followed by knowledge measurement over time. Pozen et al. (1977), in a study with 102 subjects, relates that the experimental group demonstrated increased knowledge of disease and medications at hospital discharge. At one month after discharge knowledge of

medications was negligible between the groups. This degree of similarity was attributed to the increased knowledge in the control group. There was no specific measurement of whether knowledge for the experimental group increased from discharge to one month after discharge, but the experimental group knew more about the disease than the control group. Therefore, the importance of supplying treatment regimen information from hospital discharge to one month after discharge is suggested. Six months after discharge there was no discernable educational effect between the experimental and control groups. Knowledge for both groups was low. These results substantiated that knowledge decreased over time and indicated the need for knowledge reinforcement.

Owens, McCann, and Hutelmyer (1978) studied 78 post myocardial infarction and post cardiac surgery patients before and after a group educational program. Knowledge of the disease and treatments was tested utilizing an identical instrument. This instrument was administered prior to the educational program, immediately afterward, six weeks later, and again in three months. All knowledge categories, except diet therapy, showed increases from pretest to posttest in the knowledge percent correct regarding disease and treatments. Diet therapy showed a decrease from 97 percent to 86 percent correct. This decrease in diet knowledge was possibly due to the complexity of specific diet restrictions. Confusion and lack of understanding may have also resulted because of the initial lack of application of dietary concepts in the hospital. During the interval from the posttest to six weeks later, knowledge

of treatments increased but there were variations in the knowledge of disease categories. It would follow that knowledge of the treatments may have increased due to the application of treatment regimens to every day life at this point in time. Knowledge of disease may have varied due to the retention process, individual differences, and perceptions of what was essential to know at the time. Generally, knowledge of treatments and understanding of the illness showed decreases from six weeks to three months. This trend indicated that areas understood well at six weeks were less understood or forgotten by three months. Decreases may have resulted from the continuation of therapy. Patients may no longer have felt the need to know more about the therapy in order to implement it. Also, the decrease may have indicated the lack of follow-up and reinforcement related to these specific areas. The results of the study reported that all areas of knowledge were greater at three months than at the pretest indicating that planned education does increase knowledge.

A review of the literature indicated that there were no studies designed to assess knowledge over time without reference to specific educational treatments. Such information was indirectly obtained by analyzing the knowledge of the control groups. Some chronic illness studies documented that there were indeed naturally occurring changes. Tagliacozzo et al. (1974) identified that 46 percent of the control group showed increases in knowledge of the primary diagnoses after four scheduled clinic appointments. General knowledge of four chronic illnesses showed no differences between

experimental and control groups during that same time period. Bowen, Rich, and Schlotfeld (1961) related that diabetics in control groups showed increases in knowledge of disease, treatments, and skills from initial to second testing.

In assessing medication knowledge for a six month period, Rosenberg (1971) reported a decrease in knowledge for the control group; while Pozen and associates (1977) showed that control group medication knowledge measured at one month was similar to the experimental group·medication knowledge. The later finding indicated that the control group had obtained information on their own during the interim. Caplan and colleagues (1976) reported that knowledge of specific hypertensive medication regimens remained the same for 6-14 weeks, but general knowledge of medications showed a relative decrease from pretest to posttest. These results support the principles of application and retention. Recall of recommendations is reinforced by daily medication administration but general information about medications may decrease over time.

In summary, specific structured educational programs had positive and negative effects on knowledge attainment. The results of knowledge tests, for the cardiac patient who had experienced specific educational treatments, showed considerable variation between knowledge of the disease and treatment regimens both at hospital discharge and at later specified times. Knowledge decreased over time when assessed in relation to a specific educational treatment. In addition, few studies existed in which there was

longitudinal evaluation of knowledge at specified times after hospital discharge.

Minimal information was directly obtained regarding knowledge over time without reference to educational treatments. Information which was indirectly obtained continued to demonstrate variations between knowledge of the disease and treatment regimens at two points in time. Therefore, there is a need to look at types of knowledge at two points in time, regardless of the method in which the knowledge was obtained.

Compliance

The review of the literature pertaining to compliance was viewed from two perspectives: compliance methodology and variables which influence compliance. A plethora of studies exist related to patient compliant behavior. This review specifically focused on compliance regarding chronic illness.

Compliance Methodology

Compliant behavior was measured according to several categories which included referral or appointment-keeping behavior, continuation of therapy, adhering to prescribed treatment regimens, or a combination of the above. Two studies exist which measured compliance as follow-through in appointments or continuation of therapy. Tagliacozzo and Ima (1970), in a longitudinal study with 159 chronically ill outpatients, measured attendance at clinic visits for four scheduled visits and reported that increased adherence was associated with increased general knowledge of four chronic

illnesses. In a study of social and emotional factors influencing the patient's ability to continue antihypertensive treatment, Caldwell et al. (1970) measured compliance as continuation of therapy.

A review of the literature substantiates that compliance was most frequently measured as adherence to prescribed treatments or regimens. Research on medication compliance was abundant. Sackett et al. (1975) and Hecht (1974) both reported medication compliance measured by pill counts and urine studies. Hecht (1974) utilized a four group design to evaluate the effectiveness of nurse educational encounters and compliance of 47 adult patients on Isoniazid. Compliance was measured by structured interview techniques to identify patient self-report compliance and to calculate a reliability factor by comparisons with objective measures. The results indicated that self-report is less accurate than true compliance as measured by pill counts and urine studies. Hecht found that increased nurse encounters increased objective compliance.

Vincent (1971) utilized a structured interview to obtain information from the patients regarding the scheduling of eye drops and compared this to prescribed treatments recorded in the chart. Individuals identifying noncompliance more than one time per month for each dosage were classified as noncompliant.

Drug error rates were computed by Hulka and associates (1976) two weeks following an encounter with a health care provider and were based on information from doctor-patient pairs regarding the prescribed medication regimen. Compliance was measured by patient stated compliance and by evaluation of the patients prescription refills.

Heinzelmann (1962) measured compliance of rheumatic fever patients receiving prophylactic penicillin using a self-report method. Compliance was measured by open-ended questions concerning prophylactic behavior and specific action with regard to a sore throat.

Other studies measured compliance with different treatment recommendations. Carpenter and Davis (1976) determined the extent of arthritic patient non-adherence with prescribed exercise programs based on patient report four months after hospital discharge. Open-ended questions inquired about the specific method and frequency of prescribed exercise programs at home.

In a study by Watkins et al. (1967), qualitative measures of compliance with diabetic treatments were assessed. Home management of diabetic patients was measured by structured protocals and observation of psychomotor skills used in insulin administration, dosage calculations, and urine testing. Meal spacing and food care compliance were determined by a structured interview and self-report.

Caplan and colleagues (1976), in a study involving 250 hypertensive patients, utilized a questionnaire for adherence information of specific compliance. Included in the instrument were questions regarding consumption of restricted foods, prompt prescription filling, prompt prescription refilling, adherence in taking medications, and self-report discrepancy between the number of pills taken versus those prescribed as recorded in the chart.

Given (1976), utilizing a structured interview, obtained self-report compliance of hypertensive patients with medication,

activity, and diet recommendations. The results were tabulated as a proportion score of the total possible compliance score individualized to each patient.

In a study with congestive heart failure patients, Rosenberg (1971) used an objective strategy to measure adherence to low sodium diets. Urine testing was completed for assessment of sodium levels at six month intervals.

Several studies were completed with regard to cardiac patients and compliance. Two such studies reported a measurement of compliance that included willingness or intent to comply. Willingness or intent was occasionally assessed along with specific behavioral aspects of compliance. Woodwark and Gautheir (1972) based compliance on physician estimation of the patient's willingness to comply with diet, activity, and tobacco recommendations. Specific patient behavior was not assessed in this study. Three hundred and forty five first-time male myocardial infarction patients, ranging from 30 to 60 years of age, were studied by Croog and Levine (1977). A composite index of compliance was calculated by the ratio of patient stated compliance or willingness to comply with the recommended advice as revealed by the patient. Compliance with different treatment recommendations was measured individually by structured interview at three points in time. Measurements were made through the use of general statements concerning the extent to which patients were able to follow advice. At one and a half months and one year post infarction, compliance with selected treatment regimens

displayed in rank order were identical indicating that compliance had not relatively changed over time.

Several studies reported measuring cardiac patient compliance with recommended treatments. Bille (1977a, 1977b) identified compliance categories of diet, physical activity, stress, body weight and smoking, but reported only a total compliance score measured one month after discharge. Compliance was based on patient described regimens and the extent to which the patients reported following the regimens. Compliance was reported as ranges of the possible percent of compliance along with the mean percent for the group. Davis and Eichhorn (1963), in a longitudinal study, measured compliant behavior via stated compliance concerning recalled treatments. Several categories were measured individually and the maximum percent adherence distribution was displayed. A self-report questionnaire on smoking and weight reduction was utilized by Pozen et al. (1977) to determine compliance at hospital discharge and six months later for myocardial infarction patients. Johannsen and co-workers (1966) reported that for 127 patients admitted to the Cardiac Work Classification Unit, compliance with recommendations for the preceding six month period was determined by chart review. Results showed that for medical recommendations 92.7 percent of the total population complied but for vocational and psychological recommendations the results were 76.4 percent and 66.7 percent, respectively.

In a few studies, the researchers measured compliance with treatment regimens in conjunction with follow-through of appointments

or referrals. Elling, Whittemore, and Green (1960) measured compliance of patients on rheumatic fever medication prophylaxis as participation in the clinic. Participation was determined by a composite of medications taken and by attendance at the clinic. The number of medications taken was determined by dividing the number of tablets purchased by the number of tablets prescribed and attendance was obtained from clinic records. For hypertensive patients, Inui and associates (1976) measured medication compliance by pill count while adherence to diet was measured by stated compliance. Follow-through appointment data were obtained from the records.

The results of one study suggest that medical regimens were more difficult to adhere to than referrals or keeping appointments. Berkowitz and colleagues (1963), in a study of outpatient compliance, utilized physician determination of patient compliance by a general questionnaire. A comparison was made between the amount of complete follow-through and the type of follow-through. The results were as follows: return appointments 86 percent, tests 85 percent, referrals 81 percent, medications 76 percent, treatments 75 percent, and restrictions 69 percent. Although a few questions were validated by clinic records (appointments, test, referrals) and subsequent readjustments were made, the remainder of the questions were purely subjective physician reports.

In summary, the definitions of compliance were not standardized. These definitions referred to actual behavioral aspects of compliance or the willingness to comply.

The methods or approaches used to determine compliance were variable and imprecise which made generalizations and comparisons difficult. Compliance was assessed by objective measures, subjective measures, or a combination of the two. The data for subjective compliance was obtained from the patient, the physician, or both. Compliance questionnaires or structured interviews were frequently employed to collect data but such measures were general in nature. Also, there was inconsistency in the measurement intervals for compliance.

Compliance was measured as the extent to which patients adhere to treatments or follow-through with appointments or referrals. Generally, the indices of compliance were based on treatments but even these results were difficult to compare due to the variability of specific or total treatment regimens being measured.

Furthermore, it was suggested that adherence to prescribed treatment regimens was more difficult than completing referrals and lab tests or keeping appointments. Therefore, emphasis for further research should continue to focus on the relationship of adherence with specific treatment regimens.

Variables Which Influence Compliance

Many influencing variables have been studied regarding compliant behavior. The major categories of variables discussed in this section are demographic data, disease characteristics, regimen characteristics, and psychosocial-behavioral characteristics.

Demographic Data.--Studies yielded inconsistent results concerning demographic variables that influenced compliance. In general, the majority of studies documented no association of selected demographic data such as age, sex, socioeconomic status, education, marital status, or race with compliance (Elling, Whittemore, and Green, 1960; Heinzelmann, 1962; Davis and Eichhorn, 1963; Donabedian and Rosenfeld, 1964; Johannsen, Hellmuth, and Sorauf, 1966; Davis, 1967, 1968a, 1968b; Watkins et al., 1967; Marston, 1970; Mitchell, 1974; Hulka et al., 1976; Sackett and Haynes, 1976).

However, the results of a few studies have suggested some relationship of specific demographic variables to compliance. Bille (1977a) identified a direct relationship between age and compliance of post myocardial infarction patients. As age increased, reported compliance concomitantly increased. In contrast, Davis and Eichhorn (1963) reported that compliance of post myocardial infarction patients was inversely related to age. Vincent (1971) related that women with glaucoma from 45-64 years of age were less likely to be noncompliant than men in the same age range. Davis (1966) found that women were more likely to default than men. In addition, married women tended to be more noncompliant than widows (Vincent, 1971). According to a few studies, lower socioeconomic groups compiled less than upper socioeconomic groups (Johannsen, Hellmuth, and Sorauf, 1966; Davis, 1966). In relation to education, Davis and Eichhorn (1963) identified that increased education was associated with noncompliance of cardiac patients. This was further corroborated in a later study conducted by Davis (1966). However, Elling

and colleagues (1960) reported that lower education leads to poor understanding and cooperation in patients with rheumatic heart disease.

In summary, there was no consistency in the reported results. Conflicting data existed related to the demographic factors and subsequent relationships to compliant behavior.

Disease Characteristics.--The results of some studies indicated that characteristics of the disease demonstrate variable relationships with compliance. Disease characteristics such as severity, symptomatology, and duration of hospitalization are not associated with compliant behavior (MacDonald, Hagberg, and Grossman, 1963; Johannsen, Hellmuth, and Sorauf, 1966; Charney et al., 1967; Sackett and Haynes, 1976). Conversely, Donabedian and Rosenfeld (1964) identified a direct relationship between disease severity and compliance with treatment regimens for chronically ill patients. Heinzelmann (1962) found that as rheumatic fever patients experienced increased severity of the disease, compliance increased. In further studies, Davis (1968a) indicated that cardiac patients with severe illnesses followed treatment regimens less than those with less severe illnesses.

Differences were identified in the compliant behavior of chronic illness patients on long term treatment regimens and patients with acute illness on episodic regimens. Blackwell (1973) related that patients with chronic illnesses complied less than patients with acute illnesses. Arthritis patients who had a good

understanding of the disease failed to increase compliance possibly because they were fully aware of the chronicity of the condition (Carpenter and Davis, 1976). Regimens for acute illness are troublesome and necessitate behavioral changes, but the patient can realize that the treatment is temporary. In many chronic illnesses, treatments and necessary behavioral changes are prolonged and often permanent.

Duration of hospitalization was implicated as a potential factor affecting compliance with health advice. In a study of alcoholic men, the results indicated that as the length of hospitalization increased, the rate of compliance to abstinance after discharge decreased (Rae, 1972). The results suggested that an aspect of dependency possibly was fostered during prolonged hospital care which was detrimental to compliance in the home setting.

Negative associations were identified between symptoms of the disease and compliance with medication regimens of arthritic and neurotic patients. As the symptoms increased, compliance decreased (Joyce, 1962; Lipman et al., 1965).

Another factor viewed as influencing compliant behavior is a positive family history. Heinzelmann (1962) reported that when rheumatic fever patients also had a family history of rheumatic fever, prophylactic medication compliance increased.

In summary, studies of compliance associated with severity of the cardiac disease and length of hospitalization provided conflicting data. No studies documented that the length of myocardial infarction hospitalization was associated with compliance. Chronic

illness long term regimens were more difficult to follow than episodic treatment regimens. Therefore, emphasis for further compliance studies should focus on chronically ill patients. Furthermore, studies documented the relationship between symptoms of the disease and medication compliance, but no studies attempted to relate symptoms to other types of compliance such as diet, exercise, or other behaviors. In addition, family history was relevant for patients on rheumatic fever prophylaxis but studies that related family history to cardiac patient compliance were not found.

Regimen Characteristics.--Specific characteristics of the regimen were identified as having variable influence on compliant behavior. These characteristics include duration, complexity, type of regimen, and prior experiences with regimens. A few studies reported that the duration of the regimen and prior experiences showed no association with increased adherence (Davis and Eichhorn, 1963; Glick, 1965). There was disagreement regarding the propensity of defaulting with medications and the length of time a particular medication was prescribed (Davis, 1966). Cardiac patients with long time impairments were less likely to stop complying with treatments than patients impaired for less than nine years (Davis and Eichhorn, 1963). Caldwell et al., (1970) found that newly diagnosed hypertensive patients were more likely to drop out of medication treatment than those with a longer duration of the disease. Other investigators related that compliance declines over time (Charney et al., 1967; McKenny et al., 1973). Croog and Levine (1977) reported

that compliance with selected treatment regimens at one and one half months and one year post infarction were identical in rankings.

Another characteristic potentially influencing compliance was the complexity of the regimen. Medication compliance studies reported a decrease in the accuracy of following prescribed medication regimens as the number of regimens increases (Neeley and Patrick, 1968; Hulka et al., 1976). Francis, Korsch, and Morris (1969) identified that patients were not likely to follow complex diet instructions. Davis and Eichhorn (1963) reported that when more than one medical recommendation existed patients were not as likely to follow them. These results were further substantiated by Marston (1970) who reported that compliance was lower for patients whose treatment consisted of medications and other recommendations than for patients whose recommendations were simpler.

There were identified differences in the types of regimens and the rate of compliance. Restrictions on behavior or changes in personal habits such as smoking were the most difficult to follow. Dietary and work changes were the next most difficult to implement. Taking prescribed medication was the easiest type of recommendation to follow (Berkowitz et al., 1963; Davis and Eichhorn, 1963; Davis, 1966). Marston (1970) related the greatest decrease in compliance over time with prescribed diets. Recommendations regarding diets showed less compliance than regulation of daily activities, administration of oral medications, and self-injection of insulin for chronically-ill patients (Donabedian and Rosenfeld, 1964). In addition, Croog and Levine (1977) reported that cardiac patients at

one and one half months and one year post infarction complied best with medication recommendations. Compliance with exercise, diet, and weight reduction followed in descending order.

Experiences with previous therapy and regimens demonstrated variable results with compliant behavior. Glick (1965) identified that prior experiences with medication therapy showed no relationship with completion of a four week medication treatment course for depressed patients. Others reported that prior experiences with treatment regimens positively influenced compliance (Lipman et al., 1965; Hecht, 1974). Increases in compliance were possibly due, in part, to the familiarity of the patient with behavioral changes necessary to implement treatments.

In summary, there were inconsistent results concerning the relationship of compliance and the duration of prescribed treatment regimens. Increasing noncompliance was clearly associated with an increased number of recommendations, possibly because patients were less likely to have accurate knowledge of their specific regimens as the number of regimens increased. Treatments which involved significant behavioral changes such as restrictions on behavior, changes in personal habits, or dietary changes were more difficult to follow than those that required minimal changes such as taking medication. Furthermore, there were differing results regarding the relationship between previous experiences with therapy and compliance.

Psychosocial-Behavioral Characteristics.--The final category of variables which influenced compliance involves psychosocial-behavioral characteristics. These characteristics include patient perception of disease, attitudes, values and beliefs, work orientation, support and influence from family and friends, patient-provider relationship, and knowledge of the disease and treatment regimens.

Results from a study by Eichhorn (1962) revealed that patients who perceived themselves as having a heart condition, although they actually did not, followed some of the precautions that were consistent with those prescribed for cardiac patients. Charney and associates (1967) reported that mothers whose children were treated for otitis media, complied with medication regimens more when they perceived that their child was moderately to severely ill than when they thought the child was mildly ill or not ill at all. On the other hand, patients with chronic illness who perceived the condition as not serious demonstrated greater knowledge and continuance of therapy (Tagliacozzo and Ima, 1970).

Attitudes, values and beliefs played a significant role in adherence to treatment regimens. Becker (1972), in a study of pediatric patients with otitis media, reported that mothers who identified a specific susceptibility to disease, general susceptibility to disease, and efficacy of therapy complied more with treatment regimens. Efficacy of therapy was a factor associated with increased compliance of chronically ill patients according to Donabedian and Rosenfeld (1964). Heinzelmann (1962) reported that rhuematic fever

patients demonstrated increased prophylactic behavior when they perceived susceptibility to an attack, seriousness of an attack, and benefits of the course of action in order to avoid or minimize a health hazard. A few studies related that patients with a positive attitude toward health were more likely to continue complying with therapeutic advice and were less likely to stop complying (Davis and Eichhorn, 1963; Becker, Drachman, and Kersch, 1974).

Another factor considered in relation to compliance was work orientation. Male cardiac patients with low work orientation complied to a greater degree than those with high work orientation (Davis and Eichhorn, 1963). Davis and Eichhorn's results confirmed the reports of Goldstein and Eichhorn (1961). In another study with post myocardial infarction patients, Willis and Dunsmore (1967) reported that the relationship between work orientation and compliance was negligible.

Support or influence from family and friends contributed to compliant behavior. Davis and Eichhorn (1963) identified that cardiac patients were influenced by relatives and friends to increase their compliance. Patients who were most influenced by someone other than their doctor had a higher compliance rate over time. Donabedian and Rosenfeld (1964) reported that patients did not perceive family members as influencing their noncompliance with therapy. In another study, patients with cardiac disease showed no significant correlations between the influence of family and friends, and compliance (Davis, 1967). Davis' results may be erroneous and can potentially be explained by the fact that a composite index of

compliance was used, hence, all regimens were analyzed together and not treated separately.

Several researchers deemed the patient-provider relationship as significant in promoting compliant behavior (Elling, Whittemore, and Green, 1960; Davis, 1967, 1971). Some investigators recognized the importance of communication and it's subsequent effects on compliance (Elling, Whittemore, and Green, 1960; Davis and Eichhorn, 1963). One study reported that a formal type of interaction with the doctor was more likely to result in compliance than a friendly one (Davis and Eichhorn, 1963). However, Charney et al. (1967) found that a long standing warm relationship with a pediatrician correlated positively with follow-through of medical advice. Becker and associates (1974) indicated that having a child see the same physician on subsequent visits to the clinic had ameliorative effects on compliance.

Davis (1971) specifically identified that passivity on the part of the patient and giving on the part of the doctor induced patient compliance. A positive correlation existed between compliance and preference for a strict or authoritarian doctor (Williams, Martin, and Hogan, 1967). Patient passivity or preference for a strict or authoritarian doctor is consistent with identified roles and sick role behavior as discussed by Vincent (1971) and Becker, Drachman, and Kersch (1974).

Patient satisfaction was an aspect of the patient-provider relationship that influenced continuity of regimens. When

satisfaction was demonstrated, compliance was increased (Francis, Korsch, and Morris, 1969; Becker, 1972).

In summary, variations existed concerning the perceived severity of an illness and adherent behavior. Attitudes, values, and beliefs related to health and health care influenced patient compliance. The effect of work orientation on compliance behavior was still uncertain. Generally, family and friends positively influenced patients to follow treatment orders. While there was not complete agreement on exactly how the patient-provider relationship affected compliance, patients who assumed characteristics of sick role behavior and were satisfied with their care demonstrated higher compliance rates than those who did not.

Relationship Between Knowledge and Compliance

Knowledge is the last psychosocial-behavioral variable discussed in relation to compliance. Studies supporting or refuting the relationship of knowledge to compliance were reported in the literature. In this review, major emphasis was placed on studies of chronic illnesses and recommended treatments.

Several studies compared knowledge with prophylactic medication compliance. The results of these studies indicated that a positive relationship existed. Elling, Whittemore, and Green (1960) utilized a pediatric population of 80 randomly selected rheumatic fever patients and completed interviews to obtain information regarding medication compliance. Broken appointments were ascertained from the records. It was determined that increased understanding of

Penicillin prophylaxis lead to increased compliance with medications and appointment schedules. In another study, Heinzelmann (1962) found that college aged rheumatic fever patients who had higher scores on knowledge and belief questionnaires about rheumatic fever and treatment prophylaxis complied to a greater degree with medication schedules.

A positive relationship between knowledge and compliance was demonstrated in chronic illness studies. In a study of 60 diabetic patients overall knowledge of diabetes and actual home management were evaluated by a structural protocol at a home visit. Psychomotor skills required for insulin administration, calculation of insulin dosage, and urine testing were demonstrated by the patient. In addition, information was obtained about the spacing of meals and foot care. Patients who had higher scores on knowledge tests had better home management scores or more accurate compliance with ordered treatments than those with low knowledge scores (Watkins et al., 1967). Hulka and co-workers (1976) completed a study with 357 diabetic or congestive heart failure patients. Entrance into the study was determined by random sampling of physician's offices. Two weeks after entrance into the study, a home visit was completed and information regarding medication knowledge and compliance was obtained. This information was compared to specific orders as perceived by the physicians. Results indicated that discrepancies existed in the perceived orders and much noncompliance was due to misunderstanding on the part of the patient.

It, therefore, seems essential that patients' knowledge and understanding of treatments be assessed frequently.

Many hypertensive patient compliance studies were completed (Caldwell et al., 1970; Caplan et al., 1976; Inui, Yourtee, and Williamson, 1976; Given, Given, and Simoni, 1978). Accurate knowledge of the disease was identified by Caldwell et al. (1970) as the most potent factor influencing continuation of therapy. In this study, 42 patients who had developed a hypertensive emergency after discontinuing therapy were compared to a control group of 24 patients. The reasons for discontinuing therapy for the emergency group were identified by interviews. For the control group, reasons for continuing therapy were inferred from responses elicited during interview sessions. No specific knowledge test was administered for measurement purposes. Because of the inferences made in this study, the validity of these results seem questionable.

Caplan and associates (1976), in a quasi-experimental study, viewed the effects of social support and lecture content on compliance of 70 hypertensive patients from rural, city, and university clinics. The design consisted of pretesting and posttesting three treatment conditions. Two knowledge measures were tested: specific recommendations previously prescribed, and general information concerning hypertension. Prompt refilling of prescriptions at a later time was positively correlated with patient knowledge of the regimen at an earlier time ($r = 36$, $p < .05$). The scores on the knowledge of disease posttest were positively related ($r = .23$, $p < .05$) to attendance at meetings. Patients' knowledge of the regimen did not change

over time for the total sample but general knowledge increased from the pretest to posttest. Also, posttest measurements showed a trend for persons to report greater adherence in medication taking. Therefore, the results of this study indicated, in general, that knowledge of the treatment regimen and of the disease were positively related to compliance. Although some measures of knowledge and compliance were identified, this study did not attempt to view the relationship of treatment regimen knowledge, general knowledge, or total knowledge with specific medication compliance or total compliance.

Eighty-eight diagnosed hypertensive patients were interviewed at the beginning of medication therapy and five months later in a study conducted by Given, Given, and Simoni (1978). No experimental treatment was instituted in the interim. Correlation between the variables of knowledge, patient perception, and compliance were assessed by using Pearson Product Moment Correlations and Partial Correlations. Results indicated that knowledge of medication was found to be positively correlated with compliance at both points in time, $r = .40$ and $r = .42$, but that knowledge had a greater independent assoication with compliance initially. The measurement of knowledge incorporated both recall of medication regimens and general information concerning medications. However, the components, recall of the regimen and general information concerning medications, were not analyzed separately with compliance.

In another study with hypertensive patients, Inui and associates (1976) utilized a quasi-experimental design and measured the

knowledge and compliance of 220 patients prior and subsequent to physician educational sessions. Knowledge of recalled recommendations and general knowledge of treatments such as diet and medications were measured at the initial contact. Compliance with these treatments was measured at a home visit two months later. Results indicated that after experimental educational treatment with physicians, patients in the experimental group were more knowledgeable than the control group about medication regimens and diet requirements. A greater number of treatment group patients (30) complied with medication recommendations than did the control group (17). However, there were similar numbers of patients complying with diet recommendations in both the experimental (28) and control (29) groups. Although individual indices of knowledge, recall and general information, were determined they were not viewed concomitantly with compliant behavior. Hence, specific inter-relationships were not determined between recall or general knowledge categories, and specific compliance categories. Furthermore, knowledge was not reassessed at the time compliance was measured.

Rosenberg (1971) studied 100 congestive heart failure patients who were assigned to experimental and control groups. Structured interviews were conducted initially and at six month intervals to determine knowledge and attitudinal changes. The experimental group received broad education and counseling concerning cardiac medications, diet, and disease process. Results indicated that six months after the group educational program, the experimental group demonstrated increased knowledge of low sodium

diets and medications and decreased intake of sodium measured via urine tests. It was difficult to identify whether compliance in this study was due to increases in knowledge or to the patient-provider interaction. Specific knowledge and compliance categories, diet and medications, were identified. However, no relationship was determined between medication knowledge and corresponding medication compliance. In addition, knowledge of the disease was not assessed and total knowledge and total compliance were not determined.

The results of other studies indicated that no relationship existed between knowledge and compliance of chronically ill patients (Donabedian and Rosenfeld, 1964; Tagliacozzo et al., 1974; Sackett et al., 1975; Carpenter and Davis, 1976). Adherence of 54 rheumatoid arthritic patients to exercise programs four months after hospital discharge was evaluated by Carpenter and Davis (1976). Structured interviews obtained information regarding the following of exercise regimens and understanding of the disease. Results indicated that 63 percent of the noncompliers had a good understanding of their disease as compared to 48 percent of the complying group. It may be that chronicity of the condition may have reinforced the idea that an exercise program provided no improvement in the condition.

In a study with 82 diabetic, arthritic, and cardiac patients, Donabedian and Rosenfeld (1964) determined that at three months there was no statistically significant relationship between the understanding of the treatment recommendations and noncompliance with

the recommendations. Understanding of the recommendations was determined by a social worker during the home visit and was measured by the accuracy and completeness by which the patient described recommendations. Compliance was based on self report during structured interview sessions.

The results of a few studies report that an experimental treatment had either no effect or a negative effect on the relationship between knowledge and compliance. Tagliacozzo et al., (1974) completed an experimental study with 192 chronically ill patients. All patients completed knowledge tests initially and at the end of the research period. These tests focused on the patient's specific primary diagnosis and included disease and treatment regimen questions. Patients in the experimental group were exposed to four nursing educational sessions. There were some increases in the knowledge of the primary disease but there was not a statistically significant or fundamentally different relationship between the two groups for those who attended at least two sessions. Knowledge was not analyzed separately as disease knowledge or treatment regimen knowledge but as total knowledge. Compliance was not different for the two groups in relation to attendance, regularity of attendance, medication taken, and attendance at requested visits to other clinics. However, weight loss was increased for the control group. Two hundred and thirty male Canadian steel workers with hypertension participated in a quasi-experimental study conducted by Sackett and colleagues (1975) that evaluated compliance and mastery learning. Results indicated that at six months 85 percent

of those in the mastery learning group had mastered the information concerning the disease and treatments for hypertension while only 18 percent of the men in control group had done so. Mastery learning did not, however, increase compliant behavior. Individual compliance rates demonstrated no relationship to total knowledge at entry to the study ($r = -.03$) or at six months ($r = .08$). No attempt was made to view a relationship between knowledge at entry into the study and compliance at a later time. Furthermore, knowledge categories such as disease knowledge or treatment regimen knowledge were not analyzed with compliance.

In two studies conducted with diabetic patients, the researchers reported that increases in knowledge were not associated with increased compliance (Bowen, Rich, and Schlotfeld, 1961; Etzwiler and Robb, 1972). Both studies reported increases in knowledge following the experimental treatments of diabetic classes or teaching machines. Compliance in these studies was reported as control of the disease and was measured indirectly by blood sugar levels, weight gain, and levels of sugar in the urine. Neither study directly inquired as to the extent to which patients followed prescribed treatments at home.

Watkins and associates (1967), in another study of diabetic patient control of the disease, reported that increased compliance with treatment regimens was unrelated to diabetic control. These results may have been due to many physiological and psychological influencing variables that affect the control of diabetes. Because of the many influencing variables, adherence to treatment regimens

reflects only a portion of total disease control. Therefore, using control as a measure of diabetic compliance is not significantly valid and results should be interpreted cautiously.

In addition to the general chronic illness studies discussed, a few studies were reviewed that utilized cardiac populations and measured the effects of experimental treatments on knowledge and compliance (Woodwark and Gautheir, 1972; Bille, 1977a, 1977b; Pozen et al., 1977). The effect of a Nurse Rehabilitator was evaluated prospectively by Pozen et al. (1977). In this research study, 102 post myocardial infarction patients were randomized into control and treatment groups. At hospital discharge, the treatment group knew more than the control group about the disease and medications. One month after discharge, differences in the knowledge of medications between groups was negligible, possibly because the control group was learning more about medications. At this same testing, the study group still knew more about the disease. By six months after discharge, both groups had similar low scores on knowledge of the disease and knowledge of medications. Compliance, reported only at six months, indicated that weight reduction was not significant for either group, however, more study group patients had discontinued smoking. Therefore, increased knowledge of medications at hospital discharge and increased knowledge of the disease at hospital discharge and one month after discharge were associated with smoking reduction compliance at six months. Knowledge tests of information specific for compliance categories were not measured and, therefore, not assessed in relation to corresponding specific

compliance categories. Only disease knowledge was viewed in association with smoking and weight reduction. A measure of compliance was not computed one month after discharge when knowledge was high.

A study of 24 post myocardial infarction patients, conducted by Bille (1977a, 1977b), assessed the relationships between knowledge, compliance, and teaching format. The patients were assigned to control and treatment groups. The treatment group was given a structured one-to-one educational program that was developed based on objectives. The objectives, along with other written materials, were shared with the patient. In both groups, knowledge of the disease and treatment regimens were evaluated at hospital discharge. Compliance was measured at an interview one month after discharge by having the patient indicate his current medical regimen and the extent to which he followed it. The structured educational program was not associated with increases in patient knowledge and the correlation between knowledge and compliance was not statistically significant ($r = -.336$). Age was positively related to compliance ($r = +.496$) and inversely related to knowledge ($r = -.512$) Although this study measured the relationship of knowledge to compliance, total knowledge was used and separate knowledge categories such as disease knowledge and treatment regimen knowledge were not assessed. Testing of knowledge was not completed at the time compliance was measured and, therefore, correlations of present knowledge and compliance were not computed. It is possible that significant changes in knowledge could have resulted in the time period prior to compliance testing.

Woodwark and Gautheir (1972) studied knowledge and compliance of 38 cardiac patients after an educational program. The patients were equally divided into control and treatment groups. The treatment group received educational instruction from lectures, slides, and frequent encounters with a nurse. Three weeks after discharge, all of those who had participated in the treatment group had higher knowledge scores than those in the control group. Sixteen patients in the treatment group had high compliance rates as compared to three patients in the control group. This study did not differentiate between knowledge of the disease and knowledge of treatment regimens and their specific relationships to compliance. It did suggest that those with higher total knowledge at three weeks comply more than those with lower total knowledge.

In summary, chronic illness studies indicated positive, negative, and zero associations between a variety of knowledge and compliance measures. In general, the majority of studies reported that a positive relationship existed. However, minimal analysis was conducted regarding knowledge categories, compliance categories, and their interrelationships.

Conclusion

In conclusion, a review of the literature indicated numerous factors that were perceived as influential in promoting compliant behavior. These factors were categorized as demographic data, disease characteristics, regimen characteristics, and psychosocial-behavioral characteristics. Significant differences existed

concerning a variety of these characteristics and compliance. Knowledge was one characteristic that frequently was assessed in relation to compliance.

The preceding review of the literature reported that differences existed in the definitions and methodologies involved in measuring knowledge and compliance. Knowledge indices measured different knowledge categories such as knowledge of the disease, recall of treatments, general information regarding treatments, and total knowledge. Compliance indices measured adherence to specific or general treatments, total treatment regimens, or follow-through with appointments and referrals. Occasionally, compliance incorporated the concept of willingness to comply thus adding a further dimension to the behavioral concept.

Knowledge was measured by structured interview techniques or questionnaires. Compliance was assessed by objective measures, subjective measures, or a combination of both presented as a composite score.

Knowledge and compliance were measured at various time intervals but infrequently at two points in time to allow for assessment of changes. When knowledge was measured at different points in time, variations existed between the knowledge of the disease and the knowledge of treatment regimens.

In most studies, including all cardiac studies, knowledge and compliance were measured after a specific educational treatment. Only one study measured knowledge, regardless of how obtained, with compliance.

Other studies were reviewed in which researchers reported measuring the relationships between knowledge and compliance. One study correlated knowledge and compliance separately at two points in time, but no study was found that correlated knowledge at two points in time with specific compliance. Studies indicated that knowledge indices were not always obtained at the same time as compliance measurements, hence, changes in knowledge may have occurred and remained undetected. No studies that were reviewed specifically analyzed the relationship between types of knowledge, disease knowledge or treatment regimen knowledge, at two points in time and their subsequent relationships to corresponding compliance.

Due to the inconsistencies and ambiguities that exist concerning knowledge and compliance, it is exceedingly difficult to make generalizations or comparisons between these studies. Regardless of the inconsistencies in measurement techniques, the majority of studies do suggest that a positive relationship exists between knowledge and compliant behavior. However, specific analysis of the knowledge category and compliance category relationships are not documented in the literature.

According to Orem (1971) patient education is a major responsibility of nursing at the supportive-educative systems level. In an attempt to more fully emphasize information that is influential in promoting compliant behavior of post myocardial infarction patients, nursing must determine what relationships exist between knowledge and compliance with treatment regimens.

Based on these needs and deficiencies identified in the literature, this exploratory research project will study the relationships of knowledge at the time of discharge from the hospital, and knowledge and stated compliance six weeks after discharge for post myocardial infarction patients.

In Chapter IV the methodology and procedures utilized in this study will be presented. The areas included are population, setting, instruments, data collection procedures, scoring of data, procedures for data analysis, and human rights protection.

CHAPTER IV

METHODOLOGY AND PROCEDURE

Overview

This research project is designed to study the relationships between post myocardial infarction patient knowledge at the time of discharge from the hospital, and knowledge and stated compliance six weeks after hospital discharge. A myocardial infarction patient population of a 204 bed private hospital is used. At hospital discharge a knowledge questionnaire developed by the researcher is utilized to collect data on patient knowledge (see Appendix A). Six weeks subsequent to hospital discharge, the same patients complete the same knowledge questionnaire as well as a researcher developed compliance questionnaire (see Appendix B). Knowledge and compliance are analyzed based on this data.

The problem to be studied is further divided into two specific research questions concerning the patterns of knowledge and the patterns of compliance. The patterns of knowledge and patterns of compliance are further divided into the levels of knowledge or levels of compliance, factors that affect the levels of knowledge or compliance, the relationship between knowledge at two points in time, factors that affect the relationship between knowledge at two points in time, the relationship between knowledge and compliance,

and factors that affect the relationship between knowledge and compliance. The specific knowledge or compliance categories are also investigated.

This study is exploratory in nature and a combination of statistical and descriptive case study techniques are used for data analysis. The levels of knowledge and levels of compliance are computed based on proportion scores from the instruments. Mean percent scores and range percent scores are computed. Knowledge is also viewed in relation to the number of patients whose knowledge increases, decreases, or remains the same from hospital discharge to six weeks after discharge. The patients whose scores fell below 70 percent total or specific knowledge and 75 percent total or specific compliance are identified.

The relationships between knowledge categories at two points in time, and knowledge and compliance categories are studied. Correlation mechanisms are used to test hypotheses about these relationships in order to identify trends or indications.

Since the population is small and randomization is not employed, it cannot be assumed that characteristics of the population which affect knowledge and compliance are equally distributed across the population. Therefore, a case study approach is utilized to view outlyers (extremes) and distinctive population patterns in relation to factors that may affect the levels of knowledge and compliance, knowledge relationships, and knowledge and compliance relationships. The outlyers are defined as those patients who demonstrate less than 70 percent knowledge, less than 75 percent

compliance, or show contrasting relationships from the general population as determined by scattergrams. Distinctive population patterns are particular patient groupings that are identified by scattergrams.

The purpose of this chapter is to present the methodology and procedures utilized in this descriptive study. The areas included are population, setting, instruments, data collection procedures, scoring, procedures for data analysis, and human rights protection.

Population

The population selected for the study included all consenting acute myocardial infarction patients admitted to a private 204 bed hospital during the months of August and September, 1978. Due to the anticipated small sample size randomization procedures were not utilized. Criteria for admission into the study included the following:

1. initial physician diagnosis of myocardial infarction as documented in the chart, and
2. patient home residence in or around the Greater Lansing area.

For the final study population myocardial infarction patients were defined as patients who were diagnosed by the physician at hospital discharge as having had a myocardial infarction. This diagnosis was documented in the discharge summary.

Complications such as arrhythmias, congestive heart failure, or cardiac arrest did not exclude patients from the study, although this data was obtained and included in the severity index. Since the population was small limitations were not placed on age, sex, chronic illness, or previous myocardial infarction. This information was obtained from the patient and the chart, and was recorded in the demographic and supportive data.

Setting

The setting used in the study was a private 204 bed hospital. The total number of patients admitted to the hospital in 1977 was 10,278, 89 of which were myocardial infarction patients. The designated number of Intensive Care/Coronary Care beds was 13.

Written permission was obtained from the Assistant Administrator for Nursing to secure a patient sample and view patient charts during the identified time period (see Appendix C). The study was also discussed with and approved by the Medical Director of the Intensive Care/Coronary Care Unit.

Patients diagnosed with a myocardial infarction or possible myocardial infarction were routinely admitted to the Intensive Care/Coronary Care Unit initially for observation. The usual length of stay in this unit for a myocardial infarction patient, determined by chart review, was approximately three to five days. The nursing care was provided on a primary nursing care basis by registered nurses (RN) and licensed practical nurses (LPN). The nurse-patient

ratio was approximately 1:1 to 1:3 and was adjusted according to the medical severity of the patients' condition.

After the patients' condition stabilized, they were discharged from the Intensive Care/Coronary Care Unit to one of two medical or surgical units in the hospital. The usual length of stay in these units, determined by chart review, was approximately seven to ten days. One unit used for the study was a 37 bed medical unit utilizing team nursing care with RN's and LPN's. The nurse-patient ratio on the day shift was 1:8. The other unit used in the study was a 23 bed surgical unit utilizing primary nursing care delivered by RN's and LPN's. The nurse patient ratio on the day shift was 1:5.

At the time of data collection the hospital myocardial infarction educational program was not specifically defined. No specific outline or objectives existed for defining educational content. Each patient was given pamphlets provided by the American Heart Association and a cardiac teaching manual (Withers, 1978) prepared by the hospital. This manual was prepared for myocardial infarction patients and included information about anatomy and physiology, signs and symptoms, risk factors, complications, medications, exercise, and activity.

Patient education and counseling was implemented on a one-to-one basis in the Intensive Care/Coronary Care Unit. Subsequently, educational encounters were completed when the patients were in the medical-surgical units. These subsequent educational encounters were conducted by the nurses from the Intensive Care/Coronary Care Unit and occasionally by the medical/surgical unit

nurses. Instruction was based on reviewing content presented in the written materials and answering the patients' questions. A flip chart, The Heart (Elly, 1973) was frequently used as a guide for instruction. This chart consisted of information regarding cardiovascular anatomy and physiology, complications of cardiac disease, commonly prescribed medications, signs and symptoms of cardiac disease or complications, methods of risk factor reduction, commonly prescribed activity levels, and exercise methodology. The dietitian counseled patients regarding diet prescriptions. Attempts were made for educational continuity and educational contacts were based on the needs of the patient.

Instruments

Two instruments were utilized in this study: a knowledge questionnaire and a compliance questionnaire. Both of the questionnaires were developed based on a review of the literature and the stated operational definitions of knowledge and compliance.

Knowledge Instrument

Review of Knowledge Instruments.--A paucity of published myocardial infarction patient knowledge tests was identified after a review of the literature. Rahe (1975) published a Coronary Heart Disease Evaluation Form that was used to evaluate an in-hospital educational program. The test consisted of 83 true-false, multiple-choice questions concerning disease and treatment related factors such as the nature of the disease, physical activity, diet and

smoking, psychological factors, and return to home and work. This test also incorporated information regarding emergency treatment of a myocardial infarction patient. The questions were most appropriate for patients ready to be discharged from the hospital, but inappropriate for patients engaging in full rehabilitative processes. Some areas incuded in the test, such as emergency treatments and psychological factors, were not consistent with the content for this study.

One other instrument testing myocardial infarction patient knowledge was reported. This test, developed by Bille (1977b), was a 40 question multiple-choice, true-false test which included questions on disease process and healing, risk factors, warning symptoms, and actions to be taken if symptoms arose. The general emphasis of the test was on disease and healing. The test contained a minimal number of questions on diet and activities. Neither of the tests incorporated questions regarding medication knowledge.

In this study the knowledge questions were to correspond with specific compliance categories. Hence, the relationship of specific knowledge with specific compliance could be assessed. Since an appropriate questionnaire was not available to accomplish this task, a knowledge instrument was developed.

Knowledge Instrument Development.--A knowledge instrument (see Appendix A) composed of questions specific for disease entity knowledge and treatment regimen knowledge was developed based on the operational definitions. These definitions in turn were developed

through a review of the literature pertaining to tests, treatments, and appropriate educational programs for post myocardial infarction patients.

The instrument consisted of 48 possible multiple-choice questions, each with four possible answers. The questions were answered by placing a check mark in front of each correct foil. A combination of recall and application questions were utilized throughout the instrument. The content of the instrument consisted of total knowledge, which in turn was divided into two major categories: knowledge of disease entity, and knowledge of treatment regimens.

1. Total knowledge referred to the knowledge of disease entity and knowledge of treatment regimens as measured by the knowledge instrument.
   a. Knowledge of disease entity included: normal functions of the heart, etiology of the disease, the healing process, signs or symptoms of recurrence or complications, and risk factors leading to heart disease (see Appendix A, questions 1-7).
   b. Knowledge of total treatment regimens was a summation of all treatment regimen knowledge which included physical activity, total diet, and medication knowledge (see Appendix A, questions 8-48).
      (1) Physical activity knowledge included: projected activity, progressive activity, methods of monitoring body response to activity, actions to be taken if monitoring relates abnormal body

response, effects of exercise, and exercise methodology (see Appendix A, questions 14-20).

(2) Total diet knowledge was a summation of general and specific diet knowledge (see Appendix A, questions 8-13 and 21-28).

(a) General diet knowledge included: general information related to the role and composition of nutritionally balanced meals, rationale for spacing meals, strategies for weight maintenance and control, and the relationship between food ingestion, digestion, and physical activity (see Appendix A, questions 8-13).

(b) Specific diet knowledge referred to low salt/sodium diet knowledge and/or low cholesterol/saturated fat diet knowledge. This specific diet knowledge included: definitions of low salt/sodium diets and/or low cholesterol/saturated fat diets, rationale for following diet prescriptions, common foods included and excluded, and appropriate methods of food preparation (see Appendix A, questions 21-28).

(3) Medication knowledge included: action, purpose, desired results, side effects and pertinent

information related to the medication (see Appendix A, questions 29-48).

Generalized information questions were utilized due to the volume of questions that would have been necessary if testing had been individualized to specific treatment regimens of each patient. Furthermore, the specific treatment regimen knowledge questions were selected so that they would correspond to areas of longitudinal compliance.

Knowledge Instrument Content Validity.--Content validity refers to "the degree to which the sample of test items represents the content that the test is designed to measure" (Borg and Gall, 1971, p. 136). There was no statistical test for the determination of content validity. This validity was determined by subjective analysis.

In an attempt to insure content validity, the areas and questions for knowledge evaluation were developed after reviewing knowledge instruments, treatments, and educational program emphasis from various settings. Two Cardiovascular Nurse Clinicians and a Cardiologist reviewed the developed instrument and all made significant contributions to its content refinement. A nurse responsible for myocardial infarction patient education at the hospital reviewed the instrument and verified that the content corresponded with the content presented to the patients.

The content of the instrument was determined to be representative of the necessary content by the researcher with the assistance

of cardiovascular experts and, hence, reflective of content validity.

Knowledge Instrument Refinement.--The instrument was evaluated by committee members and a psychometrician for form, vocabulary, and readibility. Changes were made in the instrument based on the information received from these individuals.

Knowledge Instrument Pretest.--After changes were made, three patients recently discharged from the hospital with a myocardial infarction completed the knowledge questionnaire. They were asked to complete the instrument and to critically review it. After completion of the instrument they were interviewed to ascertain any difficulties in wording, clarity, or format. Minor revisions, which generally involved simplification of wording, were completed prior to the utilization of the instrument in the study.

Compliance Instrument

Review of Compliance Instruments.--Examples of compliance instruments were identified through a review of the literature. None of the instruments evaluated generalized recommended treatment compliance for the post myocardial infarction patient in the areas of activity, diet, and medications. Furthermore, none of the instruments used specific content structured questions for post myocardial infarction patients.

Berkowitz and associates (1963, p. 17) designed a compliance questionnaire that measured physician estimates of their patients

compliance. This questionnaire included one very non-specific question that measured adherence to recommended treatments. The possible responses included completely, partially, not at all, and not necessary.

Other questionnaires more narrowly focused on the recommended treatments. However, they did not include specific actions the patients should or should not be completing based on their prescriptions. Croog and colleagues (1977, p. 193) in a structured interview, inquired as to whether patients had received advice on such matters as medications, diet, exercise, and other treatments. If affirmative answers were obtained the patients were asked, "How well have you been able to follow the doctor's advice?" or "How well do you think you will be able to follow the doctor's advice?" The responses were coded as: completely, for the most part, somewhat, or not at all. Carpenter and Davis (1976, p. 242), by a structured interview, utilized the following questions to measure arthritis patients' compliance with exercise programs: "How often do you do your exercises? Have you changed your exercise schedule in any way? Are you doing exercises exactly as you were trained? What changes have you made?"

Other compliance studies were more specific, dealing with the actions that the patient should be completing related to treatment regimens. However, none of these studies utilized post myocardial infarction patient populations (Caplan et al., 1976; Given, 1976; Given, Given, and Simoni, 1978).

An example of a compliance question for post myocardial infarction patients was presented by Bille (1977b). Patients were asked to state what the doctors had recommended for them in areas such as diet, medications, physical activity, stressful situations, work, weight loss, smoking, and alcohol. Patients were asked to estimate the extent to which they were able to follow the recommendations. The responses included the following: all the time, most of the time, about half of the time, very seldom, or none of the time. The results from questions for each area included numerous possible recommendations, therefore, the instrument did not individually identify adherence to specific recommendations. Although an example of a question used in this compliance instrument was presented, the completed questionnaire was not available for perusal.

Compliance Instrument Development.--Due to the lack of an appropriate compliance questionnaire that measured specific compliance corresponding to previously identified knowledge areas, a compliance questionnaire was designed by the researcher (see Appendix B). The questionnaire was developed based on the operational definitions of compliance. These definitions in turn were developed through a review of the literature related to questionnaires, treatments, and appropriate educational programs for post myocardial infarction patients.

The compliance instrument was composed of statements answered according to a five point Likert scale. Some statements were stated positively and some negatively to prevent response modes from

developing. The scale utilized was developed and used in a previous compliance study by Davis (1968a). It consisted of five gradiated choices that include the following: all of the time, most of the time, less than half of the time, very seldom, and none of the time.

The compliance instrument was composed of statements regarding physical activity, general and specific diets, and medications.

1. Total treatment regimen compliance referred to the summation of physical activity compliance, total diet compliance, and medication compliance as measured by the compliance instrument. Compliance in these specific areas was determined by statements related to the following:
   a. Physical activity compliance included: engaging in physical activity at an appropriate level, assessing body response to physical activities, taking appropriate action in relation to assessment, utilizing progressive activity, and utilizing appropriate exercise methodology (see Appendix B, statements 2, 4, 6, 7, 9, 11 and 13).
   b. Total diet compliance was a summation of general and specific diet compliance (see Appendix B, statements 1, 3, 5, 8, 10, 12 and 19-22).
      (1) General diet compliance included: spacing meals throughout the day, eating small and nutritionally balanced meals, avoiding physical activity immediately after meals, and taking measures to

lose or control weight (see Appendix B, statements 1, 3, 5, 8, 10 and 12).

(2) Specific diet compliance included: following the prescribed low salt/sodium diet and/or low cholesterol/saturated fat diet, and adhering to appropriate methods of food preparation (see Appendix B, statements 19-22).

c. Medication compliance included: administration of prescribed medication, administration of prescribed dosage and frequency, assessing for side effects, and following necessary actions or precautions based on medication desired results, side effects, or pertinent information (see Appendix B, statements 14-18).

These areas were selected in order to correspond with the knowledge areas assessed and to measure longitudinal compliance.

Compliance Content Validity.--Content validity refers to "the degree to which the sample of test items represents the content that the test is designed to measure" (Borg and Gall, 1971, p. 136). The determination of content validity was accomplished by subjective analysis since no statistical techniques were available.

The areas and statements for compliance evaluation were developed directly from identified knowledge areas which, in turn, were identified from a review of the literature. Content refinement was based on the input received from two Cardiovascular Nurse

Clinicians and committee members. A nurse responsible for myocardial infarction patient education at the hospital reviewed the instrument and related that the content was representative of what patients are advised to do at home. Since no statistical tests were available for content validity, the compliance questionnaire was reviewed by the researcher with the assistance of cardiovascular experts and was determined to be representative of the necessary content. The instrument was then assumed to be reflective of content validity.

Compliance Instrument Refinement.--After the content was determined and the statements were developed, the instrument was evaluated by committee members. Changes were then made in format and wording. Additionally, the activity and general diet statements were alternated (see Appendix B, statements 1-13).

Compliance Pretest.--Once the instrument was refined it was administered to three post myocardial infarction patients recently discharged from the hospital. They were asked to complete the questionnaire and to critically review it for difficulties in wording, clarity, or format. After completion of the questionnaire they were interviewed to ascertain any difficulties. Minor revisions resulted from the information obtained from these three patients. The revisions included word simplification and clarification of the directions.

Reliability

Two types of reliability measures were available to analyze instrument reliability, internal consistency and temporal stability. Internal consistency describes the condition in which there is a high degree of interrelatedness among items in an instrument. This is not a valid measure of reliability when there is a small sample size and, therefore, was not computed for the knowledge and compliance instruments in this study (Crano and Brewer, 1973).

Temporal stability assesses the degree to which the data obtained on an initial test administration resembles the data obtained on a second testing when the same scale and populations are employed. The data obtained at both administrations is correlated and a large positive correlation is taken as evidence of reliability. This assumes that the data at both administrations would be expected to remain the same. The test-retest method assesses temporal stability (Crano and Brewer, 1973).

A major problem involved with test-retest reliability is the time interval employed. The second testing may be too soon and the respondents may remember previous responses and attempt to appear consistent in answering. On the other hand, if the time interval is too long changes in knowledge may result as a function of time (Ebbinghaus, 1913). This study presumes that changes in knowledge may occur over the six week interval and, therefore, test-retest reliability would not be a significant measure for the knowledge instrument.

Data Collection Procedure

After obtaining permission from the hospital, individual contact was made with the Intensive Care/Coronary Care Head Nurse, the Medical and Surgical Unit Head Nurses, and two of the Intensive Care/Coronary Care Unit nurses responsible for the myocardial infarction patient education.

A general explanation of the study was given which included only information from the consent form (see Appendix D) and the knowledge instrument introduction sheets (see Appendix E). In addition, the mechanisms involved with data collection (see Figure 2) were presented. The two myocardial infarction patient nurse educators were further oriented to the specifics of data collection (see Appendix F) and had consented to participate in discharge data collection if the researcher was unavailable.

The specific procedures followed for the study were outlined in Figure 2 and a check list for the procedures was utilized (see Appendix G). Admission into the study was initiated through bi-weekly telephone contact with one of the myocardial infarction patient nurse educators. At this time patients with an initial diagnosis of myocardial infarction were identified. Further information was obtained regarding initiation of education, date of discharge to the floor, and room number. A weekly check of the Intensive Care/Coronary Care admission and discharge records served as a method for identifying all potential patients with a myocardial infarction diagnosis.

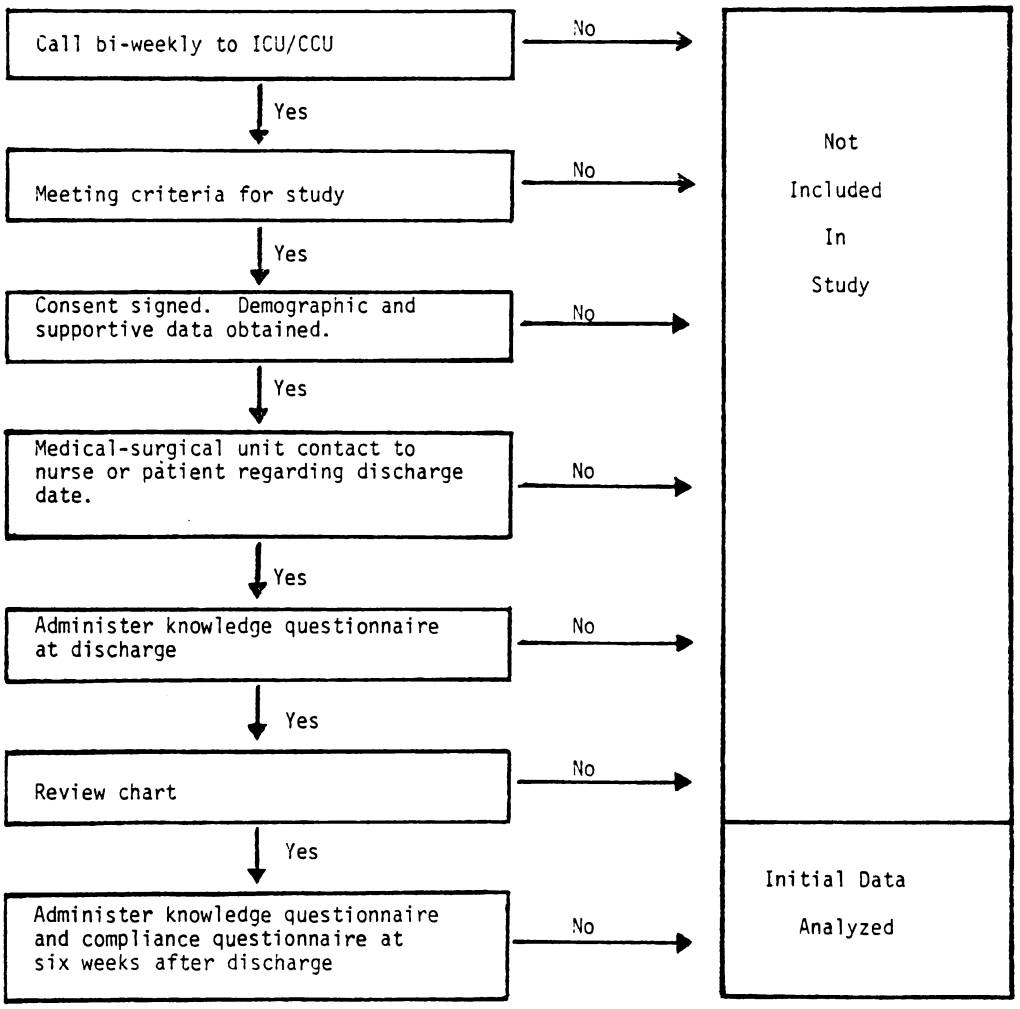

Figure 2.--Study Flow Sheet.

After discharge from the Intensive Care/Coronary Care Unit and prior to hospital discharge, patients fitting the study criteria were asked by the researcher to participate in the study. Only the researcher determined which patients would participate. The standardized introductory information written on the consent form was related verbally and then presented for the patient to read (see Appendix D). The researcher answered the patient's questions regarding the questionnaires and/or follow-up. The participants were not informed that the follow-up knowledge questionnaire would be the same as the initial knowledge questionnaire. They also were not informed about the types of compliance questions which would be asked. If the patient consented to participate in the study a written consent form was signed at that time (see Appendix D). At the same encounter patients were interviewed via a structured interview to obtain selected demographic and supportive data (see Appendix H). In addition, selected demographic and supportive data were obtained from the chart (see Appendix I).

The nurses and dietitians continued with patient education after discharge from the Intensive Care/Coronary Care Unit. This education included information related to disease entity and treatment regimens. Written materials from the American Heart Association and a cardiac teaching manual prepared by the hospital were given to each patient. Frequently, The Heart flip chart was used as a guide for instruction.

At approximately three to five days after the patient was discharged from the Intensive Care/Coronary Care Unit, the researcher

made daily telephone or personal contact with either the medical or surgical unit nurses or the patient in an attempt to determine the patient discharge date. Once the discharge date was determined the researcher reviewed the progress notes and nurses discharge sheet for the documentation of patient education. This review was completed on the afternoon prior to hospital discharge. If documentation was not present, contact was made with the myocardial infarction patient nurse educators to ascertain if educational encounters were complete.

When the education was completed, the researcher viewed the chart to determine which specific questions the patient would receive regarding diet and medications. All patients were given the knowledge questions of disease entity, general diet, and activities (see Appendix A, questions 1-20). Patients who were taking prescribed medications that corresponded with the developed knowledge questions were asked to complete the appropriate medication questions (see Appendix A, questions 29-48). Patients who verbally related or whose chart documented the prescription of a low salt/sodium diet or low cholesterol/saturated fat diet were given the appropriate questions to complete (see Appendix A, questions 21-24, 25-28).

The patients were requested to complete the knowledge questionnaire in their room according to a structured protocol (see Appendix F). No time limit was placed on administration of the questionnaire. Patients were allowed to complete the questionnaire individually or have the questions read to them if necessary. The

standardized introduction sheet (see Appendix E) and questionnaire directions (see Appendix A) were presented verbally and in written form. Questions were answered regarding testing procedures or word clarifications but not on questionnaire content. The researcher remained in a secluded portion of the room and collected the questionnaire when the patient was finished. The introduction sheet was then left with the patient. Additional information regarding the testing environment was recorded (see Appendix F). This information was obtained in order to assess potential environmental influences upon knowledge test results.

A few weeks after the patient was discharged from the hospital, the researcher reviewed the chart to validate the diagnosis. The progress notes were also reviewed for evidence of any patient education that was completed after the initial knowledge testing. In addition, other data not completed on the chart information sheet was completed at this time (see Appendix I).

Five weeks after discharge the researcher telephoned the patient and an appointment was made for the following week. The researchers telephone number was given to the patient at this time.

The day of the visit the researcher called to reconfirm the appointment. This occurred during the sixth week after discharge from the hospital. At this time it was also related that a quiet environment would be beneficial.

During the second encounter, a second knowledge questionnaire (same as that administered initially) and a compliance questionnaire were administered according to the check list for

compliance administration (see Appendix J). The standardized introduction sheet was presented verbally and in written form (see Appendix E). Then information related to the disease process, current regimens, and sources of information since hospital discharge was obtained by a structured interview (see Appendix K).

The knowledge questions utilized in the second encounter were based on previous areas tested. All patients were given questions on disease entity, general diet, and activities. Patients who were currently taking medications that had been tested previously were retested on those medications. Patients who reported having a prescribed diet were again tested on those diets which had been previously tested. Directions for the knowledge test (see Appendix A) were then presented verbally and in written form. The researcher did answer questions related to testing procedure or word clarification but not on questionnaire content. The questionnaire was then administered in a quiet environment. Again, no time limits were placed on completion. The researcher remained at the house during the completion of the questionnaires. The introduction sheet was again left with the patient.

After collection of the knowledge questionnaire, the researcher determined which compliance statements would be used. The compliance statements (see Appendix B) on general diet and activities were completed by all patients. Specific diet and medication compliance items were administered to patients who answered specific diet and medication knowledge questions at this time. The introduction sheet (see Appendix E) and instructions for the

compliance questionnaire (see Appendix B) were presented verbally and in written form. Questions were answered regarding wording or instructions but not on questionnaire content. The researcher encouraged all patients to read each question carefully. In addition, information regarding the testing environment was recorded. This information was obtained in order to assess potential environmental influences upon knowledge and compliance test results (see Appendix J). After administration of both questionnaires, the results of the initial or current questionnaires were reviewed at the request of the patient.

Written knowledge and compliance questionnaires were chosen to assess knowledge and compliant behavior. Questionnaires were much more time efficient than structured or non-structured interview techniques. The questionnaire responses were standardized which allowed the patient to choose an already established response. In addition, standardized responses allowed for more ease in data analysis.

Although stated compliance was less precise than objective compliance, stated compliance measures were utilized due to the difficulty or inability to directly measure compliance with activity, diet, and medication behaviors in the home setting. A compliance index, which includes the relationship of actual prescribed treatments to compliance with treatment regimens, was not obtained due to the difficulty in obtaining and validating actual prescribed treatment regimens from the chart or physician. Furthermore, the general compliance categories and statements developed were

universal and, hence, applicable to all generalized treatment regimens of post myocardial infarction patients. Therefore, compliance measures in this study were obtained by questionnaire and stated compliance.

The six week time frame for measuring compliance was chosen because it was assumed that by this time patients would have had time to adapt to and incorporate life-style changes. By this time, patients have usually returned to previous activity and work patterns. Patients usually are almost fully recovered physically and may not perceive any further immediate danger.

Because patients have different physicians and return for follow-up visits at varying intervals, a home visit was selected for knowledge and compliance questionnaire administration six weeks after discharge from the hospital. This was done in an attempt to keep the time frame for the second encounter relatively constant. Also, a small sample population was anticipated and return from a mailed questionnaire would be minimal. Furthermore, if a mailed knowledge questionnaire was used there would have been no controls to prevent patients from obtaining information from books, pamphlets, family, friends, or other sources during the administration.

Scoring

After the data were collected the process of scoring was initiated. The following section presents the mechanisms employed for scoring the knowledge instrument, the compliance instrument, and selected demographic data, personal supportive data and environmental supportive data.

Knowledge Instrument

The knowledge instrument (see Appendix A) was composed of 48 multiple choice questions. Each question contained four foils and points were allotted to each foil depending on whether the foil was answered correctly (1) or incorrectly (0). Each question contained a possible score of 0 to +4 (see Appendix L).

The knowledge questions were then grouped into two major categories: knowledge of disease entity (questions 1-7) and knowledge of treatment regimens (questions 8-48). The knowledge of treatment regimens included questions regarding general diet, specific diets, activities, and specific medications.

The disease entity questions (see Appendix A, questions 1-7) totaled 28 possible points. All patients answered these questions and the total points correct were calculated. A proportion score (Given, 1976) was then determined based on the number of questions that the patient answered correctly to the total possible number of points for the disease entity area. For example, if the patient obtained 24 of 28 possible points (24/28), then the score would be .86. This proportion score was utilized throughout the questionnaire and allows for questions to be individualized to each patient and yet comparable within each category.

Questions related to diet were presented as total diet, general diet, or specific diet. General diet knowledge (see Appendix A, questions 8-13) was calculated for all patients. Specific diets were further divided into: (1) low salt/sodium or no added salt

diet (see Appendix A, questions 21-24) or (2) low cholesterol/ saturated fat diet (see Appendix A, questions 25-28). Specific diet knowledge was only obtained on patients with specific diets ordered. The total possible score for general diet questions was 24 points. The specific diet categories had a possible score of 16 points for each area or a total specific diet score of up to 32 points. The score tallied for total diet knowledge was a combination score of all diet questions specific for the patient and was presented both as a total number and a proportion score. For example, the patient answered questions for general diet, low salt diet, and low cholesterol diet obtaining scores of 20, 14, and 10, respectively. General diet knowledge totaled 20 out of 24 points or .83, and specific diet knowledge totaled 24 out of 32 points or .75. Therefore, total diet knowledge was calculated to be 44 out of a possible 56 points or .79.

Activity questions (see Appendix A, questions 14-20) totaled 28 possible points. All patients answered these questions and the total points were presented. In addition, a proportion score was also computed based on a ratio of the number of points the patient received in the activity category to the total possible number of points in that category. Therefore, if a patient received 21 points out of a possible 28 points, a score of .75 was obtained.

If medication questions were administered (see Appendix A, questions 29-48) a total number correct and proportion score were obtained. For example, the patient was administered questions on nitroglycerin and diuretics for a possible total score of 32 points.

He received a score of 26 and, therefore, a proportion score of .81.

The total treatment regimen knowledge score was determined by summing the scores for total diet, activities, and medications and by calculating a proportion score. For example, the patient received 44 points or .79 for total diet knowledge, 21 points or .75 for activity knowledge, and 26 points or .81 for medication knowledge. The total treatment regimen knowledge score was 91 or .78.

Total knowledge was computed by summing the scores of the total treatment regimen knowledge and disease entity knowledge and calculating a proportion score. For example, the patients treatment regimen knowledge was 91 points or .78 and disease entity knowledge was 24 points or .86. Total knowledge was then calculated to be 115 points or .80.

If any questions were skipped they were analyzed as any other question with each foil marked as either correct or incorrect. The reason for scoring in this manner is that it serves as a consistent measure, for there is no way of determining in other questions whether foils were not checked due to being overlooked.

Compliance Instrument

The compliance instrument (see Appendix B, questions 1-22) was composed of 22 statements. A Likert scale, the same as that used by Davis (1968a), was used for scoring the items. The range of possible responses consisted of the following:

all of the time	most of the time	less than half the time	very seldom	none of the time

A possible range of points from 0 to +4 was assigned for each statement. Since some statements were negatively stated and others positively stated, the scoring mechanism was adjusted to accommodate for this. For positively stated items (1, 2, 5, 6, 8, 9, 10, 12, 14, 15, 17, 18, 19, 21, 22) the following scoring mechanisms were employed:

4 all of the time
3 most of the time
2 less than half the time
1 very seldom
0 none of the time

For negatively stated items (3, 4, 7, 11, 13, 16, 20) the scoring mechanisms were as follows:

0 all of the time
1 most of the time
2 less than half the time
3 very seldom
4 none of the time

Four points were assigned for the greatest degree of compliance for each statement. The higher the total score, the greater the extent of compliance. The compliance instrument was viewed in relation to adherence in three areas: diet compliance, activity compliance, and medication compliance.

The diet compliance statements were further categorized into general diet (see Appendix B, statements 1, 3, 5, 8, 10 and 12) and specific diet (see Appendix B, statements 19-22). The scores range from 0 to 24 for general diet compliance and 0 to 16 for specific diet compliance. All patients were assessed on general diet

compliance. The patients diet compliance score was then computed as a proportion score with respect to possible compliance in that category. The possible diet compliance score was variable with each patient depending on whether they had special diets prescribed. For example, the patient was on a low salt diet and obtained compliance scores and proportion scores of 20 points or .83 (general diet) and 16 points or 100 percent (specific diet). The total diet compliance was determined by summation score and corresponding proportions and, therefore, consisted of 36 points out of a possible 40 or .90.

Activity compliance was measured by statements 2, 4, 6, 7, 9, 11, and 13 (see Appendix B). The total possible activity scores ranged from 0 to 20 or 0 to 28 depending on whether the patients had been taught to take their pulse. A proportion score was calculated by dividing the patients activity score by the patients total possible activity score. If they had not been taught to take their pulse, statements 2 and 13 were deleted from the computations. For example, the patient had not been taught to take his pulse and, therefore, the total possible score was 20. The patients numerical score for the five items was 16 and a proportion score of .80 was assigned.

The total range of possible scores for medication compliance was 0 to 20 (see Appendix B, statements 14-18). A proportion was calculated from this data. For example, the patient received a score of 19 for medication compliance. A proportion score was then determined to be 19/20 or .95.

Total compliance was then computed by summing the category scores and then calculating a proportion score. For example, the patient received 36 points or .90 for total diet compliance, 16 points or .80 for activity compliance, and 19 points or .95 for medication compliance. The total score would then be 71 points or .88.

If any compliance statements were not answered then the average score and proportion for the patient's total compliance was computed. This score was then assigned to the missed statement. In this way, a missed question did not significantly skew the data.

Demographic and Supportive Data

A considerable amount of demographic data, personal supportive data, and environmental supportive data were collected on each patient, some of which were condensed via scoring mechanisms. This data was then used as descriptive data and to identify factors that may have affected the levels of knowledge and compliance, knowledge relationships, and knowledge and compliance relationships. The data scoring mechanisms of social position index, risk factor assessment, severity index, symptoms since discharge, and sources of information since discharge are presented in the following section.

Social Position Index.--In order to determine social class the Hollingshead Two Factor Index of Social Position (see Figure 5) was utilized (Bonjean, Hill, and McLemore, 1967, p. 384). This index was composed of occupational and educational factors. Each patient was interviewed to determine which occupational and educational category was applicable (Figures 3 and 4). Since social position

Occupation

___ 1. Major executives of large concerns, major professionals, and proprietors.

___ 2. Lesser professionals and proprietors, and business managers.

___ 3. Administrative personnel, owners of small businesses and minor professionals.

___ 4. Clerical and sales workers, and technicians.

___ 5. Skilled trades.

___ 6. Machine operators and semi-skilled workers.

___ 7. Unskilled employees.

Figure 3.--Occupational Scale.

Education

___ 1. Professionals (masters, doctorate or professional degree).

___ 2. College graduates.

___ 3. 1-3 years college or business school.

___ 4. High school graduate.

___ 5. 10-11 years of schooling.

___ 6. 7-9 years of schooling.

___ 7. Under 7 years of schooling.

Figure 4.--Educational Scale.

reflects a value system developed over time, retired persons were categorized in the occupational status relative to past employment. The specific occupations that were categorized under each occupational level were further described by Hollingshead (Bonjean, Hill, and McLemore, 1967, p. 442). This was used as a guide for specific placement of patients.

Information from the occupational and educational scales were combined to determine the Social Position Index (see Figure 5). This was accomplished by determining the number from the occupational and educational levels on the scales (scale scores), and then multiplying this by weightings. The weightings for the occupational and educational factors were 7 and 4, respectively. After occupational and educational partial scores were determined, they were added together to get a total score. This total score was then compared to a range of scores and the appropriate social class was assigned. For example, to compute the Social Position Index score

Factor	Scale Score	x	Factor Weight	=	Partial Score
Occupation		x	7	=	
Education		x	4	=	
					Total Score

Class	Range of Scores
I	11-17
II	18-31
III	32-47
IV	48-63
V	64-77

Figure 5.--Hollingshead Two Factor Index of Social Position.

of an owner of a small restaurant who had completed high school and one year of business school refer to Figure 6. The patient would be placed in Class III.

Factor	Scale Score	x	Factor Weight	=	Partial Score
Occupation	3	x	7	=	21
Education	3	x	4	=	12
					33 Total Score

Class	Range of Scores
I	11-17
II	18-31
III	32-47
IV	48-63
V	64-77

Figure 6.--Example of Hollingshead Two Factor Index of Social Position.

Risk Factor Assessment.--The determination of risk factors and criteria related to cardiovascular disease was made based on a review of the literature (Simborg, 1970; McAlister et al., 1976; Glass, 1977; Alexander et al., 1978; Gotto et al., 1978; McIntosh, Eknoyan, and Jackson, 1978; McIntosh et al., 1978; McIntosh, Stamler, and Jackson, 1978). The risk factors and criteria were developed such that each person who met the criteria for a risk factor at entrance to the hospital was given a score of +1 (see Appendix M). The points calculated from the criteria assessment were totaled and compared to the following scale:

$\geq$ 3 points = high risk

$<$ 3 points = low risk

For example, a 50 year old male who exercises less than three times a week and smokes a pack of cigarettes a day would be assigned a total score of three and considered at high risk.

Severity.--The severity index for myocardial infarctions utilized in this study was based on a severity index developed by Peel and associates (1962), which graded the severity of infarction according to the mortality rates of the same population. This index was used for the assessment of severity in the first four days after hospital admission. The categories identified were age and sex, previous history, shock, cardiac failure, electrocardiogram changes, and rhythm disturbances. Weighted numbers were assigned by Peel and associates to the specific criteria of each category so that they corresponded with the mortality rates (see Appendix N).

For the purposes of this study, the severity index developed by Peel and associates (1962) was adapted to include other signs and symptoms in criteria levels and an additional category. The signs and symptoms added to the moderate shock criteria level included cyanosis and duskiness. The most severe failure criteria level included the addition of positive hepatojugular reflux (HJR) and pink tinged sputum. All of the categories, criteria, and weightings developed by Peel and associates (1962), with the addition of some criteria, were utilized in this study for the assessment of the first four days of hospitalization.

After the first four days of hospitalization complications can arise which may affect the severity rating. Therefore, an

additional category was added that allowed for the documentation of criteria such as signs and symptoms of shock, cardiac failure, electrocardiogram changes, and rhythm disturbances that occurred during the remainder of hospitalization. However, the category was added only when the criteria had not been accounted for previously. The weightings of the criteria in this last category were the same as those used in the scale for the assessment of the first four days (see Appendix N).

The scoring consisted of weighted scores, developed by Peel and associates (1962), that were summed. If a patient qualified for two different criteria levels under a category, the higher weighted score was given.

For example, a 60 year old male with a past history of a myocardial infarction exhibited mild shock at onset (nausea, vomiting, and sweating). He also demonstrated basilar rales, EKG changes confined to the RT or T waves, and sinus rhythm during the first four days of hospitalization. In addition, he experienced ventricular tachycardia one week after admission. Therefore, his severity score could be calculated in the following manner:

Age and sex	2
Previous history	6
Shock	1
Failure	1
EKG	1
Rhythm	0
Other after four days	4
	15

The severity levels were determined by identifying the highest and lowest severity scores for the study population. Equal range scores were then computed for high, medium,and low severity. The severity levels of high, medium, and low severity were based on the following scale:

11-15 = low
16-20 = medium
21-25 = high

Each patient was then assigned the high, medium,or low severity depending on their severity score. The patient in the previous example would be assigned a rating of low severity.

Symptoms Since Hospital Discharge.--Symptoms related to cardiac disease or congestive heart failure were identified (Thorn et al., 1977; Luckmann and Sorenson, 1974). Patients in a structured interview were then asked to estimate the frequency with which they had experienced each symptom since hospital discharge (see Appendix K). The possible responses and corresponding scoring mechanisms were the following: never = 0, occasionally = 1, and frequently = 2. All responses were then totaled. The categories of high, medium,and low symptoms since discharge were based on the following scale:

0-3 = low
4-6 = medium
$\geq$ 7 = high

Sources of Information Since Hospital Discharge.--An estimate was made of the frequency and sources of information obtained since hospital discharge. Patients in a structured interview were

asked to estimate the frequency with which they had obtained information from a variety of sources (see Appendix K). The possible responses and scoring mechanisms were the following: never = 0, occasionally = 1, and frequently = 2. A total response score was computed for each patient. High, medium,and low sources of information were calculated based on the following scale:

1-4 = low
5-8 = medium
$\geq$ 9 = high

Procedures for Data Analysis

After the demographic data, personal supportive data, environmental supportive data, and instruments were scored, the data were analyzed. This section presents the structure for data analysis and includes discussion of the variables and the presentation of the research questions. In addition, the techniques for data analysis are presented.

Variables

The variables identified for this study were knowledge and compliance. The independent variable was knowledge at hospital discharge. This independent variable was not manipulated but measured for purposes of comparison. The dependent variables included knowledge and compliance six weeks after hospital discharge.

The knowledge variable was viewed as total knowledge or was further divided into knowledge of disease entity or knowledge of the treatment regimens. Knowledge of treatment regimens consisted of

total treatment regimen knowledge, total diet knowledge, general diet knowledge, specific diet knowledge, activity knowledge, and medication knowledge.

The compliance variable was measured as total compliance or compliance with a specific category of recommendations. These categories included diet, activity, or medication compliance.

Variables that directly or indirectly affect knowledge or compliance were identified in the demographic, personal supportive, and environmental supportive data and were used as descriptive measures in the study (see Tables 1, 2, 3). These variables were determined based on a review of the literature. The variables included: age; sex, marital status; race; social position; history of chronic illness; past experience of self or spouse with a myocardial infarction; prior diet, medication, or activity prescriptions or restrictions; past exercise patterns; risk factor assessment; family history of cardiovascular disease; severity of the myocardial infarction; symptoms since discharge; number of days in the Intensive Care/ Coronary Care Unit; number of days in the hospital; number of visits to the emergency room or physician since discharge; readmission to the hospital since discharge; environment during knowledge and compliance questionnaire administration; and patient request for knowledge results (see Appendices H, I, and K for data collection sheets).

Other direct or indirect influencing variables have been identified but are beyond the scope of this study. They include duration of the regimen, patient perception of disease, motivation,

attitudes and values, work orientation, support or influence from family or friends, and provider-patient relationship.

Presentation of Research Questions

The problem statement related that the central focus of this research project was a study of the relationships between post myocardial infarction patient knowledge at the time of discharge from the hospital, and knowledge and stated compliance six weeks after hospital discharge.

The following section includes the questions studied relative to the problem statement. These questions specifically focused on the patterns of knowledge and the patterns of compliance. The research questions developed for this study included the following:

Research Question I. What are the patterns of knowledge in the study population?

A. What are the levels of knowledge at two points in time?

B. What are the factors that affect the levels of knowledge?

C. What is the relationship between knowledge at hospital discharge and knowledge six weeks after hospital discharge?

   1. What is the relationship between total knowledge at hospital discharge and total knowledge six weeks after hospital discharge?

   2. What is the relationship between knowledge of disease entity at hospital discharge and knowledge of disease entity six weeks after hospital discharge?

   3. What is the relationship between knowledge of total treatment regimens at hospital discharge and knowledge of total treatment regimens six weeks after hospital discharge (Refer to Figure 1 for a schematic representation of the knowledge relationships studied).

D. What are the factors that affect the relationship between knowledge at hospital discharge and knowledge six weeks after hospital discharge?

Research Question II. What are the patterns of compliance in the study population?

A. What are the levels of stated compliance six weeks after hospital discharge?

B. What are the factors that affect the levels of stated compliance?

C. What is the relationship between knowledge at hospital discharge and stated compliance six weeks after hospital discharge?

1. What is the relationship between total knowledge at hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge?

2. What is the relationship between knowledge of disease entity at hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge?

3. What is the relationship between knowledge of total treatment regimens at hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge? (Refer to Figure 1 for a schematic representation of the knowledge and compliance relationships studied).

D. What are the factors that affect the relationship between knowledge at hospital discharge and stated compliance six weeks after hospital discharge?

E. What is the relationship between knowledge six weeks after hospital discharge and stated compliance six weeks after hospital discharge?

1. What is the relationship between total knowledge six weeks after hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge?

2. What is the relationship between knowledge of disease entity six weeks after hospital discharge and stated

compliance with total treatment regimens six weeks after hospital discharge?

3. What is the relationship between knowledge of total treatment regimens six weeks after hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge? (Refer to Figure 1 for a schematic representation of the knowledge and compliance relationships studied.)

F. What are the factors that affect the relationship between knowledge six weeks after hospital discharge and stated compliance six weeks after hospital discharge?

Techniques for Data Analysis

This study was exploratory in nature and a combination of statistical and descriptive case study techniques were used for data analysis. Since the sample size was small the correlation coefficient may have been unstable. Therefore, the statistical tests were used as indications and trends but not as strict hypothesis testing. Data analysis techniques were viewed from three perspectives: analysis of the levels of knowledge and the levels of compliance, analysis of relationships, and analysis of factors affecting knowledge and compliance.

Analysis of the Levels of Knowledge and the Levels of Compliance.--The level of knowledge was the amount of patient knowledge measured by the knowledge instrument which was displayed as a proportion score for hospital discharge and six weeks after discharge. The level of knowledge was analyzed by range percent correct scores and mean percent correct scores at hospital discharge and six weeks after discharge (Table 4). Also, frequency counts of the number of

patients whose knowledge increases, decreases, or remains the same between hospital discharge and six weeks after discharge were computed (Table 5 or Figure 6).

The level of compliance was the amount of patient compliance six weeks after hospital discharge which was measured by the compliance instrument and displayed as a proportion score. The level of compliance was analyzed by range percent compliance scores and mean percent compliance scores six weeks after hospital discharge (Table 9).

Low knowledge and low compliance scores were determined by the patients total or specific category scores of knowledge or compliance less than 70 percent and 75 percent, respectively. Outlyers were identified as those patients with less than 70 percent knowledge and/or 75 percent compliance (see Table 6 and Table 10).

A review of the literature failed to indicate the amount of knowledge required to positively influence compliant behavior. This review also failed to indicate the rate of compliance which positively influences patients' health status (outcomes) or to suggest a minimum rate of compliance that was acceptable. For the purposes of this study, less than 70 percent knowledge was chosen as the parameter by which to identify outlyers. This level was chosen because a minimum of 70 percent of the information related to disease and/or treatments must be obtained in order for a patient to comply. Furthermore, the optimal rate of compliance would be 100 percent but this is unrealistic. Therefore, outlyers were identified

as patients who were noncompliant and whose compliance scores fell below 75 percent compliance.

Analysis of Relationships.--A correlation coefficient is the most appropriate statistical measure that can be used to address the research questions about relationships between two variables. Therefore, these research questions were analyzed by using the Spearman Rank Difference Correlation. This correlation is approximately the same as the Pearson r for the same data but is used when the number of subjects is less than 30. The Spearman Rank Difference Correlation can be viewed as the degree to which persons maintain their same relative ranks or positions on two variables. If the change is great, the correlation coefficient will be low; if there is little change, the correlation coefficient will be high (Borg and Gall, 1971; Stanley and Hopkins, 1972). The correlation coefficients (r) for the variables in the research questions regarding relationships are displayed in Table 7, Table 11, and Table 12.

The Spearman Rank Difference Correlation (Stanley and Hopkins, 1972) is computed by the formula:

$$r_{ranks} = 1 - \frac{6 \Sigma D^2}{N(N^2-1)}$$

where D^2 = the squared difference between the ranks for each individual

N = number of pairs of scores.

Once computed, the interpretation of r is based on the strength of the linear relationship. Marascullo (1971, p. 433) identifies the relationships as the following:

Value of r	Strength of the Relationship
.01	none
.1 to .2	very weak
.3 to .4	weak
.5	moderate
.6 to .7	strong
.8 to .9	very strong
1.0	perfect

The statistical hypotheses testing for research questions concerning relationships utilized a statistical hypotheses testing schedule (see Appendix O). All statistical hypotheses were stated in the null form (see Appendix O). The level of significance selected for this study was .10. This means that the results considered significant at the .10 level have the probability of occurring by chance only ten times in 100. This level of significance was selected because of the exploratory nature of the study and because the chance of a type one error (rejecting a true null) is not potentially harmful to the research subject.

In view of the fact that the sample number is small, scattergrams were completed on all correlations in an attempt to identify extremes (outlyers) or distinctive population patterns (see Appendix P). Outlyers for relationships were defined as those patients who

demonstrate contrasting relationships from the general population as determined by scattergrams. Distinctive population patterns consisted of particular patient groupings that were identified by scattergrams.

Analysis of Factors Affecting Knowledge and Compliance.--A case study approach was utilized to view outlyers and distinctive population patterns in relation to factors that may have affected the levels of knowledge and compliance, knowledge relationships, and knowledge and compliance relationships. Outlyers were defined as those patients who demonstrated less than 70 percent knowledge and/or 75 percent compliance, or showed contrasting relationships from the general population as determined by scattergrams. The distinctive population patterns consisted of particular patient groupings that are identified by scattergrams. The factors that potentially influenced knowledge and compliance as viewed in this study, were the demographic, personal and environmental supportive variables which emerged from a review of the literature. These variables influenced knowledge and compliance in a direct or indirect manner and included: age; sex; marital status; race; social position; history of chronic illness; past experience of self or spouse with a myocardial infarction; prior diet, medication, or activity prescriptions or restrictions; past exercise patterns; risk factor assessment; family history of cardiovascular disease; severity of the myocardial infarction; symptoms since discharge; number of days in Intensive Care/ Coronary Care Unit; number of days in the hospital; number of visits

to the emergency room or physician since discharge; readmission to hospital since discharge; sources of information since discharge; environment during knowledge and compliance questionnaire administration, and patient request for knowledge results.

Human Rights Protection

This section discussed the measures taken to insure that the rights of the participants were protected. All participants were informed about the purpose of the study, the schedule for data collection, and the confidentiality of identity and results. All were informed that they had a right to refuse to participate, and that if they did consent to participate they had a right to withdraw at any time without penalty. Participation was voluntary with written consent obtained (see Appendix D). For a further review of the Human Rights Protection Procedures see Appendix Q.

Summary

Chapter IV has provided an overview of the methodology and procedures employed in the study. This discussion has included a presentation of the population, a description of the setting, the development of the instruments, the data collection procedure, the scoring mechanisms, the data analysis techniques, and the human rights protection. In Chapter V descriptive data and data addressing the previously identified research questions is presented.

CHAPTER V

PRESENTATION OF FINDINGS

Overview

In this chapter the descriptive data and the data addressing the research questions are presented. Data regarding the research questions are based on information obtained from demographic data, personal and environmental supportive data, and knowledge and compliance questionnaires of post myocardial infarction patients.

The central focus of this research project is a study of the relationships between myocardial infarction patient knowledge at the time of discharge from the hospital, and knowledge and stated compliance six weeks after hospital discharge. The major research questions focus on the patterns of knowledge and the patterns of compliance in the study population. The specific research questions in this study include the following:

Research Question I. What are the patterns of knowledge in the study population?

A. What are the levels of knowledge at two points in time?

B. What are the factors that affect the levels of knowledge?

C. What is the relationship between knowledge at hospital discharge and knowledge six weeks after hospital discharge?

1. What is the relationship between total knowledge at hospital discharge and total knowledge six weeks after hospital discharge?

2. What is the relationship between knowledge of disease entity at hospital discharge and knowledge of disease entity six weeks after hospital discharge?

3. What is the relationship between knowledge of total treatment regimens at hospital discharge and knowledge of total treatment regimens six weeks after hospital discharge (refer to Figure 1 for schematic representation of the knowledge relationships studied).

D. What are the factors that affect the relationship between knowledge at hospital discharge and knowledge six weeks after hospital discharge?

Research Question II. What are the patterns of compliance in the study population?

A. What are the levels of stated compliance six weeks after hospital discharge?

B. What are the factors that affect the levels of stated compliance?

C. What is the relationship between knowledge at hospital discharge and stated compliance six weeks after hospital discharge?

1. What is the relationship between total knowledge at hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge?

2. What is the relationship between knowledge of disease entity at hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge?

3. What is the relationship between knowledge of total treatment regimens at hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge? (Refer to Figure 1 for schematic representation of the knowledge and compliance relationships studied.)

D. What are the factors that affect the relationship between knowledge at hospital discharge and stated compliance six weeks after hospital discharge?

E. What is the relationship between knowledge six weeks after hospital discharge and stated compliance six weeks after hospital discharge?

   1. What is the relationship between total knowledge six weeks after hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge?

   2. What is the relationship between knowledge of disease entity six weeks after hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge?

   3. What is the relationship between knowledge of total treatment regimens six weeks after hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge? (Refer to Figure 1 for schematic representation of the knowledge and compliance relationships studied).

F. What are the factors that affect the relationship between knowledge six weeks after hospital discharge and stated compliance six weeks after hospital discharge?

This exploratory study utilizes a combination of statistical and descriptive case study techniques for data analysis. Descriptive data are presented initially. This descriptive data include population data, demographic data (Table 1), personal supportive data (Table 2), and environmental supportive data (Table 3).

The data addressing the research questions are then discussed. Levels of knowledge and compliance are based on proportion scores from the instruments. Mean percent and range percent scores are presented. The number of patients whose knowledge increased, decreased, or remained constant is then discussed. The number of patients with less than 70 percent total or specific knowledge and less than 75 percent total or specific compliance are identified.

The relationship between knowledge categories at two points in time, and knowledge and compliance categories are analyzed. The Spearman Rank Difference Correlation (Borg and Gall, 1971; Stanley and Hopkins, 1972) is used to test hypotheses about relationships in order to identify trends or indications (see Appendix M).

Since the population is small and randomization is not employed, the researcher cannot assume that characteristics of the population which affect knowledge and compliance are equally distributed across the population. Therefore, a case study approach is utilized to view outlyers (extremes) and distinctive population patterns in relation to factors that may affect the levels of knowledge and compliance, knowledge realationships, and knowledge and compliance relationships. The outlyers are defined as patients who demonstrate less than 70 percent knowledge and/or 75 percent compliance, or show contrasting relationships from the general population as determined by scattergrams. Distinctive population patterns consist of particular patient groupings that are identified by scattergrams. This case study approach was used in order to establish indicators and trends along with the statistical information.

Presentation of Descriptive Data

The descriptive data discussed include population data, demographic data (Table 1), and supportive data (Tables 2, 3). The supportive data are further divided into personal and environmental supportive data.

Population Data

The study population consisted of 11 post myocardial infarction patients that were admitted to a 204 bed private hospital during August and September, 1978. All patients meeting the predetermined criteria for admittance into the study were asked to participate and all agreed. Two patients were not initially admitted to the study because their physicians did not confirm the diagnosis of myocardial infarction. The knowledge questionnaires at hospital discharge, and knowledge and compliance questionnaires six weeks after discharge were completed by all patients.

Demographic Data

Table 1 shows that the study population consisted of ten Caucasian males and one Caucasian female. There were four patients between 50-59 years of age, five patients between 60-69 years of age, and one patient each in the age categories of 70-79 years and 80 years or older. Eight of the patients were married while one patient was included in each of the single, widowed, and divorced/separated categories. In the social position category, five patients were at level III, three patients at level IV, two patients at level V, and one patient at level II. No patient occupied the highest social position level. In summary, the population consisted of predominately male Caucasian patients between 50 to 70 years of age. Most of the patients were in the medium to lower social positions.

Table 1.--Selected Demographic Data of the Study Population.

Characteristic	Patients Number	Percent
Sex		
Male	10	91
Female	1	9
Age		
Less than 50 years	0	0
50-59 years	4	36
60-69 years	5	45
70-79 years	1	9
80 years or older	1	9
Race		
Caucasian	11	100
Marital Status		
Single	1	9
Married	8	73
Widowed	1	9
Divorced/Separated	1	9
*Social Position Index		
I	0	0
II	1	9
III	5	45
IV	3	27
V	2	18

*Hollingshead Two Factor Index of Social Position.

Selected Personal Supportive Data

Selected personal supportive data were obtained regarding the patients. Examination of Table 2 reveals that 91 percent or ten of the patients had a history of chronic illness. These chronic illnesses included hypertension, cancer, cerebral vascular accidents, diabetes, and emphysema in descending order of occurrence. None of

Table 2.--Selected Personal Supportive Data of the Study Population.

Characteristic	Patients Number	Percent
History of Chronic Illness		
Positive	10	91
Past Experience with Myocardial Infarction		
Spouse	0	0
Self	6	55
Prior Prescriptions or Restrictions		
None	2	18
Diet	0	0
Medications	6	55
Activities	0	0
Diet and Medications	2	18
Diet and Activities	0	0
Medications and Activities	0	0
All	1	9
Current Prescriptions or Restrictions		
None	0	0
Diet	0	0
Medications	0	0
Activities	1	9
Diet and Medications	0	0
Diet and Activities	1	9
Medications and Activities	0	0
All	9	82
Past Exercise Patterns		
Less than one time per week	8	73
Between one and four times per week	2	18
Greater than or equal to four times per week	1	9
Risk Factor Assessment		
High	11	100
Low	0	0
Family History of Cardiovascular Disease		
Positive	9	82
Severity Index of Myocardial Infarction		
High	2	18
Medium	7	64
Low	2	18

Table 2.--Continued.

Characteristic	Patients Number	Patients Percent
Symptoms Since Discharge		
High	3	27
Medium	2	18
Low	6	55
Patient Request for Questionnaire Results		
Yes	3	27

the spouses had ever experienced a myocardial infarction, while six or 55 percent of the patients had myocardial infarctions in the past. Two of the patients (18 percent) had never experienced diet, medication, or activity prescriptions or restrictions. Six or 55 percent of the patients had only medication prescriptions prior to hospital admission. Patients with medication and diet recommendations prior to hospitalization totalled two or 18 percent. Only one patient had previous diet, medication, and activity prescriptions or restrictions prior to hospital admission. In regard to current prescriptions and restrictions, 82 percent or nine of the patients had diet, medication, and activity recommendations. One patient currently had only activity recommendations and another patient had only diet and activity prescriptions or restrictions. The majority of patients, eight or 73 percent, had a past exercise pattern of less than once a week. All patients demonstrated a high risk factor assessment (see risk factor assessment, p. 107). A positive family history of cardiovascular disease was present for nine patients (82

percent). Seven patients (64 percent) had myocardial infarctions of medium severity (see severity index, p. 108), while two patients (18 percent) had myocardial infarctions of high severity and two patients (18 percent) had myocardial infarctions of low severity. Low symptoms since hospital discharge (see symptoms, p. 110) were experienced by six patients (55 percent), while two (18 percent) and three (27 percent) of the patients experienced medium or high symptoms, respectively, since discharge. Only three patients (27 percent) requested the results of the questionnaire.

Selected Environmental Supportive Data

In examining Table 3, it can be seen that the number of days in the Intensive Care/Coronary Care Unit was almost equally divided between less than five days (five patients or 45 percent) and greater than or equal to five days (six patients or 55 percent). Fifty-five percent or six of the patients experienced less than 15 total days in the hospital while five patients (45 percent) had 15 days of hospitalization or more. Variations existed in the number of visits to the physician since discharge. Three patients (27 percent) had three visits, two patients (18 percent) had two visits, two patients (18 percent) had four or more visits, and four patients (36 percent) had 0-1 visit. Only one patient was readmitted to the hospital after discharge for a cardiac catheterization. Seven patients (64 percent) demonstrated medium sources of information since discharge from the hospital (see sources of information, p.

Table 3.--Selected Environmental Supportive Data of the Study Population.

	Patients	
	Number	Percent
Number of Days in the Intensive Care/ Coronary Care Unit		
Less than five days	5	45
Greater than or equal to five days	6	55
Number of Days in the Hospital		
Less than 15 days	6	55
Greater than or equal to 15 days	5	45
Visits to Emergency Room or Physician Since Discharge		
0-1 time	4	36
2 times	2	18
3 times	3	27
4 or more times	2	18
Readmission to the Hospital Since Discharge		
Yes	1	9
Sources of Information Since Discharge		
High	1	9
Medium	7	64
Low	3	27

110). Three patients (27 percent) demonstrated low sources of information and one patient (9 percent) demonstrated high sources.

Presentation of Data Regarding Research Questions

The previous section discussed the descriptive data of the study. In this section the findings from the data analysis are presented to address the research questions posed for this project.

Research Question I. What are the patterns of knowledge in the study population?

This question was further divided into four specific questions. These specific questions were examined prior to the examination of research question I.

I-A. What are the levels of knowledge at two points in time?

The levels of knowledge were interpreted based on: the range and mean percent correct scores of the knowledge instrument; the number of patients whose knowledge increased, decreased, or remained the same; and the number of patients who had less than 70 percent total knowledge or specific knowledge.

By examining Table 4, it can be noted that at hospital discharge and six weeks after discharge the highest mean percent scores were specific diet knowledge (89 percent and 87 percent, respectively). The lowest mean percent scores were medication knowledge both at hospital discharge (75 percent) and six weeks after discharge (80 percent). Specific diet knowledge was the highest knowledge category and medication knowledge was the lowest category at both hospital discharge and six weeks later, indicating that patients generally knew most about specific diets and least about medications at two points in time. Total knowledge was 81 percent at hospital

Table 4.--Mean and Range Percent Correct Knowledge Scores at Hospital Discharge and Six Weeks After Hospital Discharge.

Knowledge Categories[a]	Knowledge Scores at Hospital Discharge		Knowledge Scores Six Weeks after Discharge	
	Range % Correct	Mean % Correct	Range % Correct	Mean % Correct
Disease Entity	61-93	82	68-96	81
Total Treatment Regimen	76-88	80	77-88	84
Diet				
Total	73-93	83	78-92	84
General	67-92	80	67-92	81
Specific[b]	75-94	89	75-94	87
Activity	71-93	81	68-93	84
Medication[c]	67-88	75	75-85	80
Total Knowledge	72-88	81	77-89	83

[a]The number of patients in each knowledge category was 11 (n=11) unless specified.

[b]n=9

[c]n=8

discharge and 83 percent six weeks after discharge. The scores for disease entity knowledge ranged from 61 percent to 93 percent at hospital discharge and 68 percent to 96 percent six weeks after discharge. These ranges indicated that wide variations existed in the disease entity knowledge in this population.

Any increase or decrease in the knowledge score was considered a change. Examination of Table 5 and Figure 6 shows that more patients increased in total knowledge, total treatment regimen

Table 5.--Number and Percent of Patients Changing in Knowledge From Hospital Discharge to Six Weeks After Discharge.

Knowledge Categories[a]	KNOWLEDGE					
	Increasing From Onset		Remaining the Same		Decreasing From Onset	
	Number	%	Number	%	Number	%
Disease Entity	4	36	2	18	5	45
Total Treatment Regimen	8	73	1	9	2	18
Diet						
Total	6	55			5	45
General	6	55			5	45
Specific[b]	2	22	5	55	2	22
Activity	6	55	1	9	4	36
Medication[c]	6	75	1	12	1	12
Total Knowledge	6	55	1	9	4	36

[a]The number of patients in each knowledge category was 11 (n=11) unless specified.

[b]n=9

[c]n=8

knowledge, and specific treatment regimen knowledge (excluding specific diet knowledge) than decreased in knowledge of these areas. Five patients showed decreases in disease entity knowledge while four patients showed increases. In the area of increases in knowledge from onset, a majority of patients showed increases in total treatment regimen knowledge (eight patients or 73 percent) and medication knowledge (six patients or 75 percent). The specific diet knowledge category showed the highest number of patients whose

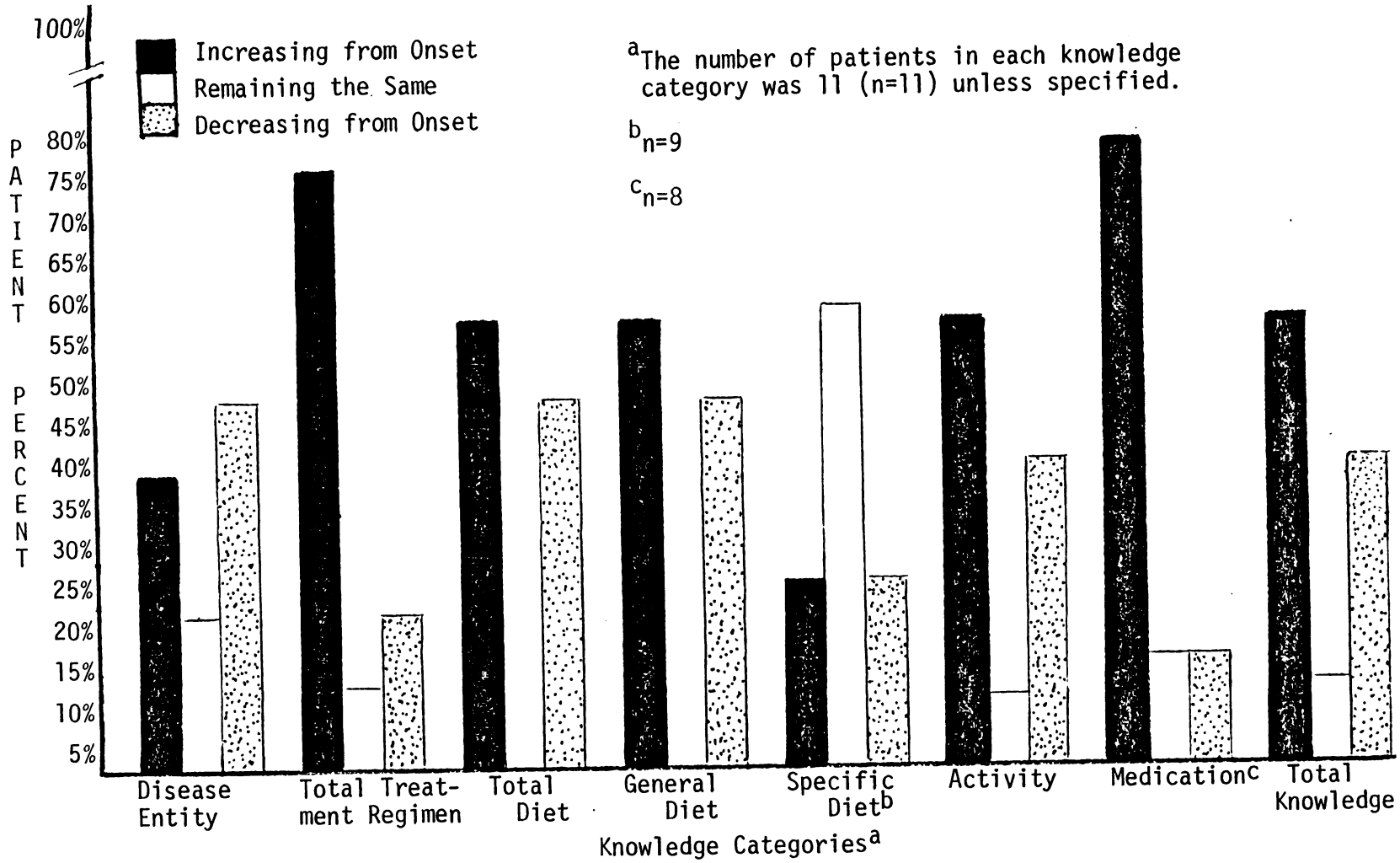

Figure 7.--Percent of Patients Changing in Knowledge From Hospital Discharge To Six Weeks After Discharge.

knowledge remained the same (five patients or 55 percent). In the area of decreases in knowledge from onset, disease entity knowledge (five patients or 45 percent), total diet knowledge (five patients or 45 percent), and general diet knowledge (five patients or 45 percent) were the categories that demonstrated the highest number of patients decreasing.

An examination of Table 6 indicates that patients demonstrated less than 70 percent knowledge in four knowledge categories. The categories were disease entity knowledge, general diet knowledge, activity knowledge, and medication knowledge. Knowledge below 70 percent was demonstrated by four patients. Two patients scored less than 70 percent knowledge in two categories. One patient had low knowledge scores in activity and medication knowledge and the other patient had low knowledge scores in general diet and disease entity knowledge. No one scored less than 70 percent knowledge in total treatment regimen knowledge, total diet knowledge, specific diet knowledge, or total knowledge.

I-B. What are the factors that affect the levels of knowledge?

Patients with less than 70 percent knowledge were identified. No patients demonstrated less than 70 percent total knowledge. The specific categories of disease entity, general diet, activity, and medication included patients with less than 70 percent knowledge (Table 6). Some important factors were identified for patients with less than 70 percent knowledge. The patients were generally younger than the total group and currently were following diet,

Table 6.--Number and Percent of Patients Below 70 Percent Knowledge.

Knowledge Categories[a]	Less than 70% Knowledge Patients	
	Number	Percent
Disease Entity	2	18
Total Treatment Regimen	0	0
Diet		
Total	0	0
General	1	9
Specific[b]	0	0
Activity	1	9
Mediciation[c]	2	25
Total Knowledge	0	0

[a]The number of patients in each knowledge category was 11 (n=11) unless specified.

[b]n=9

[c]n=8

medication, and activity prescriptions or restrictions. Three out of four of the low knowledge patients had prior individual experience with myocardial infarctions. Out of three patients who requested the results for the knowledge questionnaires, two of these patients had less than 70 percent knowledge in a specific area.

I-C. What is the relationship between knowledge at hospital discharge and knowledge six weeks after hospital discharge?

This question was subdivided into three questions that further delineate the relationship measured. These three questions were answered prior to answering question I-C.

I-C-1. What is the relationship between total knowledge at hospital discharge and total knowledge six weeks after hospital discharge?

Total knowledge at hospital discharge correlated with total knowledge six weeks after discharge .38 (Table 7). The null statistical hypothesis was accepted since t = 1.24 and no statistical significance was demonstrated at a .10 alpha level (Table 8). Therefore, no significant relationship existed between total knowledge at hospital discharge and six weeks after discharge (see Figure 1).

I-C-2. What is the relationship between knowledge of disease entity at hospital discharge and knowledge of disease entity six weeks after hospital discharge?

Table 7 shows that knowledge of disease entity at hospital discharge and knowledge of disease entity six weeks after discharge were moderately correlated at .47. The disease entity correlation was not significant at the .10 level (t = 1.59), therefore, the null statistical hypothesis was accepted (Table 8). A significant relationship does not exist between disease entity knowledge at hospital discharge and six weeks after discharge (see Figure 1).

I-C-3. What is the relationship between knowledge of total treatment regimens at hospital discharge and knowledge of total treatment regimens six weeks after hospital discharge?

Table 7 indicates that there were no significant relationships between total treatment regimen or specific treatment regimen knowledge at hospital discharge and six weeks after discharge (see Figure 1). Total treatment regimen knowledge correlation was r = .28.

Table 7.--Spearman Rank Difference Correlations of Knowledge at Hospital Discharge and Knowledge Six Weeks After Discharge.

Knowledge Categories at Hospital Discharge[a]	Knowledge Categories Six Weeks After Discharge[a]							
	Disease Entity	Total Treatment Regimen	Diet Total	Diet General	Diet Specific[b]	Activity	Medication[c]	Total Knowledge
Disease Entity	.47							
Total Treatment Regimen		.28						
Diet								
Total			.10					
General				.18				
Specific[b]					.36			
Activity						.06		
Medication[c]							-.31	
Total Knowledge								.38

*Significant at .10 level.

[a]The number of patients in each knowledge category was 11 (n=11) unless specified.

[b]n=9

[c]n=8

Table 8.--Summary of Statistical Tests.

Hypothesis	Calculated t	Decision Regarding Null Hypotheses*
I-C:		
I-C-1: $TK_1 \rightarrow TK_2$	1.24	accept
I-C-2: $DE_1 \rightarrow DE_2$	1.59	accept
I-C-3: $TTR_1 \rightarrow TTR_2$	.87	accept
II-C:		
II-C-1: $TK_1 \rightarrow$ TTRC	2.03	reject
II-C-2: $DE_1 \rightarrow$ TTRC	.20	accept
II-C-3: $TTR_1 \rightarrow$ TTRC	1.49	accept
II-E:		
II-E-1: $TK_2 \rightarrow$ TTRC	1.43	accept
II-E-2: $DE_2 \rightarrow$ TTRC	.12	accept
II-E-3: $TTR_2 \rightarrow$ TTRC	.96	accept
$TD_2 \rightarrow$ TDC	3.14	reject

*Significant at the .10 level.

TK_1 = Total knowledge at hospital discharge
TK_2 = Total knowledge six weeks after discharge
DE_1 = Disease entity knowledge at hospital discharge
DE_2 = Disease entity knowledge six weeks after discharge
TTR_1 = Total treatment regimen knowledge at hospital discharge
TTR_2 = Total treatment regimen knowledge six weeks after discharge
TD_2 = Total diet knowledge six weeks after discharge
TTRC = Total treatment regimen compliance
TDC = Total diet compliance

The test statistic was t = .87. Therefore, the null statistical hypothesis was accepted indicating that no significant relationship existed (Table 8). All of the specific treatment regimen knowledge relationships, excluding medication, were positively related indicating that patients tended to maintain their relative ranks on the treatment regimen knowledge categories from hospital discharge to six weeks after discharge. A weak negative relationship existed between medication knowledge at hospital discharge and six weeks after discharge indicating that there were changes in the relative ranks of medication knowledge. Patients ranking high on medication knowledge at hospital discharge tended to rank lower six weeks after discharge, and patients ranking low at hospital discharge tended to rank higher six weeks later.

In addressing the research question I-C, there were no significant relationships noted between the relative ranks of knowledge at hospital discharge and knowledge six weeks after discharge. However, all relationships were weakly positive except for a weak negative relationship found between medication knowledge at hospital discharge and six weeks after discharge.

I-D. What are the factors that affect the relationship between knowledge at hospital discharge and knowledge six weeks after hospital discharge?

Outlyers were individuals differing from the general population as identified by scattergrams. Distinctive population patterns consisted of groups of patients who demonstrated clusterings on the

scattergrams (see scattergrams I--Appendix P). The factors for these individuals or groups of patients were assessed.

For disease entity, only one patient showed a difference from the group. This patient changed from ranking high in disease entity knowledge to ranking lowest. Some important factors were identified for this patient such as age, prior restrictions, and past exercise patterns. This patient was generally older than the other patients, had a past exercise pattern of four or more times a week, claimed no past prescriptions or restrictions, and related only current activity recommendations.

Two patients showed considerable change in medication knowledge. These patients reversed from being ranked first to last and last to first. Both patients had also experienced the most severe myocardial infarctions (see severity index, p. 108). The patient who decreased his rank was married, had no experience with a past myocardial infarction, and had never been placed on prescriptions or restrictions prior to this myocardial infarction. The patient who increased in rank was divorced, requested the results of his knowledge questionnaire, had experienced a past myocardial infarction, and had prior experience with diet and medication recommendations.

Two groups of patients were identified from the scattergrams of total knowledge and activity knowledge. The two groups were patients maintaining relatively high ranks in knowledge and patients maintaining relatively low ranks. All patients maintaining their relative high or low ranks had current diet, medication, and activity prescriptions or restrictions.

Patients who maintained their high ranks in total knowledge (three patients) were those who generally had high severity indices (see severity index, p. 108), demonstrated low symptoms (see symptoms, p. 110), and had greater than 15 days of hospitalization. Patients who maintained their low relative ranks in total knowledge (five patients) all had myocardial infarctions of medium severity and demonstrated higher symptoms.

In relation to activity knowledge, those patients who maintained relative high knowledge (two patients) had experienced a past myocardial infarction and demonstrated low symptoms. The four patients who maintained low activity knowledge generally had no experiences with myocardial infarctions in the past, had prior experience with medication recommendations, related past exercise patterns of less than once a week, and demonstrated high or low symptoms.

Research Question I can now be answered. The patterns of knowledge identified in this study were based on findings from the data analysis. Examination of Table 4 shows that at hospital discharge and six weeks after discharge specific diet knowledge demonstrated the highest mean percent scores (89 percent and 87 percent, respectively). Medication knowledge demonstrated the lowest mean percent scores (75 percent and 80 percent, respectively). Medication knowledge and specific diet knowledge maintained their relative positions over time. Total knowledge was 81 percent at hospital discharge. Six weeks after discharge total knowledge was 83 percent. Wide variations existed in the range of scores for disease entity

knowledge at hospital discharge (61 percent to 93 percent) and six weeks after discharge (68 percent to 96 percent) indicating that some patients knew more about the disease entity than others.

A larger number of patients showed increases in total knowledge (six or 55 percent), total treatment regimen knowledge (eight or 73 percent), total diet knowledge (six or 55 percent), general diet knowledge (six or 55 percent), activity knowledge (six or 55 percent), and medication knowledge (six or 75 percent) rather than decreases (Table 5). The number of patients decreasing in disease entity knowledge was greater than the number of patients increasing. Therefore, more patients showed increases in treatment regimen knowledge (excluding specific diets) and total knowledge rather than decreases, and more patients showed decreases in disease entity knowledge rather than increases. Total treatment regimen knowledge (eight patients or 73 percent) and medication knowledge (six patients or 75 percent) were the two knowledge categories that showed a majority of patients increasing from onset. For those patients remaining the same in knowledge from onset, specific diet knowledge was the category that included the highest number of patients (five or 55 percent). In the area of decreases in knowledge from onset disease entity knowledge (five patients or 45 percent), general diet knowledge (five patients or 45 percent), and total diet knowledge (five patients or 45 percent) were the categories that showed the largest number of patients decreasing from onset.

Some factors were significant for those patients with less than 70 percent knowledge. This group tended to be young and

currently following diet, medication, and activity prescriptions and restrictions. The majority of patients in this group had past myocardial infarctions. In addition, two out of three patients who requested the knowledge test results were from this group.

No significant relationships existed between the relative ranks of knowledge at hospital discharge and knowledge six weeks after discharge for any of the categories. However, all relationships were weakly or very weakly positive except for medication knowledge which demonstrated a weak negative association.

Some factors were identified concerning the relationship between knowledge at hospital discharge and knowledge six weeks after hospital discharge. One patient demonstrated a change from a high rank to a low rank in disease entity knowledge. This individual was generally older than the other patients, had a past exercise pattern of four or more times a week, claimed no past prescriptions or restrictions, and related only current activity recommendations.

Two patients completely reversed their rankings for medication knowledge from first to last and last to first. Both patients had experienced the most severe myocardial infarctions (see severity index, p. 108). The patient decreasing in rank was married, had no previous experience with myocardial infarctions, and had never been placed on prescriptions or restrictions before this myocardial infarction. The patient increasing in rank was divorced, requested the results of his knowledge questionnaire, had experienced a past myocardial infarction, and had prior experience with diet and medication recommendations.

Two groups of patients were identified from the scattergrams of total knowledge and activity knowledge. The groups were patients maintaining relatively high ranks in knowledge and patients maintaining relatively low ranks. All patients maintaining their relative high or low ranks had current diet, medication, and activity prescriptions or restrictions.

For total knowledge, patients who maintained their high ranks generally had high severity indices, demonstrated low symptoms (see symptoms, p. 110), and had more than 15 days of hospitalization. Patients who maintained their low relative ranks in total knowledge all had myocardial infarctions of medium severity and demonstrated higher symptoms.

In relation to activity knowledge, patients who maintained relative high knowledge had experienced a past myocardial infarction and demonstrated low symptoms. Patients who maintained low activity knowledge generally had no experiences with myocardial infarctions in the past, had prior experience with medications, related past exercise patterns of less than once a week, and demonstrated either high or low symptoms.

Research Question II. What are the patterns of compliance in the study population?

This question was further divided into specific questions which were analyzed prior to the analysis of research question II.

II-A. What are the levels of stated compliance six weeks after hospital discharge?

The levels of compliance were analyzed based on the range and mean percent scores of the compliance instrument and the number and percent of patients who had less than 75 percent total or specific treatment regimen compliance.

Examination of Table 9 shows that the highest mean percent score was medication compliance (96 percent) and the lowest mean percent scores were activity compliance (78 percent) and general diet compliance (79 percent). Patients complied more with medication

Table 9.--Mean and Range Percent Compliance Scores Six Weeks After Hospital Discharge.

Compliance Categories[a]	Compliance Scores	
	Range % Compliance	Mean % Compliance
Total Treatment Regimen	63- 95	83
Diet		
Total	63-100	82
General	63-100	79
Specific[b]	63-100	86
Activity	46-100	78
Medication[c]	85-100	96

[a]The number of patients in each compliance category was 11 (n=11) unless specified.

[b]n=9

[c]n=8

recommendations than they did with activity or general diet recommendations. The range for medication compliance was 85 percent to

100 percent, demonstrating a high compliance rate for all patients. Activity compliance showed a wide variation in range (46 percent to 100 percent) indicating that some patients had high compliance rates while others had low compliance rates.

Table 10 shows that all compliance categories, except medication compliance, included patients with less than 75 percent compliance. There was a total of five patients with less than 75 percent compliance in at least one category. These compliance results indicated that patients complied more with medication recommendations than with diet or activity recommendations. Of

Table 10.--Number and Percent of Patients Below 75 Percent Compliance.

Compliance Categories[a]	Less than 75% Compliance	
	Number of Patients	Percent of Patients
Total Treatment Regimen	1	9
Diet		
Total	3	27
General	4	36
Specific[b]	2	22
Activity	2	18
Medication[c]	0	0

[a]The number of patients in each compliance category was 11 (n=11) unless specified.

[b]n=9

[c]n=8

those patients with less than 75 percent compliance, two patients had low compliance in only one category (general diet or activity), one patient had low compliance in two categories (general diet and total diet), one patient had low compliance in three categories (specific diet, total diet, and activity), and one patient had low compliance in all of the categories (total treatment regimen, total diet, general diet, specific diet, and activity).

II-B. What are the factors that affect the levels of stated compliance?

Patients with less than 75 percent total and specific compliance were identified (Table 10). Important factors indicated that all of the patients were married, had a myocardial infarction of high or medium severity (see severity index, p. 108), demonstrated low or medium sources of information (see sources of information, p. 110), and were following diet, medication, and activity recommendations. The patient not complying in six categories did not demonstrate any different factors affecting compliance than the other low compliers.

II-C. What is the relationship between knowledge at hospital discharge and stated compliance six weeks after hospital discharge?

This question was subdivided into three specific questions related to the knowledge and compliance relationship. These specific questions were answered prior to answering question II-C.

II-C-1. What is the relationship between total knowledge at hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge?

Total knowledge at hospital discharge was moderately related to total treatment regimen compliance at r = .56 (Table 11). The null statistical hypothesis was rejected because there was statistical significance at the .10 level of significance with a t = 2.03 (Table 8). A significant relationship does exist between total knowledge at hospital discharge and compliance six weeks after discharge (see Figure 1). Patients in this population who had higher total knowledge scores at hospital discharge tended to comply more with total treatment regimens six weeks after discharge. Patients with low knowledge were less compliant at six weeks. This significant positive relationship could be viewed as an indication of the relationship between knowledge and compliance in larger populations.

II-C-2. <u>What is the relationship between knowledge of disease entity at hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge?</u>

Examination of Table 11 indicates that disease entity at hospital discharge correlated with total treatment regimen compliance at .07. The null statistical hypothesis was accepted with the t = .20 which is less than the critical value at the .10 alpha level (Table 8). Therefore, no significant relationship existed between disease entity knowledge at hospital discharge and compliance six weeks after discharge (see Figure 1).

II-C-3. <u>What is the relationship between knowledge of total treatment regimens at hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge?</u>

Table 11.--Spearman Rank Difference Correlations of Knowledge at Hospital Discharge and Compliance Six Weeks After Discharge.

Knowledge Categories at Hospital Discharge[a]	Compliance Categories Six Weeks After Discharge[a]					
	Total Treatment Regimen	Diet Total	Diet General	Diet Specific[b]	Activity	Medication[c]
Disease Entity	.07					
Total Treatment Regimen	.45					
Diet						
Total		.35				
General			.42			
Specific[b]				-.20		
Activity					.30	
Medication[c]						.22
Total Knowledge	.56*					

*Significant at the .10 level.

[a]The number of patients in each category was 11 (n=11) unless specified.

[b]n=9

[c]n=8

Table 11 shows that no significant relationship existed between knowledge of total treatment regimens at hospital discharge and total treatment regimen compliance six weeks after discharge (see Figure 1). This correlation ($r = .45$) was not significant at the .10 level of significance ($t = 1.49$) and the null statistical hypotheses was accepted (Table 8).

The specific treatment regimen knowledge categories showed no significant relationship with corresponding compliance. Correlations of specific knowledge with corresponding compliance were weak or very weak. The correlations were the following: total diet, $r = .35$; general diet, $r = .42$; specific diet, $r = -.20$; activity, $r = .30$; and medications, $r = .22$. Therefore, in general, weak and very weak positive correlations existed between specific categories of knowledge at hospital discharge and compliance six weeks after discharge, except for the specific diet relationship which showed a very weak negative correlation. These positive relationships indicated that patients with higher specific knowledge at hospital discharge tended to have higher corresponding compliance six weeks after discharge, and patients with lower knowledge tended to have lower compliance. However, patients with high specific diet knowledge at hospital discharge tended to have low diet compliance six weeks after discharge, and patients with low specific diet knowledge tended to have high diet compliance.

Research question II-C can be answered based on the relationship identified between knowledge at hospital discharge and stated compliance six weeks after discharge. Total knowledge was the only

significant relationship and was positively related to total treatment regimen compliance at .56. Patients with high total knowledge complied more with all recommendations than patients with low total knowledge. The specific knowledge categories and corresponding compliance showed positive relationships, except for specific diet knowledge and corresponding compliance which showed an inverse relationship.

II-D. What are the factors that affect the relationship between knowledge at hospital discharge and stated compliance six weeks after hospital discharge?

The outlyers were patients who were different than the general population as identified by scattergrams. Distinctive population patterns consisted of groups of patients who demonstrated clusterings on the scattergrams (see scattergrams II--Appendix P). The factors for these individuals or groups of patients were then assessed for significance. Total knowledge and total treatment regimen knowledge relationships with compliance demonstrated two significant groups of patients. Patient groups consisted of patients with high knowledge and high compliance, and low knowledge and low compliance.

The three high knowledge and high compliant patients from both the total treatment regimen knowledge and total knowledge categories were the same individuals. All were married and demonstrated low symptoms (see symptoms, p. 110). This high knowledge and high compliance group included the two patients with no prior prescriptions or restrictions.

Five patients had low total treatment regimen knowledge and low treatment regimen compliance. All of the patients who requested the results of the knowledge questionnaire and all patients with low sources of information were in this group (see sources of information, p. 110). Important factors in relation to the low total knowledge and low total compliance relationship included lack of experience with past myocardial infarctions, prior medication prescriptions, and current diet, medication, and activity recommendations.

II-E. What is the relationship between knowledge six weeks after hospital discharge and stated compliance six weeks after hospital discharge?

This question was divided into three specific questions concerning the knowledge and compliance relationship. These questions were examined before the research question II-E was analyzed.

II-E-1. What is the relationship between total knowledge six weeks after hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge?

Examination of Table 12 reveals that a significant relationship does not exist between total knowledge and total treatment regimen compliance six weeks after hospital discharge (see Figure 1). The correlation was $r = .43$ and the null statistical hypothesis was accepted with $t = 1.43$ which was less than the critical value at the .10 alpha level (Table 8).

II-E-2. What is the relationship between knowledge of disease entity six weeks after hospital discharge and stated compliance with total treatment regimens six weeks after discharge?

Table 12.--Spearman Rank Difference Correlations of Knowledge and Compliance Six Weeks After Hospital Discharge.

Knowledge Categories Six Weeks After Discharge[a]	Compliance Categories Six Weeks After Discharge[a]					
	Total Treatment Regimen	Diet-Total	Diet-General	Diet-Specific[b]	Activity	Medication[c]
Disease Entity	.04					
Total Treatment Regimen	.30					
Diet						
Total		.72**				
General			.26			
Specific[b]				.08		
Activity					.51	
Medication[c]						-.54
Total Knowledge	.43					

*Significant at .10 level.

**Significant at .025 level.

[a]The number of patients in each category was 11 (n=11) unless specified.

[b]n=9

[c]n=8

Disease entity knowledge six weeks after hospital discharge was not correlated significantly (r = .04) with total treatment regimen compliance six weeks after hospital discharge (Table 12). The t score was .12, showing no statistical significance at the .10 level of significance. The null statistical hypothesis was accepted (Table 8) indicating that no significant relationship existed (see Figure 1).

II-E-3. What is the relationship between knowledge of total treatment regimens six weeks after hospital discharge and compliance with total treatment regimens six weeks after hospital discharge?

Table 12 indicates that the correlation between total treatment regimen knowledge and compliance six weeks after discharge was r = .30. A significant relationship did not exist between total treatment regimen knowledge and total treatment regimen compliance (see Figure 1). The t score was .96 and, therefore, the null hypotheses was accepted at the .10 level of significance (Table 8).

A positive relationship was evident between total diet knowledge and total diet compliance (r = .72) at the .025 level of significance. This level of significance indicated that the probability of this relationship occurring by chance was 2.5 times in 100. The hypothesis was rejected because there was statistical significance with a t value of 3.14 (Table 8). Patients with higher total diet knowledge scores six weeks after discharge tended to comply more with total diet regimens. Patients with low total diet knowledge at six weeks were less compliant with diets at six weeks. The total diet results can be viewed as indications or trends of the

relationship between knowledge and compliance in larger populations.

Activity knowledge and medication knowledge at six weeks were correlated with corresponding compliance at r = .51 and r = -.54, respectively. These correlations were not significant at the .10 level of significance but were considered moderate relationships.

All treatment regimen knowledge correlated positively with corresponding compliance, except for medication knowledge and compliance which was inversely related. This inverse relationship indicated that as medication knowledge six weeks after hospital discharge increased, the compliance decreased and as knowledge decreased, the compliance increased.

The answers to research question II-E were based on the relationships identified between knowledge at hospital discharge and corresponding compliance as identified in Table 12. Only one significant relationship existed. The knowledge of total diets was correlated with total diet compliance at r = .72. This relationship indicated that patients with high total diet knowledge at six weeks tended to comply more with diet advice than patients with low total diet knowledge. All of the knowledge categories, excluding medication, were positively related to corresponding compliance indicating that as knowledge at six weeks increased, compliance concomitantly increased and as knowledge decreased, compliance also decreased. The relationships of activity and medication knowledge with corresponding compliance demonstrated moderate associations. Medication knowledge

showed a moderate negative correlation with compliance. As medication knowledge at six weeks increased, corresponding compliance decreased and as knowledge decreased, corresponding compliance increased.

II-F. What are the factors that affect the relationship between knowledge six weeks after hospital discharge and stated compliance six weeks after hospital discharge?

An outlyer was identified in the relationship between medication knowledge six weeks after discharge and medication compliance. This outlyer was an individual who fell outside of the negative sloping relationship of medication knowledge and compliance. There were no differences in the factors associated with this individual than factors associated with other patients (see scattergrams III, Appendix P).

The patterns of compliance, research question II, can now be discussed. From Table 9 it can be seen that compliance mean percent scores were highest for medications (96 percent) and lowest for activity (78 percent) and general diet (79 percent). Mean percent compliance was greater for medication recommendations than for activity and general diet recommendations. In general, patients followed medication recommendations more than activity and general diet recommendations.

Examination of Table 10 shows that all categories of compliance, except medication compliance, included persons with less than 75 percent compliance. Medication compliance was greater than other treatment regimen compliance such as total diet, general diet,

specific diet, or activity compliance. There was no specific pattern of patients that complied with individual or multiple categories.

Some factors were significant for patients with less than 75 percent compliance. In this group all were married and were following diet, medication, and activity recommendations. Patients in this group had experienced myocardial infarctions of high or medium severity (see severity, p. 108), and demonstrated low or medium sources of information (see sources of information, p. 110).

The results in Table 11 demonstrated a significant relationship between knowledge at hospital discharge and compliance six weeks after discharge. A significant relationship existed between total knowledge and total treatment regimen compliance ($r = .56$). Patients with high total knowledge tended to comply with all treatment recommendations and patients with low total knowledge complied less with all treatment recommendations. The remainder of the relationships were very weak, weak, or moderately positive, except for specific diet knowledge and corresponding diet compliance which demonstrated a very weak negative relationship.

The relationship between total knowledge or total treatment regimen knowledge at hospital discharge with compliance demonstrated two distinctive groups of patients. Patient groups were those with high knowledge and high compliance and patients with low knowledge and low compliance.

The high knowledge patients and high compliers from both total treatment and total knowledge categories included the same

patients. All were married and demonstrated low symptoms (see symptoms, p. 110). This high knowledge and high compliant group included the two patients with no prior prescriptions or restrictions.

The low total treatment regimen knowledge and low treatment regimen compliance group included all the patients who requested the results of the knowledge questionnaire and patients with low sources of information.

Important factors in relation to the low total knowledge and low total compliance relationship were lack of experience with past myocardial infarctions, prior medication prescriptions, and current diet, medication, and activity recommendations.

From Table 12 it can be seen that a significant relationship did exist between knowledge of total diets six weeks after hospital discharge and total diet compliance ($r = .72$). This relationship indicated that patients with high total diet knowledge tended to comply more with diet advice than those with low total diet knowledge. All of the knowledge categories, excluding medication, were positively correlated with corresponding compliance indicating that as knowledge increased, compliance increased and as knowledge decreased, compliance also decreased. The relationships of activity and medication knowledge with corresponding compliance demonstrated moderate associations. Medication knowledge showed a moderate negative correlation with compliance. As medication knowledge increased, corresponding compliance decreased and as knowledge decreased, compliance increased.

No important factors were identified in relation to the outlyer in the relationship between medication knowledge and compliance six weeks after hospital discharge.

Summary

In Chapter V an overview was presented which described the major emphasis and organization of the chapter. The descriptive data were presented next. This descriptive data included population data, demographic data, personal supportive data, and environmental supportive data. The data addressing the research questions regarding the patterns of knowledge and patterns of compliance were then presented. A combination of statistical and case study methods were used to analyze the data.

In Chapter VI the summary of findings and implications will be presented. Specifically this chapter will focus on the summary and interpretation of findings, limitations and problems encountered, implications for nursing and other health related professions, and recommendations for future studies.

CHAPTER VI

SUMMARY AND IMPLICATIONS OF FINDINGS

Overview

The purpose of this research project is to study the relationships between myocardial infarction patient knowledge at the time of discharge from the hospital, and knowledge and stated compliance six weeks after hospital discharge. In a review of the literature, the researcher found that differing results exist regarding knowledge relationships and knowledge and compliance relationships. Furthermore, multiple factors are reported as influencing knowledge and compliance. Based on the reported results, the major research questions posed for this study focus on the patterns of knowledge and the patterns of compliance in the study population. The present study is implemented to address the following specific research questions:

Research Question I. What are the patterns of knowledge in the study population?

A. What are the levels of knowledge at two points in time?

B. What are the factors that affect the levels of knowledge?

C. What is the relationship between knowledge at hospital discharge and knowledge six weeks after hospital discharge?

1. What is the relationship between total knowledge at hospital discharge and total knowledge six weeks after hospital discharge?

2. What is the relationship between knowledge of disease entity at hospital discharge and knowledge of disease entity six weeks after hospital discharge?

3. What is the relationship between knowledge of total treatment regimens at hospital discharge and knowledge of total treatment regimens six weeks after hospital discharge (refer to Figure 1 for a schematic representation of the knowledge relationships studied).

D. What are the factors that affect the relationship between knowledge at hospital discharge and knowledge six weeks after hospital discharge?

Research Question II. What are the patterns of compliance in the study population?

A. What are the levels of stated compliance six weeks after hospital discharge?

B. What are the factors that affect the levels of stated compliance?

C. What is the relationship between knowledge at hospital discharge and stated compliance six weeks after hospital discharge?

1. What is the relationship between total knowledge at hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge?

2. What is the relationship between knowledge of disease entity at hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge?

3. What is the relationship between knowledge of total treatment regimens at hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge? (Refer to Figure 1 for a schematic representation of the knowledge and compliance relationships studied.)

D. What are the factors that affect the relationship between knowledge at hospital discharge and stated compliance six weeks after hospital discharge?

E. What is the relationship between knowledge six weeks after hospital discharge and stated compliance six weeks after hospital discharge?

1. What is the relationship between total knowledge six weeks after hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge?

2. What is the relationship between knowledge of disease entity six weeks after hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge?

3. What is the relationship between knowledge of total treatment regimens six weeks after hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge? (Refer to Figure 1 for a schematic representation of the knowledge and compliance relationships studied.)

F. What are the factors that affect the relationship between knowledge six weeks after hospital discharge and stated compliance six weeks after hospital discharge?

Data for addressing the research questions is obtained from demographic data, personal and environmental supportive data, and knowledge and compliance questionnaire results from 11 post myocardial infarction patients. Data analysis consists of a combination of statistical and case study techniques which suggest indications and trends that may exist in larger populations. Results are presented for each of the research questions developed for the study.

The following sections present the summary and interpretations of the findings, limitations and problems encountered, implications for nursing and other health care providers, and recommendations for future studies.

Summary and Interpretations of the Findings

In this section findings from the study are discussed and analyzed. The two major research questions are presented and the specific research questions are discussed under the appropriate major question.

Summary Research Question I

What are the patterns of knowledge in the study population?

The patterns of knowledge included the levels of knowledge, factors that affect the levels of knowledge, the relationship between knowledge at two points in time, and factors that affect the relationship. Levels of knowledge were determined by: mean and range percent correct scores; the number of patients whose knowledge increased, decreased, or remained the same; and the number of patients with less than 70 percent total or specific knowledge. Changes in the levels of knowledge could result from the phenomena of regression toward the mean and, therefore, should be kept in mind when reviewing the results.

Mean and range percent correct scores demonstrated that specific diet knowledge was the highest of all the knowledge categories both at hospital discharge and six weeks after discharge (89 percent and 87 percent). Initial high levels may be attributed to program emphasis, prior knowledge, or the perceived relevancy of the information in general. Since low cholesterol/saturated fat diets and low salt/sodium diets have received considerable emphasis through the mass media in the last few years, it seems logical that

people may have retained that information due to reinforcement. Media emphasis may have also influenced the patient's perception of relevant information by suggesting that diet was a significant factor to be followed in order to decrease risk factors for cardiovascular disease. Also, hospital education programs routinely included information on diets as part of the content.

Specific diet remained the highest knowledge category at the second encounter and suggests patients retained or gained the information over time. The reasons for increased specific diet knowledge initially continue to apply to increased specific diet knowledge six weeks after discharge. It seems consistent with the literature that applying knowledge will in fact positively influence retention. Patients problem-solve and make decisions regarding diet throughout the day which suggests that they may have frequently applied information learned.

Medication knowledge demonstrated the lowest mean percent correct scores both at hospital discharge and six weeks after discharge (75 percent and 80 percent). Medication knowledge may have been low due to the lack of emphasis placed on medication knowledge or high anxiety levels which hampered the information attained during hospitalization. Patients may not have viewed the information as meaningful or may have preferred to deny the importance of knowing about medications. Patients may have felt that they had little independent control over medication decisions and, therefore, relegated total responsibility to the health care providers. Since taking medications does not really involve much daily decision-making,

except to take the medication or not, there may have been less application and reinforcement of knowledge than in other areas such as activity and diet compliance.

In the area of changes in knowledge from onset, a majority of patients showed increases in the total treatment regimen knowledge (eight patients or 73 percent) and medication knowledge (six patients or 75 percent). This finding supports the results reported in the literature that knowledge which was applied reinforced learning or stimulated new inquiry. The number of patients who decreased in disease entity knowledge was only one patient greater than the number of patients who increased (five patients or 45 percent). It was, therefore, difficult to substantiate that disease entity knowledge decreased more than increased, or that disease entity knowledge decayed over time. The findings did suggest further exploration of disease entity knowledge.

For knowledge concerning specific diet, a larger number of patients retained the same relative position at both knowledge testings than the number of patients who increased or decreased (five patients or 55 percent). Once patients were given a certain amount of information regarding specific diets further information was possibly not sought. The mean percent correct for specific diet knowledge at two points in time was the highest, suggesting that a maximum amount of knowledge needed by the patient may be reached.

Some patients demonstrated less than 70 percent total or specific knowledge. Important factors which may have affected knowledge adversely were identified. Patients with less than 70

percent total or specific knowledge were younger than the general study population and may not have been ready to accept the disease process as readily as those who were older. Literature also suggested that the six week interval may not have been enough time for patients to accept the disease. If there was a lack of readiness to learn, knowledge would be low. In addition, patients may not have viewed knowledge as important.

All patients with less than 70 percent knowledge were following diet, medications, and activity prescriptions or restrictions. Patients had more information to retain due to a large number of prescriptions or restrictions and their knowledge may have been lower due to information overload and possible confusion. This result further substantiated literature reports of lower knowledge being associated with an increased number of treatment regimens.

The majority of patients with less than 70 percent knowledge had experienced myocardial infarctions in the past. A previous myocardial infarction associated with low knowledge refuted the principle of relearning and retention which related that retention was greater if information was relearned rather than learning of new information (Craig, Mehrens, and Clarizio, 1975). However, if the patients did not perceive the information as important previously, they may not have learned the material at that time. Patients may not have implemented previous regimens or understood the importance of the regimens. Thus, patients with past myocardial infarctions may have been learning large amounts of new material during hospitalization and six weeks after discharge.

If low knowledge demonstrated by this group indicated that they did not have adequate knowledge, their compliance may have also been lower. The lower compliance rate may have precipitated the current myocardial infarction. After the second myocardial infarction, information regarding disease and treatment regimens may have been more accepted which may explain why two of the three patients who requested the knowledge test results were from this group. Patients requesting information concerning knowledge may have been attempting to attain greater control over the disease.

Some patients with low knowledge may not have been ready to learn information earlier than six weeks. An opportunity to interact with a nurse at a time when patients were ready to learn provided a stimulus for some patients to seek answers. At this time knowledge may have been more meaningful (Cronbach, 1977).

The relationship between knowledge at hospital discharge and knowledge six weeks after discharge was not significant. All relationships, except medication knowledge, were positively weak or very weak. This finding indicated patients with high knowledge at hospital discharge tended to rank high on knowledge six weeks after discharge, and patients with low knowledge at hospital discharge tended to remain low at six weeks. Medication knowledge demonstrated a weak negative correlation (-.31) which indicated patients with low medication knowledge at hospital discharge tended to have high knowledge at six weeks, while patients with high medication knowledge at hospital discharge tended to have low knowledge at six weeks. However, the non-significance of these knowledge results indicated

no particular knowledge relationships existed over time and changes were variable. Knowledge, therefore, needs to be reassessed at different points in time.

The knowledge results also suggested that many factors were involved with the learning and retention of knowledge. The factors are very individual and may differ for each patient making it difficult to generalize about methods of increasing knowledge. Further studies should attempt to isolate factors which may contribute to knowledge retention.

Some important factors concerning the relationship between knowledge at hospital discharge and knowledge six weeks after discharge were identified. One patient changed from a high rank to a low rank in disease entity knowledge which was different from the remainder of the study population. The patient who changed in rank was generally older than the others, had a past exercise pattern of four or more times a week, related no past prescriptions or restrictions, and only current activity recommendations. This patient did not retain or seek to increase disease entity knowledge possibly due to patient perception or from emphasis on activity prescriptions from hospital education programs. This change in disease entity knowledge seems consistent with the fact that disease knowledge may not be important to everyday living.

Two patients completely reversed their ranking for medication knowledge from first to last and last to first. One patient increased greatly in knowledge and the other declined. The decline may suggest that the patient did not really learn the information.

Both patients had experienced the most severe myocardial infarctions (see severity index, p. 108) indicating severity of the infarction may influence the need for medication knowledge.

Treatment such as medication administration may not have been viewed by some patients as totally their responsibility. Patients with severe infarctions may have relegated responsibility to the health care provider and, in doing so, may not have sought information in this area. However, a patient may have viewed increased knowledge of the medical aspects of treatment regimens as an increasing factor in the control of the disease process. A study involving these two perceptions and knowledge should be implemented.

The patient decreasing in medication knowledge rank was married, had no previous experience with myocardial infarctions, and had never been placed on prescriptions or restrictions before this infarction. Lack of past experience with a myocardial infarction may have contributed to the decay or loss of knowledge regarding medications (Craig, Mehrens, and Clarizio, 1975). The patient may have felt that medication knowledge was less important to know than other knowledge. Such feelings could have resulted when patients believed only in the need to follow medication orders without understanding the implications. Therefore, the meaningfulness of the knowledge may have been decreased. It is possible that this patient may have experienced a knowledge overload which influenced prolonged retention.

The patient increasing in medication rank was divorced, requested the results of his knowledge questionnaire, had experienced

a past myocardial infarction, and had prior experience with diet and medication recommendations. Past experience may have influenced the amount of knowledge retained and may have allowed the patient to focus on relevant information about medications. This patient may have felt the need to be self-sufficient since no significant others were available for support. This self-sufficiency may have stimulated the patient to seek information in order to gain control over the disease. If the patient was complacent after the first myocardial infarction this pattern may be reversed now in an attempt to prevent further occurrences.

Two groups of patients were identified from the scattergrams of total knowledge and activity knowledge. The groups included patients maintaining relatively high ranks in knowledge and patients maintaining relatively low ranks in knowledge. All patients maintaining their relative high or low ranks had current diet, medications, and activity prescriptions or restrictions.

Patients who maintained total knowledge high ranks were those who generally had high severity indices, demonstrated low symptoms (see symptoms, p. 110) and were hospitalized for more than 15 days. The propensity to retain total knowledge remained high for patients with severe myocardial infarctions. Patients may have viewed knowledge as a method of control over a severe disease process. Because these patients experienced more days of hospitalization than the average, it was possible that they received more total knowledge instruction than other patients. Increased hospitalization may have resulted in more provider-patient interaction

indicating an interest in patient learning. The perception of provider interest may have influenced knowledge retention and attainment. Low symptoms could have been a result of increased total knowledge. Patients with increased total knowledge were possibly more accurate in preventing symptoms from occurring or interpreting symptoms more appropriately when they did occur.

Patients who maintained low relative ranks in total knowledge all had myocardial infarctions of medium severity and demonstrated higher symptoms. Since medium severity may not have posed as much of a threat as high severity, patients may not have felt the need to acquire overall knowledge. Also, higher symptoms may have been a function of low total knowledge. Patients who had decreased total knowledge may not have been aware of methods or strategies which could have been used to prevent, avoid, or manage symptoms.

In relation to activity knowledge, patients who maintained relative high knowledge experienced a past myocardial infarction and demonstrated low symptoms. Patients with a past myocardial infarction may have had more knowledge about activities because activity prescriptions and restrictions would have been prescribed previously. Activity knowledge may have been influenced by relearning, reinforcement, and application principles. The level of symptoms could have been directly related to activity compliance. If patients knew how to accurately implement activities, monitor progress, and adjust activities the appearance of symptoms may have possibly been lower.

Patients who maintained low activity knowledge generally had no experience with myocardial infarctions in the past, had prior experience with medications, related past exercise patterns of less than once a week, and demonstrated high or low symptoms. Activity knowledge may have remained low due to the lack of prior learning, reinforcement, and application over time. Patients in this group did have prior experiences with medications. If they did not seek information related to medications previously, they may have carried over lack of inquiry into the activity knowledge area. Since applying information tends to reinforce learning, if past activity patterns were low activity knowledge may also remain low.

Summary Research Question II

What are the patterns of compliance in the study population?

The patterns of compliance included the levels of compliance, factors that affect the levels of compliance, the relationship between knowledge at hospital discharge and compliance six weeks after discharge, factors that affect the relationship between knowledge at hospital discharge and compliance six weeks after discharge, the relationship between knowledge and compliance six weeks after discharge, and factors that affect the relationship between knowledge and compliance six weeks after discharge. Levels of compliance were determined by range and mean percent scores and the number of patients with less than 75 percent total or specific treatment regimen compliance.

Mean and range percent compliance scores showed medication compliance (96 percent) was the highest, and activity (78 percent) and general diet (79 percent) compliance were lowest. All categories of compliance, except medication compliance, included persons with less than 75 percent compliance which indicated that patients followed medication recommendations more than other treatment regimen recommendations. Activity and general diet recommendations were followed the least. These results were consistent with the reports in the literature and indicated there was higher compliance with medication recommendations and lower compliance with activities requiring significant or long standing behavioral or life-style changes (Berkowitz et al., 1963; Davis and Eichhorn, 1963; Davis, 1966).

Activity compliance was one of the most important categories of compliance for the cardiac patient. Since the results of this study indicated that activity compliance was low, further studies should be conducted to identify methods of increasing activity compliance. Compliance could also have been influenced by the value the patient placed on medical recommendations versus those over which he had more control.

Some factors were identified that possibly affected the levels of compliance. Patients with less than 75 percent compliance were married and followed diet, medication, and activity recommendations. These patients had also experienced myocardial infarctions of high or medium severity (see severity index, p. 108) and

demonstrated low or medium sources of information (see sources of information, p. 110).

All of the patients with less than 75 percent compliance were married. The literature suggested that patients with support from significant others complied to a greater degree. The marriage relationship may not have provided patients with the support they needed to carry out treatment recommendations. Since the majority of the study population were males, spouses who were usually responsible for meal preparation may not have followed treatment recommendations. However, spouses may have encouraged patients to follow recommendations only to have been met with resistance by the patient. If patients viewed the treatment regimens as interfering with independence, they may have resisted complying regardless of the consequences. It would be important for nursing to study family relationships and personality types with regard to compliance rates. This could assist nursing in developing methodologies for offering supportive relationships to patients in many different situations.

All of the patients with less than 75 percent compliance were following diet, medication, and activity recommendations. The results that increasing numbers of regimens were associated with noncompliance was consistent with the literature which reported compliance decreasing as the complexity or number of regimens increased (Davis and Eichhorn, 1963). It was easier for patients to follow minimal recommendations, for as the number increased there were more chances of confusion or misinterpretation. Also, a large

number of recommendations may be overwhelming and influence patients' nonadherence.

Patients with less than 75 percent compliance had experienced myocardial infarctions of high or medium severity. This result was consistent with studies of cardiac patients with severe illnesses who followed treatment regimens less than patients with less severe illnesses (Davis, 1968a). Constant life threatening aspects of the disease may have precipitated denial. Denial would have discouraged compliant behavior. However, patients may have had a fatalistic outlook on life and may not have perceived treatment regimens as important.

Low or medium sources of information were demonstrated by patients with less than 75 percent compliance. Patients had minimal contact with information concerning myocardial infarctions. Either patients did not actively seek information or were not given information frequently. A study is needed to identify the differences in compliance for patients who seek information versus patients who do not seek information. Frequent provider-patient contacts for educational encounter sessions should be studied in relation to subsequent effects on compliant behavior.

Some of the relationships between knowledge at hospital discharge and compliance six weeks after discharge demonstrate significance. A significant relationship exists between total knowledge and total treatment regimen compliance ($r = .56$). Patients with high total knowledge tended to comply with all treatment recommendations and patients with low total knowledge complied less. Patients

with adequate knowledge of the disease and treatments at hospital discharge were more inclined to comply with recommendations at a later time.

Patients were given information in the hospital so that they could make informed decisions regarding their treatment regimens in the future. Hospitalization and educational programs reinforced the seriousness of the disease process which may have stimulated patients to attain significant amounts of overall information. Increased information may have increased patient compliance in an attempt to overcome the impending threat of death.

All of the relationships of knowledge at hospital discharge and compliance six weeks after discharge were very weak, weak, or moderately positive, except for specific diet knowledge and corresponding compliance which demonstrated a very weak negative relationship. In most knowledge and compliance categories increased knowledge tended to be important. However, the amount of knowledge which was essential was unknown. Differences may have existed between knowledge categories and the amounts of knowledge needed or required to influence compliance.

The negative relationship between specific diet knowledge at hospital discharge and diet compliance indicated that as specific diet knowledge increased, diet compliance decreased and as specific diet knowledge decreased, diet compliance increased. Giving too much specific diet information at hospitalization may have tended to overload or possibly confuse patients.

The factors which may have affected the relationship between knowledge at hospital discharge and compliance six weeks after discharge were viewed in relation to two distinctive groups of patients. These groups included patients with high knowledge and high compliance and patients with low knowledge and low compliance. The high knowledge patients and high compliers from both total treatment and total knowledge categories were the same patients. This demonstrated some consistency in the characteristics of the high knowledge and high compliant patients. All high knowledge and high compliant patients were married and demonstrated low symptoms. The group also included the two patients with no prior prescriptions or restrictions.

The marriage relationship, when associated with specific total knowledge and total treatment knowledge categories, may have offered support for compliant behavior. However, support may not have been based on whether the patient was married but whether a relationship with a supportive significant other was available. A study determining factors of support could also assist in the development of a nursing assessment tool. Further studies could then assess the relationships between supportive significant others, nursing interventions, and subsequent compliance.

Highly compliant patients with high total knowledge and high total treatment regimen knowledge, demonstrated low symptoms (see symptoms, p. 110). If patients knew more about the disease and treatments and followed the recommendations they would most probably experience fewer symptoms because of adherence. Patients with

increased knowledge about necessary treatments may have been aware of strategies to prevent symptoms and of how to manage symptoms appropriately when experienced.

All the patients who requested the results of the knowledge questionnaire and all patients with low sources of information had low total treatment regimen knowledge and low treatment regimen compliance. Patients who knew less about treatments complied less. However, patients in this category may not have necessarily wanted to be less compliant. They may not have had the opportunity to attain necessary knowledge or they may not have been ready to learn necessary information during their hospitalization. Sources of information were also low indicating that in the six week interval contacts with others were minimal or patients did not individually seek information regarding the disease and treatments. Further studies should be conducted to assess these two parameters.

Important factors in relation to the low total knowledge and low total treatment regimen compliance relationship were lack of experience with past myocardial infarctions, prior medication prescriptions, and current diet, medication, and activity recommendations. Patients who have not had myocardial infarctions in the past may not have learned or retained as much information at hospital discharge as those who had prior experiences. Patients also who had a myocardial infarction for the first time may be denying the significance of the disease process and possible recurrence.

Since patients with low total knowledge and low total treatment regimen compliance generally had prior medication prescriptions,

this may have influenced their knowledge and compliance with other recommendations. If experience with medications in the past was based on a dependent relationship with a health care provider and was not accompanied by patient inquiry behavior, this same type of behavior may be presently utilized with other types of treatment recommendations.

Patients demonstrating low relationships between total knowledge and total treatment regimen compliance had current treatment regimen recommendations including diet, medications, and activities. The results support other studies which reported less compliance with complex and increasing numbers of recommendations. The more recommendations patients received, the more information they were presented. This information may have lead to overload or confusion. As a result, compliance may have been lower due to confusion or lack of understanding regarding appropriate treatments. With increasing numbers of recommendations, patients may have become overwhelmed and may have decided to only follow some of the recommendations.

A significant relationship existed between knowledge six weeks after hospital discharge and compliance at six weeks. Total diet knowledge was correlated ($r = .72$) with total diet compliance. Patients with high total diet knowledge at six weeks tended to comply more with diet advice than those with low total diet knowledge. Adhering to diet recommendations often involves significant behavioral changes which make compliance difficult. To increase the ease of adhering to diet recommendations patients may have

attempted to increase their knowledge base. Increased knowledge may have reinforced compliance with diet recommendations. Furthermore, patients who then complied with diet recommendations may have increased their knowledge in the dietary area.

All of the knowledge categories at six weeks were positively correlated with corresponding compliance, except medications. These positive relationships were very weak, weak, or moderate indicating that in most categories increased knowledge tended to be important. However, the amount of knowledge necessary to influence compliance and the amount of knowledge needed in different categories are questionable.

The negative relationship between medication knowledge at hospital discharge and compliance indicated that as medication knowledge increased, corresponding compliance decreased and as knowledge decreased, compliance increased. Giving patients increased information about medications may have been detrimental to their following of prescriptions. Informing patients about medication actions and side effects may have influenced the patients to not take the medications. Such findings may affect our responsibility toward patient self-care and well being. If patients are provided with increased information and are encouraged to be self-sufficient and make decisions, then we must be aware that patients may decide not to follow recommendations. If patients have made informed decisions then health care providers must respect these decisions.

Limitations and Problems Encountered

The limitations and problems encountered in this study are presented in this section. A major problem was the small sample size due to the limited availability of myocardial infarction patients (n=11). The selection of the patient population was based on availability at one hospital and randomization was not employed. Therefore, variables not measured cannot be assumed to have been normally distributed and a potential for systematic bias exists. In general, the population consisted of predominately male Caucasian patients between 50-70 years of age. Most patients were in the medium to lower socioeconomic positions. The results are generalizable only to a population with the same characteristics as the study population.

Another problem encountered was that reliability of the instruments was unable to be calculated due to the small sample size. There were not enough patients in the study to use internal consistency measures and obtain significant results. The correlation coefficients would have been very low and unstable. In addition, test-retest reliability was not calculated for the knowledge questionnaire because it was presumed that knowledge would change over time.

The sample size was small and the knowledge and compliance relationship correlation coefficients may have been unstable. Thus, statistical tests were used as indications and trends but not as strict hypothesis testing. Regardless of the limitations and

problems encountered during the study, the findings do support the literature and do suggest implications for health care providers, especially for nursing.

Implications for Nursing and Other Health Care Professions

The results of this study suggest implications for nurses and other health care providers. Nursing stresses the importance of patient self-care (Orem, 1971). This self-care was defined by Orem (1971, p. 13) as "a practice of activities that individuals personally initiate and perform on their own behalf in maintaining life, health and well being." Knowledge and compliance with recommended treatments were viewed as components of self-care. Nursing, during the supportive-educative system (Orem, 1971), contributed to the process of patient self-care by supplying information and educating patients in the hospital and after discharge. Education was completed so that the patients were provided with the knowledge and skills to take better care of themselves and to comply with treatment regimens.

The major implications for nursing resulting from this study are that current educational encounters and programs especially in the interim from hospital discharge to six weeks after discharge, may not be providing patients with information or strategies that are needed to assist them with compliant behavior. No relationships existed between knowledge at hospital discharge and knowledge six weeks after discharge which implied that individual differences do exist for changes in knowledge over time. Total knowledge at

hospital discharge was associated with total treatment regimen compliance six weeks after discharge, suggesting that hospital education programs providing disease entity knowledge and treatment regimen knowledge positively influenced compliance. Only total diet knowledge at six weeks was positively related to compliance. However, it cannot be assumed that knowledge is not essential for other areas of compliance at six weeks. The kind of knowledge needed at six weeks may not be appropriately attained. Patients may need knowledge of specific strategies to assist with implementation of behavioral and life-style changes. Emphasis should possibly be placed on process components such as problem-solving, behavior modification, and anticipatory guidance rather than knowledge of disease entity and treatment regimens. Nursing is in a unique position to assist patients with knowledge needs and to further assess factors which influence knowledge attainment and compliance.

Significant results and associated implications are presented in the following section. A significant relationship existed between total knowledge at hospital discharge and total treatment regimen compliance six weeks after discharge. Patients with adequate knowledge of the disease entity and treatment regimens at discharge were more inclined to comply with treatment regimens at a later time. Implications are evident for hospital and primary care nurses. Hospital education programs for patients with a myocardial infarction should continue to provide information regarding the disease entity and treatment regimens. Hospital rounds by primary

care nurses might be instituted on post myocardial infarction patients to reinforce information regarding disease entity and treatment regimens. Continuity can then be provided on follow-up visits.

The knowledge questionnaire could be utilized at hospital discharge to assess patient knowledge and to specify individualized educational needs. Educational instruction could then be based on identified needs. The knowledge questionnaire may also stimulate patient inquiry of the disease entity or treatment regimens. Increased contact-time and interpersonal relationships during administration and discussion of the knowledge questionnaire may positively influence future compliance. Nursing studies are needed to determine if increased contact-time and interpersonal relationships increase adherence.

Some factors have been identified which may have influenced the relationships between low total knowledge at hospital discharge and low total treatment regimen compliance. Patients who have not experienced a myocardial infarction in the past may need frequent contacts and educational reinforcement from health care providers.

Literature reports that high anxiety may negatively influence learning. Hospitalization may be anxiety provoking for patients. Encouraging verbalizations and making frequent attempts to answer patient questions, therefore, should be accomplished in hospital and out-patient settings.

Patients with past medication experiences may follow similar knowledge and compliance patterns with other recommendations.

Health care providers, therefore, should assess past compliance patterns of patients with past medication prescriptions. Emphasis should be placed on how other treatment regimen compliance may be different from compliance with medication recommendations.

In addition, nurses should assist patients with identifying effective strategies for behavioral and life-style changes. Such strategies may include behavior modification. These behavior modification techniques can be adjusted to individual patient needs. Also education encounters could include anticipatory guidance and problem-solving experiences for the patient. Reports in the literature indicate that patients with increased numbers of treatment regimens demonstrated less knowledge and compliance. Nurses should offer support and encouragement to patients on complex treatment regimens by providing opportunities for frequent contacts which provide positive feedback and positive reinforcement. Patients should be supplied with information regarding the disease entity, treatment regimens, and consequences and should be assisted in decision-making concerning priority setting. Furthermore, health care providers should prioritize prescribed treatment regimens rather than ordering many treatment regimens at one time. In addition, nurses may encourage family participation in educational sessions which may offer significant support for the patient.

The knowledge assessment from hospital discharge to six weeks after discharge showed that various changes in disease entity and treatment regimen knowledge existed, none of which were significant. Knowledge does change over time but changes are very individualized.

Studies should be conducted to look at factors affecting individual changes in knowledge. Some of the factors that should be evaluated are: severity of myocardial infarction; marital status; supportive relationships; past experience with myocardial infarctions; past diet, activity, and medication prescriptions and restrictions; current prescriptions or restrictions; number of hospitalization days; symptoms of the disease; provider-patient encounters; and patient personality.

Because knowledge changes are highly variable and cannot be totally predicted, nurses should utilize the knowledge questionnaire at different points in time during follow-up visits. Assessment of knowledge could reinforce past knowledge and stimulate further patient inquiry. More frequent administration of the knowledge questionnaires may increase the time necessary for patient encounters.

A significant positive relationship existed between total diet knowledge and compliance six weeks after hospital discharge. Patients with high total diet knowledge at six weeks tended to comply more with diet advice than those with low total diet knowledge. Strategies used for diet education seem beneficial and utilization of similar strategies for education regarding other treatment regimens may be advantageous. Examination of diet education revealed a strong orientation to application. Content is presented along with discussions on how to use the information. Patients are encouraged to ask questions based on past experiences. This same educational strategy could be used with medication and activity education. Posing of problem-solving questions can be

used for patients who do not initiate questions themselves. This strategy could begin at hospital discharge and continue through follow-up visits.

Nurses should reinforce disease entity and treatment regiment knowledge six weeks after hospital discharge. Furthermore, nurses should continue to assist patients to more easily identify individualized strategies for behavioral and life-style changes. This assistance should be offered to patients over time.

Specific diet knowledge was high both at hospital discharge and six weeks after discharge. A very weak negative relationship existed between specific diet knowledge at hospital discharge and compliance. As specific diet knowledge increased, compliance decreased and as specific diet knowledge decreased, compliance increased. Further studies should be conducted to reassess specific diet knowledge and compliance. Giving too much specific diet information at hospital discharge may tend to overload or confuse patients.

The overall implication for diet knowledge at hospital discharge is that health care providers should present patients with only essential information regarding general and specific diets. Six weeks after hospital discharge total and specific diet can be reinforced and further information concerning specific diets can be presented. Patients will have had an opportunity to apply information and experience problems so that additional information will be more meaningful.

All of the knowledge categories tended to be important in positively influencing compliance six weeks after hospital discharge.

However, knowledge of disease entity and treatment regimens may not be the most important at this time. The most important focus may be on strategies for behavioral and life-style changes. Patients may need assistance in directly implementing treatment recommendations that have been prescribed.

Patients who increase knowledge because of their own knowledge-seeking behavior or due to frequent contacts with health care providers have increased compliance. Further studies are needed concerning information-seeking behaviors of patients and increased patient contacts with regard to compliance. A concerned health care provider during the six week interval and beyond may positively influence compliance.

Hospital education programs provide increased patient contacts and high total treatment knowledge at hospital discharge was related to high total treatment regimen compliance. Therefore, an experimental study should be implemented using educational encounters during the six week interval. Patients could have an opportunity to ask questions and obtain needed information and an assessment of relationships between knowledge and compliance could then be made.

Confusion exists regarding the amount of knowledge needed to influence compliance. It is possible that different amounts of knowledge in different knowledge categories or different kinds of knowledge are required to influence compliant behavior. Nursing and other disciplines should conduct studies to identify the appropriate knowledge that is needed for compliance.

Further studies are needed to determine relationships between medication knowledge from hospital discharge to six weeks after discharge, and medication knowledge and compliance six weeks after discharge. These relationships demonstrated negative associations but were not significant. Medication knowledge demonstrated the lowest mean percent correct at hospital discharge and six weeks after discharge. Longitudinal studies are needed, therefore, to determine the amount of medication knowledge which most positively influences compliance. Further studies should also focus on patient perceptions, medication knowledge, and compliance.

Some patients demonstrated low levels of knowledge and compliance. Factors related to these low levels suggest health care providers should reinforce knowledge with younger myocardial infarction patients. Time should be spent discussing patient feelings and perceptions of the disease and treatments. The reality of the disease, and behavioral and life-style changes should be emphasized.

The majority of patients with less than 70 percent knowledge had experienced a myocardial infarction in the past. A lack of knowledge is associated with reinfarction, therefore, prior knowledge experiences do not necessarily influence learning or behavior in a positive way. Health care providers must not assume that patients with prior myocardial infarctions have already obtained necessary information and should assess their knowledge level just as they would with newly diagnosed patients.

Even though patients have less than 70 percent knowledge it cannot be assumed they did not want information. This was

evidenced by the fact that two out of three of the patients with less than 70 percent knowledge requested the results of the knowledge questionnaire. Health care providers need to assess patient knowledge periodically and provide opportunities for patients to ask questions. Providers should be prepared to discuss patient concerns in an unhurried and calm environment.

The lowest mean percent compliance category was activity compliance. Activity compliance is an essential compliance category for the purpose of preventing further cardiac difficulties. Based on the literature review, compliance is most difficult when it involves behavior and life-style changes. Activity compliance frequently includes these necessary changes and is, therefore, often difficult. Health care providers should spend extra time with patient education and discussion of specific strategies for activity behavior and life-style changes. It is essential that an atmosphere of acceptance exists where patients are supported and encouraged in their endeavors concerning behavior and life-style changes. In addition, provider-patient continuity may be critical.

Patients with less than 75 percent compliance demonstrated some important factors. A married person may not have support in the implementation of treatment regimens. The health care provider must assess the significant supportive relationships for each patient. If these supportive relationships are lacking, it may be necessary to increase provider-patient contacts in an attempt to assist with compliance.

As with knowledge, increased numbers of recommendations may adversely influence compliance. Health care providers may promote compliance by prescribing only essential treatment regimens and prioritizing these regimens when ordered. Continually reinforcing the necessity of these regimens is also necessary.

Patients vary in the amount of dependence versus independence exhibited. Assessment of past patient independent behavior and patient perception of independence in relation to prescribed treatment regimens is needed to adjust treatment regimen strategies appropriately. Patients should be included in the decision-making regarding treatment regimens.

Because severity of the myocardial infarction is inversely related to compliance, health care providers should more closely assess patients with severe myocardial infarctions. Many of these patients may prefer to deny the existence of the disease process. Such patients should be encouraged to verbalize their feelings. Since denial may be detrimental to the well being of the cardiac patient, it would be important for nursing to assist patients in identifying reality. This could be accomplished through discussions of reality and confronting patients with reality if behavior is detrimental. The provider should present possible consequences of treatment recommendation non-adherence to the patient, but must respect the patients decision to follow or not to follow treatment.

Patients with low compliance also demonstrated low or medium sources of information. Frequent contact is needed with such patients and they should be encouraged to ask questions.

Information could be discussed with each patient in order to meet individual needs.

Barriers can also prevent compliance. Discussions of current or anticipated barriers may lead to problem-solving strategies and, hence, greater compliance.

Nursing practice is based on the philosophy of "self-care" (Orem, 1971). Self-care is accomplished in the home environment by the post myocardial infarction patient because the patient takes personal responsibility for adhering to prescribed treatment regimens. Knowledge and compliance with recommended treatments can be viewed as components of self-care activities. Nurses, during the supportive-educative system, are in strategic positions to positively influence knowledge and compliance with recommended treatments both at hospital discharge and six weeks after discharge.

Educational encounters have traditionally been concerned with imparting information about the disease entity and treatment regimens. Since increased compliance is desired, increasing the knowledge of disease entity and treatment regimens may not be sufficient. Educators may need to transend these traditional methodologies and also assist patients with developing strategies for making behavior and life-style changes. Nurses can assist the patients by providing anticipatory guidance and problem-solving experiences, encouraging open expression of feelings, and assisting with the development of behavior modification techniques.

This section has focused on significant results of the study and implications for nursing and other health care professionals. In the following section recommendations for future studies are made.

Recommendations for Future Studies

1. Replication of the study should be conducted using a larger population and different settings.

2. The knowledge and compliance instruments should be used with larger populations so that validity and reliability of the instruments can be determined. Once valid and reliable instruments are identified, further studies can be conducted with more meaningful results.

3. There is a need for consistency in the definitions and research methodologies associated with the measurement of knowledge, compliance, and knowledge and compliance relationships. Replication of existing studies should be a priority in order to generalize.

4. More studies should be conducted to measure a combination of specific knowledge categories and specific compliance categories to determine if relationships exist.

5. Exploratory studies are needed to assess the amount of knowledge in specific knowledge categories which most effectively influence compliance.

6. Studies should be conducted to assess the characteristics of patients who do or do not comply. The characteristics should include those utilized in this study with the addition of the

following: duration of the regimen, patient perception of the disease and treatments, motivation, attitudes, values and beliefs, work orientation, denial versus acceptance of the disease, personality type, dependant versus independent needs, support or influence from family or friends, and provider-patient relationship.

7. The knowledge instruments should be used by health care providers to assess knowledge prior and subsequent to educational contacts. This would also serve as a stimulus for the patient to ask questions and identify educational needs. Sections of the knowledge questionnaire also could be used with other patients and not just limited to use with cardiac patients.

8. The compliance instrument should be used by health care providers to assess the compliance of patients on prescribed treatment regimens. This would then help to identify compliance deficiencies in order to individualize education and counseling. Sections of the compliance questionnaire could also be used to assess compliance of many patients other than cardiac patients.

9. Other research studies should be undertaken six weeks after hospital discharge to assess knowledge and compliance after specific interim educational programs which incorporate behavior modification techniques, anticipatory guidance, and problem-solving.

10. Longitudinal studies should be conducted on knowledge and compliance to identify if patterns exist regarding changes in these variables.

11. Studies should be conducted to further assess knowledge (facts versus application questions) and compliance.

12. Exploratory studies are needed to assess the relationships between specific diet knowledge at hospital discharge and compliance, and medication knowledge at hospital discharge and six weeks thereafter and compliance.

13. A study should be conducted to view patient perceptions of provider responsibility versus individual responsibility for medical aspects of treatment and associated compliance.

14. Additional studies should focus on the family supportive relationships, nursing interventions, and independence with regard to compliance.

15. Patients who actively seek information concerning the disease or treatment during the six week interim time and those who do not should be studied in regard to compliant behavior six weeks after myocardial infarction.

16. It seems feasible that the number of patient contacts with health care providers may influence knowledge and compliance. These relationships should be studied in the future.

This study has raised many additional questions related to the levels of knowledge and compliance, relationships between knowledge at two points in time, relationships between knowledge and compliance, and the factors that affect the levels and relationships. The results of this study indicate that certain relationships do exist between myocardial infarction patient knowledge at the time of discharge from the hospital, and knowledge and stated compliance six weeks after hospital discharge. The results suggest that current educational programs or encounters, especially in the

interim from hospital discharge to six weeks after discharge, may not be providing patients with all that is needed to assist them with compliance. The results of this study can be viewed as indications and trends which exist in larger populations. The findings add to the developing knowledge base concerning the relationships between knowledge and compliance.

APPENDICES

APPENDIX A

KNOWLEDGE QUESTIONNAIRE

Directions: The following are general questions about a heart attack and treatments. Please answer the questions by checking (✓) each response that is correct. There may be more than one correct answer to each question, so check all that apply. Answer each question before going on to the next. There is no penalty for guessing. Answer the questions yourself. Do not ask others to help you.

1) My heart

___a) is a muscle.
___b) stores excess water in my body.
___c) pumps oxygen to all my body tissues.
___d) pumps blood through my blood vessels.

2) Because I had a heart attack

___a) my whole heart is damaged for a short period of time.
___b) a part of my heart is damaged for a short period of time.
___c) my whole heart is damaged forever.
___d) a part of my heart is damaged forever.

3) A heart attack can be caused by

___a) not enough oxygen getting to the heart.
___b) a slow build up of fat in the blood vessels (arteries) over many years.
___c) a closing (narrowing) of the blood vessel(s) (arteries) that supply the heart.
___d) not enough blood getting to the lungs.

4) In the healing process after my heart attack, my heart

___a) heals slowly and forms a scar after 6 to 8 weeks.
___b) forms new blood vessels (arteries) to supply blood to the damaged area.
___c) heals only when I'm completely inactive and confined to bed.
___d) has healed completely when I no longer have chest pain.

5) Persons that are likely to have a heart attack are those who

___a) smoke 2 packs of cigarettes a day.
___b) have a regular exercise program at least twice a week.
___c) are 20-30 pounds overweight.
___d) have high blood pressure.

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Answer the following questions by checking (✓) each response that is correct. There may be more than one correct answer to each question, so check all that apply.

6) Chest pain

___a) always means I'm having a heart attack.
___b) frequently means that my activity level is more than my heart can take.
___c) is caused by too little blood and oxygen getting to my heart muscle.
___d) will go away if I keep active and try to forget about it.

7) Angina is another term for

___a) shortness of breath.
___b) chest pain.
___c) heart attack.
___d) kidney failure.

8) After my heart attack, my meals

___a) are always digested slower.
___b) should be eaten just before physical exercise.
___c) should include foods from the basic food groups.
___d) may be easier on my body if divided into smaller and more frequent meals a day.

9) Eating a good nutritious diet will

___a) help to heal and repair my body tissue.
___b) provide my body with the most important foods that it needs.
___c) help my body to grow new tissue.
___d) always make me lose weight.

10) Which of the following are the best example(s) of a nutritionally balanced meal

___a) chicken and gravy, potatoes, green beans and milk.
___b) hamburg, french fries and coke.
___c) peanut butter sandwich, apple and orange slices, ice cream.
___d) crackers and cheese, ham slices and iced tea.

11) Digestion of big meals

___a) may cause me to have chest pain.
___b) may be easier on my body if I rest after eating.
___c) makes my heart work harder.
___d) is helped when I do exercise.

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Answer the following questions by checking (✓) each response that is correct. There may be more than one correct answer to each question, so check all that apply.

12) Weight gain

___a) depends only on the amount of food eaten.
___b) is the same for everyone.
___c) depends only on the kind of food eaten.
___d) depends on a balance between food eaten and activity.

13) Which foods will most likely cause a gain in weight if eaten frequently?

___a) tomatoes, lettuce, carrots.
___b) apples, oranges, iced tea.
___c) breads, cakes, pies.
___d) fried chicken, gravy, potato chips.

14) After a heart attack,

___a) a person should not get angry or excited.
___b) most people eventually can return to previous activities.
___c) physical activity levels will always be limited.
___d) most people eventually return to their previous sexual activities.

15) After a heart attack, mild exercise such as walking, golfing, swimming, etc.

___a) are not good for the body.
___b) should be done on a regular schedule.
___c) are started and increased in gradual steps.
___d) should be done only when a person thinks of it.

16) When doing physical activities, it is important that I

___a) use sudden bursts of energy to start activities.
___b) not push or pull heavy objects.
___c) hold my breath during the activity to give me more strength.
___d) not lift 15-20 pound objects.

17) If my body is able to tolerate (handle) an activity,

___a) my pulse (heart beat) will be back to normal within 5 minutes after I stop the activity.
___b) I may develop chest pain or pressure.
___c) my heart may beat faster than 170 during the activity.
___d) I may be weak at the end of the day or on the following day.

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Answer the following questions by checking (✓) each response that is correct. There may be more than one correct answer to each question, so check all that apply.

18) I should stop what I am doing and rest, if I

___a) feel tired, weak or dizzy.
___b) get short of breath.
___c) have a pounding in my chest.
___d) have chest pain or chest pressure.

19) If I have chest pain while walking up stairs, I should

___a) sit on the stairs and rest.
___b) keep going to the top and then rest.
___c) never try going up stairs again.
___d) go to the top only after I've rested and the pain has stopped.

20) If I have chest pain or chest pressure that does not go away within 15 minutes after resting or taking nitroglycerin, if ordered, I should

___a) not do anything until I talk to my doctor.
___b) wait 3 to 4 hours to see if the pain gets worse before going to the hospital.
___c) go off to be by myself and rest without telling others of my pain.
___d) have someone drive me to the hospital.

Low Salt Diet/No Added Salt Diet

Directions: The following questions are about a low salt or no added salt diet. Answer them by checking (✓) each response that is correct. There may be more than one correct answer to each question, so check all that apply.

21) Eating salt may

___a) make the body hold water.
___b) lower the amount of fat in the blood.
___c) make a person lose weight.
___d) make extra work on a weakened heart.

22) Another name for a low salt diet is

___a) low cholesterol diet.
___b) low fat diet.
___c) low sodium diet.
___d) weight reduction diet.

23) While on a low salt diet, I should order which of the following foods when eating out?

___a) hot dogs and sauerkraut.
___b) baked chicken and potatoes.
___c) ham and cheese sandwich.
___d) steak and carrots.

24) When lowering the amount of salt I eat, I should

___a) not add salt to my food at the table.
___b) avoid eating bouillon.
___c) avoid eating onions.
___d) avoid eating garlic salt.

Low Cholesterol Diet/Low Saturated Fat Diet

Directions: The following are questions about a low cholesterol/ low saturated fat diet. Answer them by checking (√) each response that is correct. There may be more than one correct answer to each question, so check all that apply.

25) Cholesterol

___a) is a fat-like substance.
___b) is made by the body.
___c) is in foods.
___d) is not needed by the body.

26) A low cholesterol, low saturated fat diet

___a) may help to lower future fat levels in my blood.
___b) increases the amount of water in my body.
___c) may help to keep my blood vessels from getting narrower.
___d) may be helpful for all my family members.

27) I should limit eating which of the following foods when on a low cholesterol/low saturated fat diet?

___a) fish and poultry.
___b) whole milk and cheese.
___c) bacon and eggs.
___d) vegetables and fruits.

28) I can lower cholesterol and saturated fat in my diet by

___a) cooking and baking with solid shortening and butter.
___b) buying lean meats and cutting off excess fat.
___c) using a rack to bake or broil meats and fish.
___d) skimming fat off cooled soups and gravies.

Nitroglycerin

Directions: The following questions are about the medicine nitroglycerin. Answer them by checking (✓) each response that is correct. There may be more than one correct answer to each question, so check all that apply.

29) Nitroglycerin

___a) makes all the muscles of my body relax.
___b) dilates (opens) the blood vessels (arteries) that supply my heart.
___c) makes my blood clot slower.
___d) increases the blood and oxygen getting to my heart.

30) Nitroglycerin is used to lessen

___a) headaches.
___b) stomach pains.
___c) backaches.
___d) chest pain.

31) Negative (bad) effects of this medicine may be

___a) dizziness.
___b) leg pains.
___c) headaches.
___d) warm flushed feeling.

32) When taking nitroglycerin, it is important to know that

___a) I can take another tablet, if I accidently swallow the first.
___b) I should go to the nearest hospital if my pain does not go away in 15 minutes after resting and taking 3 tablets.
___c) I won't feel a sting when the medicine is dissolving if the medicine is too old.
___d) When it is necessary for me to do an activity that causes chest pain (walking, climbing stairs, sexual intercourse), I should take a nitroglycerin before that activity.

Diuretics

Directions: The following questions are about diuretic medicines (water pills). Answer then by checking (✓) each response that is correct. There may be more than one correct answer to each question, so check all that apply.

33) Diuretics work by

___a) making my body get rid of salt and water.
___b) making all the muscles of my body relax.
___c) dilating (opening) the blood vessels (arteries) of my heart.
___d) making my heart beat stronger.

34) Diuretics

___a) lower the amount of water in my body.
___b) make my body hold extra fluid.
___c) make my heart work harder.
___d) lower the work load on my heart.

35) When taking diuretics, I should

___a) weigh myself every day.
___b) report a 3 pound gain of weight if it happens in one week or sooner.
___c) limit the amount of fluid I drink to 3 glasses a day.
___d) take my medicine just before I go to bed.

36) Important negative (bad) effects of diuretics that I should report to my doctor are

___a) general muscle weakness.
___b) leg or abdomen cramps.
___c) increased urine output (passing water).
___d) increased hunger.

Digitalis

Directions: The following questions are about the medicine digitalis (heart pill). Answer them by checking (✓) each response that is correct. There may be more than one correct answer to each question, so check all that apply.

37) Digitalis works by

___a) making my blood clot slower.
___b) slowing my heart beat.
___c) making my heart beat stronger.
___d) dilating (opening) the blood vessels (arteries) that supply my heart.

38) When taking digitalis, I should call my doctor immediately if

___a) my pulse (heart beat) changes from a regular to irregular beat.
___b) my pulse (heart beat) is less than 50-60 beats a minute.
___c) I have nausea, vomiting, or diarrhea that lasts for longer than a day.
___d) my pulse (heart beat) is faster than 120 beats a minute.

39) Digitalis can cause the heart to slow too much. If this occurs, I may notice

___a) a pulse (heart beat) of less than 30 to 40 beats a minute.
___b) a difficulty breathing when resting or doing an activity.
___c) an increased surge of energy.
___d) severe weakness.

40) When taking digitalis, I should

___a) take my pulse (heart beat) regularly as I've been told.
___b) contact my doctor before taking my next dose if my pulse (heart beat) is less than 50-60 beats a minute.
___c) take my medicine at the same time every day.
___d) take a double dose if I have forgotten a dose.

Anticoagulants

Directions: The following questions are about anticoagulants medicines (blood thinners). Answer them by checking (✓) each response that is correct. There may be more than one correct answer to each question, so check all that apply.

41) Anticoagulants

___a) stop my chest pain.
___b) make my blood clot slower.
___c) dilate (open) the blood vessels (arteries) of my heart.
___d) reduce the amount of salt in my body.

42) It is important to know that anticoagulants

___a) may prevent further clotting of my blood.
___b) dissolve clots in my blood.
___c) may cause me to bruise easily.
___d) will make me bleed easier and for a longer time than normal.

43) When taking anticoagulants, I should

___a) tell other doctors and my dentist that I'm taking this medicine.
___b) not take medicines containing aspirin.
___c) ask the pharmacist about over-the-counter medicines if I'm not sure that they have aspirin in them.
___d) call my doctor whenever I cut myself.

44) I should contact my doctor immediately if

___a) my urine (water) is red or dark brown.
___b) my appetite increases.
___c) my stools (bowel movements) are black or tarry.
___d) I suddenly develop joint pain or swelling.

Isordil

Directions: The following are questions about the medicine Isordil. Answer them by checking (✓) each response that is correct. There may be more than one correct answer to each question, so check all that apply.

45) Isordil works by

___a) dilating (opening) the blood vessels (arteries) that supply my heart.
___b) making my blood clot slower.
___c) making my heart beat stronger.
___d) increasing the blood and oxygen getting to my heart.

46) When taking Isordil, negative (bad) effects may include

___a) headaches.
___b) leg pains.
___c) dizziness.
___d) warm flushed feeling.

47) Negative (bad) effects of Isordil, like those in question #46

___a) will last forever.
___b) should go away within a few weeks.
___c) should be reported to the nurse or doctor if they do not go away.
___d) will stay for 6 months.

48) It is important to know that Isordil

___a) prevents all future chest pain.
___b) may let me do more activities in comfort.
___c) may reduce the number of times I have chest pain.
___d) may reduce the time that chest pain lasts.

APPENDIX B

COMPLIANCE QUESTIONNAIRE

This questionnaire will identify to what extent you were able to follow the treatment orders, advice, and information that you received from the doctors, nurses, and reading materials after your heart attack. It is difficult to follow all of the treatment orders, advice, and information, therefore, please answer each statement honestly. It is important that you answer according to what you do, and not what you think you should be doing. There is no right or wrong answer. This information is strictly confidential for the purposes of this study and your doctors and nurses will not be informed of your answers.

DIRECTIONS: Below are a series of statements based on general treatments for heart attack patients. Answer the following statements based on the treatment orders, advice, and information that you received from the doctors, nurses, and reading materials after your heart attack.

Read each statement carefully and then place a check (✓) in the box under the most appropriate category that represents the extent to which you have done what the statement indicates since your discharge from the hospital, approximately 6 weeks ago. The categories include: all the time, most of the time, less than half the time, very seldom, and none of the time.

Please check only one box for each statement. Do not skip any statements.

Please indicate the extent to which you do the following since your discharge from the hospital:

	all of the time	most of the time	less than half the time	very seldom	none of the time
1) I space my meals throughout the day.					
2) I take my pulse (heart beat) after physical activities and/or exercise as I was told.					
3) I do physical activities and/or exercise right after eating meals.					
4) I start physical activities and/or exercise with sudden bursts of energy.					
5) I rest a half hour or more after meals.					
6) I modify physical activities and/or exercise based on how my body feels or tolerates it.					

turn to next page

DIRECTIONS:

Answer each statement by placing a check (✓) in the box under the most appropriate category that represents the extent to which you have done what the statement indicates since your discharge from the hospital, approximately 6 weeks ago.

Please check only one box for each statement. Do not skip any statements.

Please indicate the extent to which you do the following since your discharge from the hospital:

	all of the time	most of the time	less than half the time	very seldom	none of the time
7) I do physical activities and/or exercise I should avoid.					
8) I eat small meals.					
9) I change my physical activities and/or exercise the way I was told.					
10) I eat meals that contain foods from all of the basic food groups.					
11) I do physical exercise less than 3 times a week. (swimming, golfing, walking, etc.)					
12) I take measures to loose or control my weight.					
13) I forget to take my pulse (heart beat) before physical activity and/or exercise as I was told.					

DIRECTIONS:

Answer each statement by placing a check (√) in the box under the most appropriate catergory that represents the extent to which you have done what the statement indicates since your discharge from the hospital, approximately 6 weeks ago.

Please check only one box for each statement. Do not skip any statements.

The following statements on medicines should be answered based only on the medicines you are taking related to your heart attack. [nitroglycerin, diuretics (water pills), digitalis (heart pills), anticoagulants (blood thinners), Isordil, Inderal]

Please indicate the extent to which you do the following since your discharge from the hospital:

	all of the time	most of the time	less than half the time	very seldom	none of the time
14) I take all the medicines ordered for me.					
15) I take the amount or dosage ordered for me.					
16) I forget to take my medicine(s) at the times I should take them.					
17) I watch for negative (bad) effects of my medicines.					
18) I follow the necessary actions (precautions) that I should with my medicines. [examples: nitroglycerin--keep tablets in a dark place, diuretics (water pills) ---weigh self daily, digitalis (heart pill)--take pulse frequently, anticoagulants (blood thinners)--avoid asprin, etc]					

DIRECTIONS:

Answer each statement by placing a check (✓) in the box under the most appropriate category that represents the extent to which you have done what the statement indicates since your discharge from the hospital, approximately 6 weeks ago.

Please check only one box for each statement. Do not skip any statements.

The following statements on diet should be answered based on the specific diet restrictions--low salt, low sodium, low cholesterol, low saturated fat, or weight reduction.

Please indicate the extent to which you do the following since your discharge from the hospital:

	all of the time	most of the time	less than half the time	very seldom	none of the time
19) I follow the diet ordered for me.					
20) I eat the foods that I was told to avoid.					
21) I eat foods cooked and prepared the way I was told.					
22) I season foods the way I was told.					

APPENDIX C

HOSPITAL CONSENT

1210 WEST SAGINAW
LANSING, MICHIGAN 48914

TELEPHONE
AREA CODE 517/372-3610

St. Lawrence
HOSPITAL

September 29, 1978

Jan Finkbeiner R.N.
Family Nurse Clinician Student
Michigan State University
1558 Hillside Drive
Okemos, Michigan 48864

Dear Jan:

This is to confirm your requested extension of time for your research project, "The Relationship of Knowledge and Compliance to Post-Myocardial Infarction Patients".

You are approved to continue utilizing the patient population at St. Lawrence Hospital for your study through October 15, 1978, and to have access to patient charts through December 31, 1978.

This approval is effective October 1, 1978.

Sincerely,

Rosa Lee Weinert, R.N.

Rosa Lee Weinert R.N.
Assistant Administrator-Nursing

RLW/cb

APPENDIX D

PATIENT CONSENT FORM

Michigan State University
School of Nursing
For: Master's Thesis

After a heart attack, patients are given information about the heart attack and ordered treatments. I am studying what patients know about their heart attack and treatments, both when going home from the hospital and six (6) weeks after going home. I would like to see if this information is related to how patients follow treatment orders when they are at home. By collecting and analyzing this data, I hope to help future heart attack patients after their discharge from the hospital.

This study will involve completing a 10-15 minute questionnaire before you go home from the hospital.

I will administer another 20-30 minute questionnaire in your home six (6) weeks after you go home from the hospital. Five (5) weeks after you go home, I will call you to set up an appointment, at your convenience, for the following week.

Additional information (age, marital status, etc.) will also be obtained from you now and at the home visit.

Your name will never be associated with the data and your identity will remain confidential. You are free to withdraw at any time without penalty. If you are interested, your results can be shared with you at the home visit.

Thank you for your time and cooperation.

Jan Finkbeiner, R.N.
Family Nurse Clinician Student
Telephone: 349-1216

I voluntarily consent to participate in this study on both occasions. I have had an opportunity to ask questions.

_____ _____

Signature of Subject Date

APPENDIX E

ENCOUNTER INTRODUCTION SHEETS

This is the first questionnaire of the study in which you have agreed to participate. This study will look at the information patients have about their heart attacks and treatments when they are ready to go home from the hospital, and information they have at six (6) weeks after discharge from the hospital. Also, this study will see if this information is related to how people follow treatment orders when they go home. The researcher will call you in five (5) weeks to set up an appointment, at your convenience, for a visit the following week (sixth week).

Your name will never be associated with the data and your identity will remain confidential. The results of this questionnaire can be shared with you at the home visit.

If you have questions after completing the questionnaire, please contact your doctor, the nurse who has given you information before, or call 372-6310, extension 1385 (ICU/CCU).

Thank you for your time and cooperation.

Jan Finkbeiner, R.N.

APPENDIX F

CHECK LIST FOR KNOWLEDGE QUESTIONNAIRE ADMINISTRATION

Check List for Questionnaire Administration

___ Check on diet & medications - - - Get appropriate questions

___ Place sign on door

___ Ask patient's visitors to leave for 10 minutes

___ Alone Yes ___ No ___ Who in room _____

___ Ask if ok to turn TV off for 10 minutes
Off Yes ___ No ___

___ Ask if ok to turn radio off for 10 minutes
Off Yes ___ No ___

___ Read introduction sheet & instructions for the questionnaire

___ Explain additional tests

___ Give to patient to read
Allow him to read

___ Ask if any questions
--Answer questions on wording or intructions--
NOT ON CONTENT

___ Shut door

___ Pick up questionnaire in 10-15 minutes

___ Any interruptions
Phone _____
Medications _____
Visitors _____
Nurses _____
Doctors _____
Other _____
_____
_____

___ Leave introduction sheet with patient

___ Remove sign on door

(Return this with questionnaire)

APPENDIX G

CHECK LIST FOR PATIENTS ADMITTED TO THE STUDY

CHECK LIST OF PATIENTS ADMITTED TO THE STUDY

MI ___

Reside around Lansing $\bar{p}$ discharge ___

Education initiated ___

Consent form signed ___

Demographic data & support data
patient ___
chart ___

Education completed ___

Administer knowledge test at discharge ___
date _____

Call at 5 weeks ___
(week) date _____
date _____

Appointment for 6 weeks ___
(week) date _____
date _____

Follow-up call morning of appointment ___
date _____

Obtain demographic & supportive data ___

Administer knowledge test at 6 weeks ___

Administer compliance questions at 6 weeks ___

Requested results of test ___

Comments:

APPENDIX H

DEMOGRAPHIC AND SUPPORTIVE DATA

--PATIENT

Patient name _____

Address:
Phone:

Marital status S M Sep W Div
Height _____
Weight _____

Occupation
___1) Major executives of large concerns, major professionals, and proprietors
___2) Lesser professionals and proprietors, and business managers
___3) Administrative personnel, owners of small businesses and minor professionals
___4) Clerical and sales workers, and technicians
___5) Skilled trades
___6) Machine operators and semi-skilled workers
___7) Unskilled employees

Education scale
___1) Professionals (masters, doctorate or professional degree)
___2) College graduates
___3) 1-3 years college or business school
___4) High school graduates
___5) 10-11 years of schooling
___6) 7-9 years of schooling
___7) Under 7 years of schooling

Were you on any specific diet or did you have any diet restrictions before this heart attack?
Yes ___ No ___
What were they? _____
_____

Were you on any medicines before this heart attack?
Yes ___ No ___
What were they? _____
_____
How many times a day taken _____
_____

Did you have any activity restrictions before this heart attack?
Yes ___ No ___
What were they? _____
_____

Before this heart attack, did you do exercise (swimming, walking, golfing) beyond your activities of daily living and household activities?
___ Less than 1 time/week ___ Greater than 1 time/week

Do you smoke?

Yes ___ No ___
Cig ___#/day
Pipe ___#/day
Cigar ___#/day

Have you had a heart attack before?

Yes ___ No ___
___

Has your spouse had a heart attack in the past?

Yes ___ No ___

Has anyone in your family had high blood pressure, heart attacks, hardening of the arteries or strokes?

Yes ___ No ___

What were the ages when they occurred?

	High BP	Heart Attacks	Hardening of Arteries	Strokes
Mat Grandmother				
Mat Grandfather				
Pat Grandmother				
Pat Grandfather				
Mother				
Father				
Sisters & Brothers				
_____				
_____				
_____				
_____				
_____				
Children				
_____				
_____				
_____				
_____				
_____				

APPENDIX I

DEMOGRAPHIC AND SUPPORTIVE DATA

--CHART

Patient _____

Chart

GENERAL INFORMATION

Chart # _____

Admission date _____
days CCU _____
Discharge date _____
days in hospital _____

Date _____
Age _____
Sex _____
Marital Status _____
Race _____
Weight _____ Height __
> 20 lbs Yes ___ No ___

Community referral Yes ___ No ___

Chronic illnesses:

Diabetes	Yes ___	No ___
Cancer	Yes ___	No ___
Arteriosclerosis	Yes ___	No ___
High blood pressure	Yes ___	No ___
Kidney disease	Yes ___	No ___
Other	_____	
	_____	
	_____	

Highest cholesterol _____
Highest triglycerides _____

SPECIFICS OF MI

Complications

Arrhythmias	Yes ___	No ___
1) lethal	Yes ___	No ___
2) major	Yes ___	No ___
3) minor	Yes ___	No ___
Cardiac arrest	Yes ___	No ___
Cardiogenic shock	Yes ___	No ___
lowest blood pressure ____		
CHF	Yes ___	No ___
Angina	Yes ___	No ___
Other:		

DISCHARGE INFORMATION

Discharge diet _____
fluid restriction Yes ___ No ___
medications
MI _____ Chronic diseases ____
_____ _____

APPENDIX J

CHECK LIST FOR COMPLIANCE QUESTIONNAIRE ADMINISTRATION

Check List for Compliance Administration

___Read introduction sheet

___Have patient read

___Answer questions

___Obtain demographic and supportive data

___Quiet environment

- ___alone
- ___TV on
- ___radio on
- ___family present
- ___other interuptions

___Determine knowledge questions

___Read instructions for knowledge questionnaire

___Explain additional questions

___Have patient read

___Answer questions on wording or instructions (not on content)

___Administer questionnaire

___Collect questionnaire

___Quiet environment

- ___alone
- ___TV on
- ___radio on
- ___family present
- ___other interuptions

___Determine compliance questions

___Read instructions for compliance questionnaire

___Explain additional questions

___Have patient read

___Answer questions on wording or instructions (not on content)

___Administer questionnaire

___Collect questionnaire

___Leave introduction sheet

APPENDIX K

DATA AFTER HOSPITAL DISCHARGE

Patient _____ Date _____

Disease process

How may times have you had office visits or emergency room visits with your doctor since you went home from the hospital after your heart attack?

_____ 0-1
_____ 2
_____ 3
_____ 4 or more

Have you been readmitted to the hospital since your discharge after your heart attack?

_____ No
_____ Yes Reason _____
_____

How often have you had any of the following symptoms since you went home from the hospital after your heart attack?

	Freq	Occ	Never
Chest pain or pressure without radiation			
Chest pain or pressure with radiation			
Shortness of breath			
Difficulty breathing when lying flat			
Paroxysmal nocturnal dyspnea			
Swelling of ankles			
Increased heart rate (pounding in chest)			
New irregular heart beat (pulse)			

Current regime

Are you currently on a

Na restricted diet	_____ Yes	_____ No
Chol restricted diet	_____ Yes	_____ No
Weight reduction diet	_____ Yes	_____ No

Are you currently on a fluid (water, juices, etc.) restriction?

_____ Yes _____ No

What are your current medicines?

_____
_____
_____
_____

Bottle check _____
Statement _____

Additional information attainment

Have you attended classes in the community for heart attack patients?

_____ Yes _____No

Specify _____
_____

How often have you obtained information about a heart attack and/or treatments from

	Freq	Occ	Never
Books			
Magazines			
Newspaper			
Radio			
TV			
Friends			
Family			
Doctor			
Nurse (hospital, doctor's office, friend)			
Visiting Nurses Association			
Public Health Nurse			
Community Agency (American Heart Association, etc.)			
Other _____			

APPENDIX L

KNOWLEDGE INSTRUMENT SCORING EXAMPLE

KNOWLEDGE INSTRUMENT SCORING EXAMPLE

For example, in the following question foils a, b, and c were correct answers. The patient may have answered the question in the following manner:

3. A heart attack can be caused by

   ✓ a. not enough oxygen getting to the heart.

   ___ b. a slow build up of fat in the blood vessels (arteries) over many years.

   ✓ c. a closing (narrowing) of the blood vessel(s) (arteries) that supply the heart.

   ✓ d. not enough blood getting to the lungs.

Therefore, the scoring of this question would result in: (a) 1, (b) 0, (c) 1, (d) 0, for a total of two points.

APPENDIX M

SUMMARIZATION OF RISK FACTORS AND CRITERIA

SUMMARIZATION OF RISK FACTORS AND CRITERIA

Risk Factor	Criteria
age	> 60
sex	male
weight	≥ 20 pounds overweight as determined by the Metropolitan Life Insurance Company's Desirable Weights Table.
illness	diabetes, hypertension, past myocardial infarctions and/or arteriosclerosis
elevated cholesterol	cholesterol 300 mgm/100 ml or stated history
elevated triglycerides	triglycerides 170 mgm/100 ml or stated history
exercise per week	< 3 times per week
smoking (cigarettes, or inhaled pipe or cigar smoke)	≥ 1 pack per day
family history of hypertension, myocardial infarctions, or arteriosclerosis	parents and/or siblings

APPENDIX N

SEVERITY INDEX

Severity Index

Age and Sex:		
men		
≤ 54 years	0	
55-59 years	1	
60-64 years	2	
65 years	3	
women		
≤ 64 years	2	
≥ 65 years	3	
Previous History:		
past MI	6	
other cardiovascular diseases or history of exertional dyspnea (↑BP, peripheral vascular disease, CVA, cor pulmonale, valvular disease, arrhythmia)	3	
angina only	1	
no cardiovascular disease	0	
Shock:		
absent	0	
mild-- Shock at or soon after the onset of the attack manifest by transient pallor, faintness, sweating, nausea, or vomiting; and subsiding spontaneously within 15-30 minutes.	1	
moderate-- Signs of shock still present on examination, including duskiness or or cyanosis, but subsiding with rest and sedation.	5	
severe-- Shock persisting despite rest and sedation, leading to the use of or contemplation of the use of pressure drugs. Oliguria present.	7	
Failure:		
absent	0	
few basilar rales only	1	
any one or more of the following: breathlessness, acute pulmonary edema, orthopnea or dyspnea, gallop rhythm, hepatomegaly, edema, jugular vein distention, positive HJR, pink tinged sputum.	4	
EKG:		
normal QRS, changes confined to R-T or T wave	1	
in addition to R-T or T wave changes, QR complexes present in one or more leads other than aVR, and QS complexes are not present in any lead. If QR complexes are present in lead III, they must persist on full inspiration (lead IIIR) or must be accompanied by distinct Q waves in lead II or aVF.	3	
QS complexes in one or more leads, either with or without QR complexes in other leads, and with the usual RT/T pattern of cardiac infarction.	4	
bundle-branch block (BBB)	4	
Rhythm:		
sinus	0	
any or more of the following: atrial fib., atrial flutter, PAT, simple tachy (persistent 110 or >), freq. extra systole, nodal rhythm, V tachy., or heart block.	4	
Other after 4 days:		
none	0	
shock, failure, or rhythm disturbances after 4 days (score same as category above		

Total Severity Score_____

APPENDIX O

HYPOTHESES TESTING SCHEDULE AND STATISTICAL HYPOTHESES

Statistical Hypotheses Testing Schedule

1) H_0: p=0
2) H_1: p≠0
3) α =.10 (bidirectional alternative hypotheses)
4) Critical region:
   df=9 t critical = ± 1.833
   df=6 t critical = ± 1.943
5) Test statistic:

$$t = \frac{r_{ranks}\sqrt{N-2}}{\sqrt{1-r^2_{ranks}}}$$

6) Decision:

   if $|t|>|c|$ Reject H_0

   if $|t|<|c|$ Do not reject H_0

Erickson (1970, p. 262)

Statistical Hypotheses

I-C-1. There is no significant relationship between total knowledge at hospital discharge and total knowledge six weeks after hospital discharge.

I-C-2. There is no significant relationship between knowledge of disease entity at hospital discharge and knowledge of disease entity six weeks after hospital discharge.

I-C-3. There is no significant relationship between knowledge of total treatment regimens at hospital discharge and knowledge of total treatment regimens six weeks after hospital discharge.

II-C-1. There is no significant relationship between total knowledge at hospital discharge and stated compliance with total treatment regimes six weeks after hospital discharge.

II-C-2. There is no significant relationship between knowledge of disease entity at hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge.

II-C-3. There is no significant relationship between knowledge of total treatment regimens at hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge.

II-E-1. There is no significant relationship between total knowledge six weeks after hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge.

II-E-2. There is no significant relationship between knowledge of disease entity six weeks after hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge.

II-E-3. There is no significant relationship between knowledge of total treatment regimens six weeks after hospital discharge and stated compliance with total treatment regimens six weeks after hospital discharge.

II-E-3a. There is no significant relationship between knowledge of total diet six weeks after hospital discharge and stated compliance with total diet regimens six weeks after hospital discharge.

APPENDIX P

SCATTERGRAMS

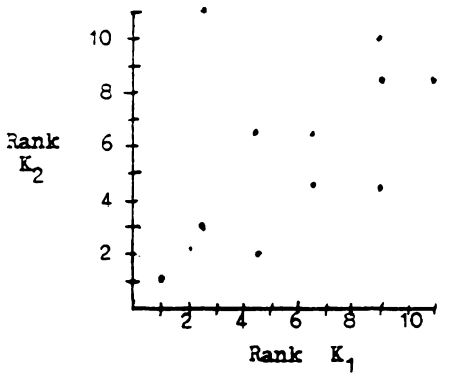
Legend for Scattergrams

DE_1	Disease entity knowledge at hospital discharge
TTR_1	Total treatment regimen knowledge at hospital discharge
TD_1	Total diet knowledge at hospital discharge
GD_1	General diet knowledge at hospital discharge
SD_1	Specific diet knowledge at hospital discharge
A_1	Activity knowledge at hospital discharge
M_1	Medication knowledge at hospital discharge
TK_1	Total knowledge at hospital discharge
DE_2	Disease entity knowledge six weeks after hospital discharge
TTR_2	Total treatment regimen knowledge six weeks after hospital discharge
TD_2	Total diet knowledge six weeks after hospital discharge
GD_2	General diet knowledge six weeks after hospital discharge
SD_2	Specific diet knowledge six weeks after hospital discharge
A_2	Activity knowledge six weeks after hospital discharge
M_2	Medication knowledge six weeks after hospital discharge
TK_2	Total knowledge six weeks after hospital discharge
TTRC	Total treatment regimen compliance
TDC	Total diet compliance
GDC	General diet compliance
SDC	Specific diet compliance
AC	Activity compliance
MC	Medication compliance
K_1	Knowledge at hospital discharge
K_2	Knowledge six weeks after hospital discharge

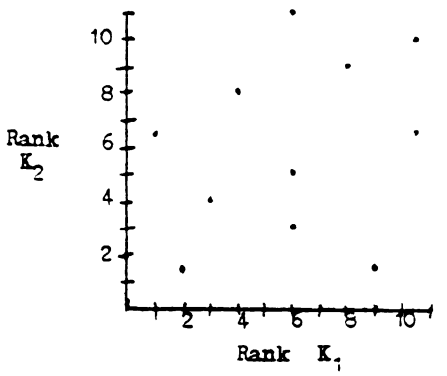
Knowledge at Hospital Discharge and Six Weeks after Discharge

Scattergram I

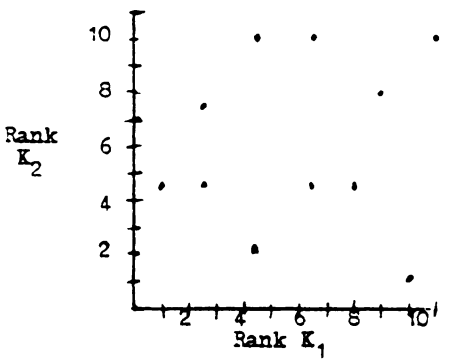
Disease Entity



Total Treatment Regimen



Total Diet



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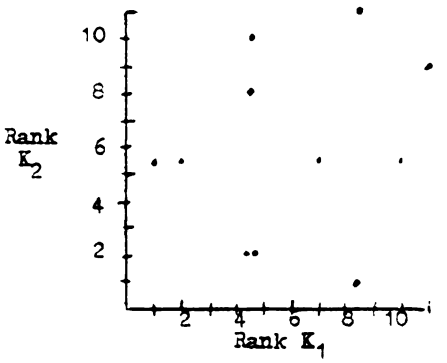

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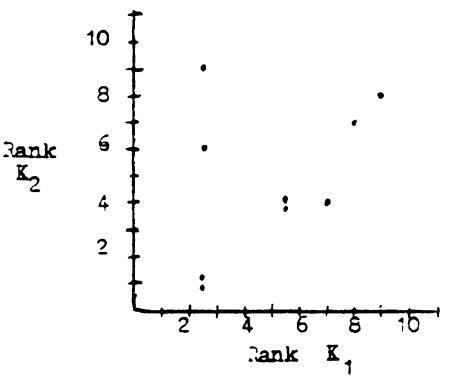
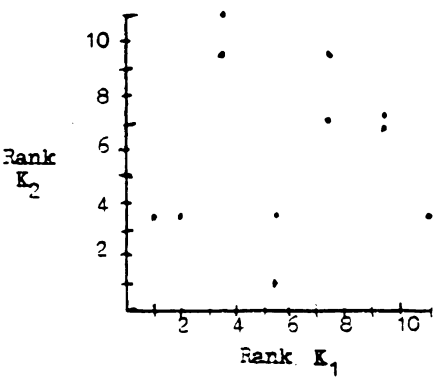
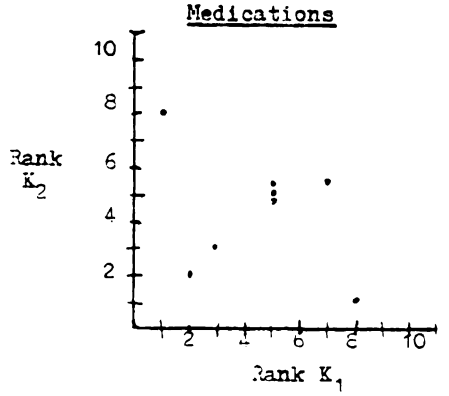


Activity



Medications



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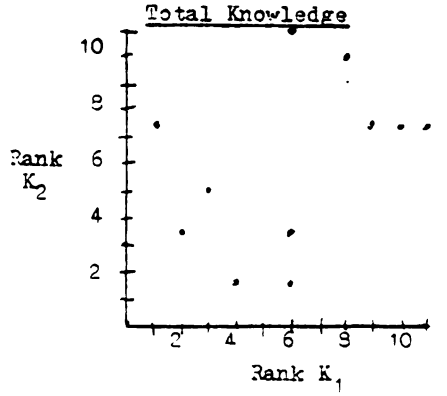
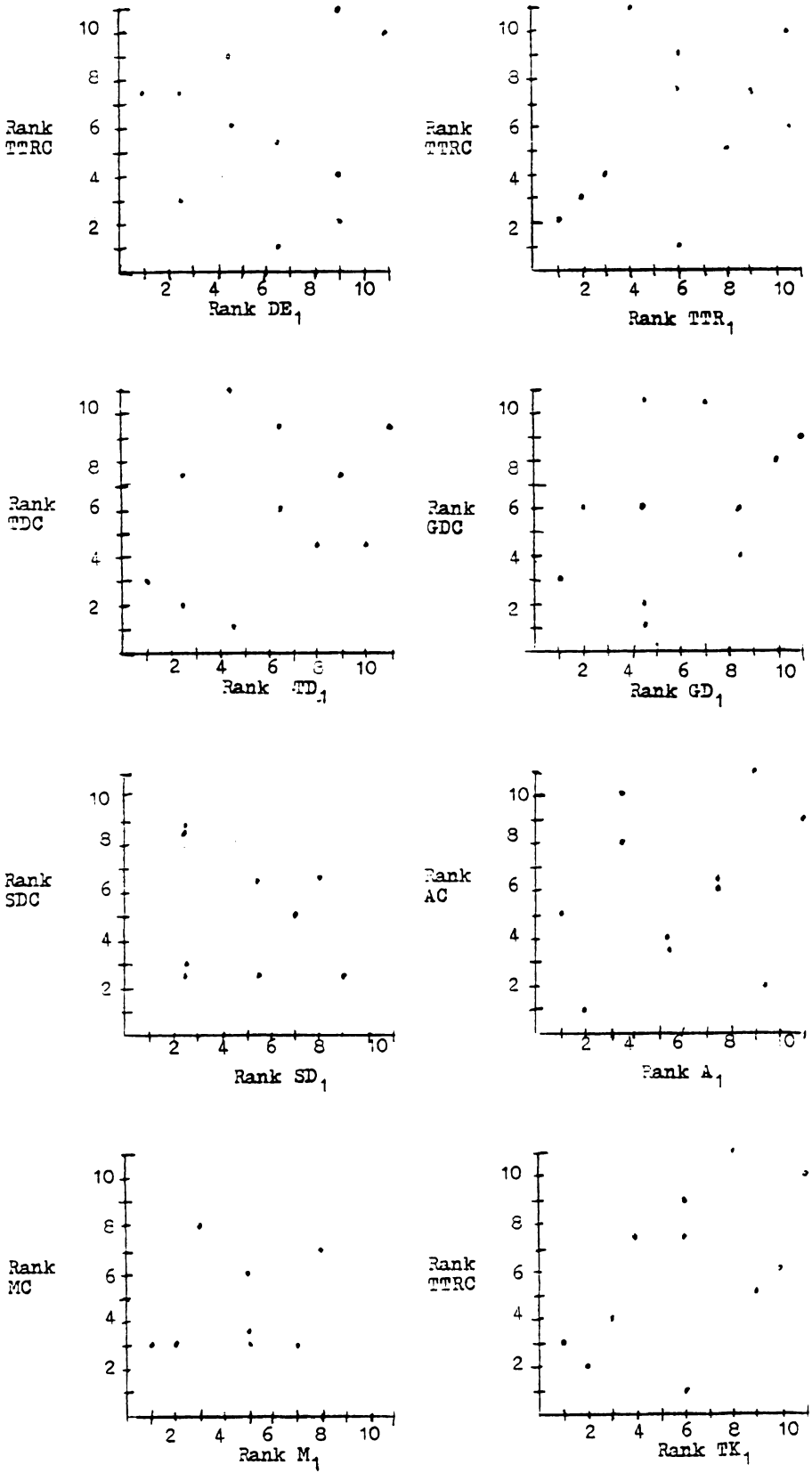


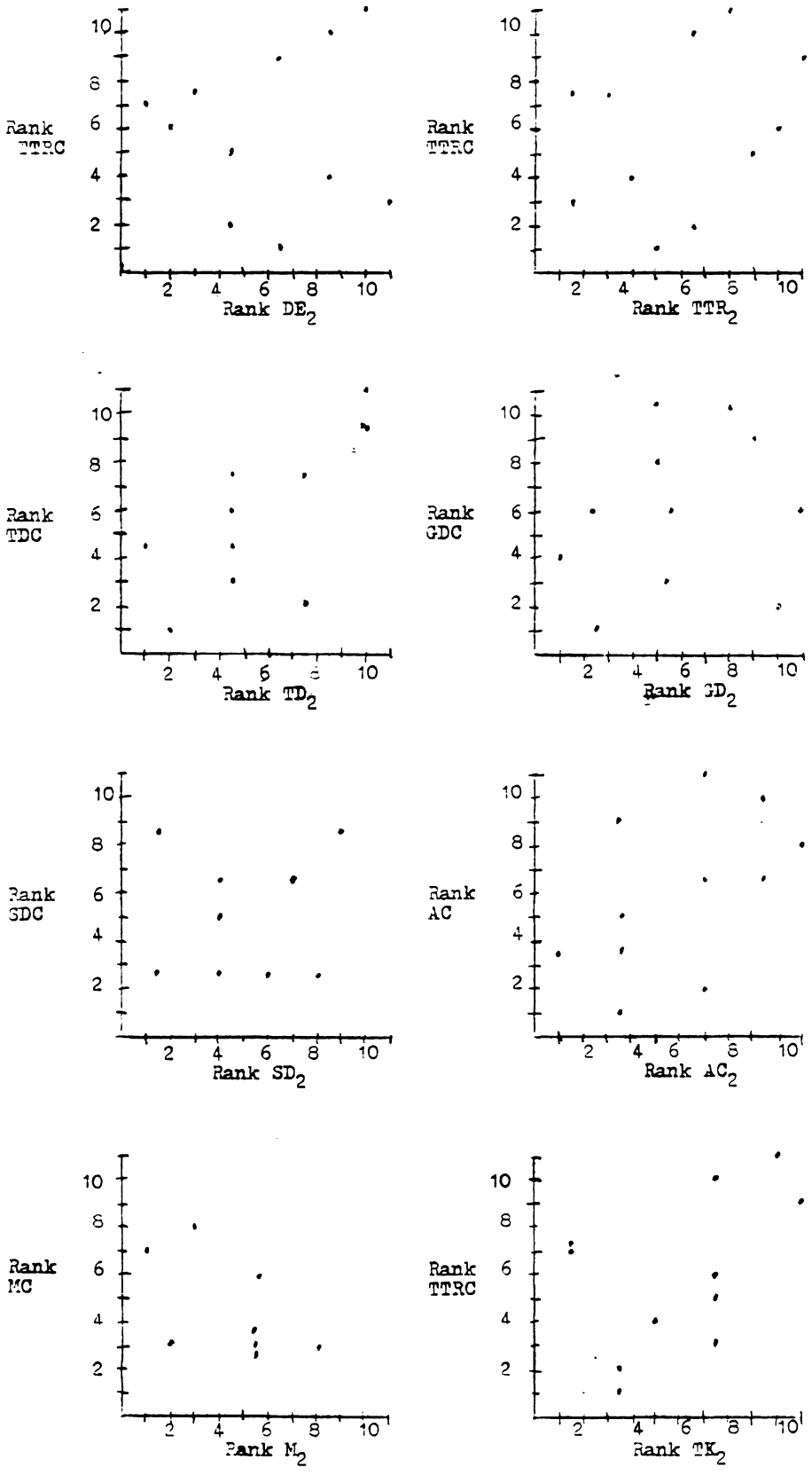
Knowledge at Hospital Discharge and Compliance Six Weeks after Discharge

Scattergram II



Knowledge and Compliance Six Weeks After Hospital Discharge

Scattergram III



APPENDIX Q

HUMAN RIGHTS PROTECTION

PROCEDURES TO BE USED IN THE PROJECT
TO OBTAIN CONSENT AND TO SAFEGUARD THE
RIGHTS AND WELFARE OF RESPONDENTS

Potential Risks to Sample: There are no physical risks involved in this study, and at any point the subjects are free to withdraw. There is a possibility that the questionnaires will increase awareness of the subject regarding the topics identified. Therefore, all subjects are given a standardized verbal and written introduction sheet, during both questionnaire sessions, that includes referrals to appropriate persons (a phone number is provided) so that support can be obtained and additional questions may be answered. (copy enclosed)

Consent Procedures: Participation in the study is voluntary. Written consent will be obtained by this researcher after all subjects have had an opportunity to have all questions answered. They may withdraw from the study at any point. (copy enclosed)

Protecting Respondents: The identity and responses of all subjects will remain confidential. Names will never be associated in discussion or displayed with data.

Potential Benefit of Study: This study may stimulate the subjects to increase their knowledge related to the topics identified and may contribute to increased patient activation. Furthermore, it may stimulate the subjects to become more compliant with identified treatments. Additionally, it may identify support systems in the community that are available to the subjects. The information will provide nursing with an increased understanding of the needs in relation to education of the post myocardial patient. The outcomes will be beneficial to future education programs.

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