THE INTERRELATIONSHIP BETWEEN MULTIDIMENSIONAL HEALTH LOCUS OF CONTROL, KNOWLEDGE OF DIABETES, PERCEIVED SOCIAL SUPPORT, SELF-REPORTED COMPLIANCE AND THERAPEUTIC OUTCOMES SIX WEEKS AFTER THE ADULT PATIENT HAS BEEN DIAGNOSED WITH DIABETES MELLITUS

By

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The purpose of this study was to determine the extent of the interrelationships of the variables health locus of control, knowledge, social support and compliance on therapeutic outcomes of adult patients with newly diagnosed diabetes. Instruments to measure the variables were developed based on the literature review. Fifty adult patients completed the questionnaires six weeks after the diagnosis of diabetes was made.

Frequency tables were used to describe the data. Path analysis was used to determine the interrelationship between the variables.

Internal locus of control was positively related to social support, compliance and therapeutic outcomes at a significant level. Powerful others orientation was related significantly to knowledge, social support, therapeutic outcomes, but not compliance. Chance orientation

was not significantly related to any of the variables. Social support was significantly related to all the variables. Knowledge was significantly related to compliance and therapeutic outcomes. The only negative significant relationship was between compliance and therapeutic outcomes.

Implications for health care providers are discussed in relation to practice, education and research.

I dedicate this dissertation

to my parents:

Earl and Ruth

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CHAPTER I

OVERVIEW

Health care models can be conceptualized in many different ways, but two elements are essential to all models; the patient and the provider. When individuals become aware of a health problem, they enter the health care system seeking assistance from a health care provider. The provider proceeds with a systematic appraisal of the patient's condition, problem identification, determination of treatment modalities and provisions for follow-up supervision. The treatment modalities are frequently given to the patient in the form of a prescription recommending dietary change, medication, exercise or other changes in life style. Since the patient seeks assistance from the health care provider, the provider assumes that the patient will comply with the recommendations, or the prescribed health regimen will be followed thoroughly. In reality, this is not true.

There are many other elements that affect health care models, particularly what the patient and provider bring to the model, in terms of individual differences and past experiences, and what the patient and provider receive from the interaction. This study focuses on the patient and five elements the patient brings to and receives from the health care model. The five elements are: health locus of control, knowledge of the disease (diabetes), social support, compliance to the prescribed regimen and therapeutic outcomes. The five elements were selected because they may affect the patient's willingness and ability to maintain wellness by following the prescribed health regimen.

In the section that follows, the need for the study, the purpose of the study, statement of the problem, research questions and rationale for the research questions, assumptions, operational definitions, limitations and an overview of the study are presented.

Need for the Study

Every health care provider realizes that the success of proper diagnosis and prescribed treatment is partially dependent on the patient's willingness and ability to comply with the health regimen. The discrepancy between the health regimen prescribed by the health care provider and patient compliance is distressingly wide for self-care regimens that require implementation by the patient as the primary health resource. Health care providers have recognized some compliance problems in the past, but the magnitude of the problem has only been recognized in the last one and a half decades.

Although the literature has shown a considerable increase in the area of compliance research over the past few years, many questions about compliant behavior remain unanswered. Several factors have been suggested as determinants of compliant behavior. Three of these factors, health locus of control, knowledge and social support have been chosen for study with patients who have diabetes.

The extent to which people think they can exercise control over events may influence their health behaviors and "control" may be an important variable in compliance behavior. The concept of locus of control grew out of social learning theory and was originally divided into two areas of expectancy, internals and externals. The term "externals" refers to patients who think fate controls much of their lives and they do not expect to have control over events. On the other hand, "internals" expect to exert control over events. Whether patients have an internal or external orientation probably influences their response to health care prescriptions.

Lowery and DuCette (1976) tested patients with diabetes for the affect of locus of control orientation on compliance using the generalized expectancy I-E scale (Rotter, 1966). They found that internals initially learned more about their disease and were more compliant than externals. However, as internals discovered that they could not control the disease to the degree they expected, they became less compliant. Externals, on the other hand, may yield to powerful others or may gain the knowledge over time and eventually become as compliant as internals (Lowery and DuCette, 1976).

Further research on locus of control suggested two changes: (1) the instrument should be specific to the variable tested, and (2) that there are more dimensions than internal and external. Therefore a Multidimensional Health Locus of Control (MHLC) scale was used in this study to incorporate the two suggested changes. The MHLC has the advantage of testing the health variable and dividing externality into two dimensions: powerful others and chance. The MHLC has not been used with diabetic patients. It is important to test patients for internal, chance and powerful others orientation with a health specific instrument. People who yield to powerful others, such as doctors, nurses or dietitians, may be more compliant than either internals or chance oriented people because of their orientation to follow the suggestions of a powerful other. The amount of control people expect to have over events may vary according to the event. Individuals may not expect to control political events, but expect to control events affecting their health. The determination of patients' multidimensional health locus of control orientation may produce information that will lead to a better understanding of the individual differences that account for variation in health related behaviors. Therefore, health locus of control is included as a variable in this study.

Studies describing the effect of knowledge on compliance are contradictory. In the past, it was assumed that if patients understood their disease and the recommended treatment, they would carry out the recommendations. The studies on compliance do not bear out this assumption. Patient comprehension of treatment does not seem to be a factor in compliance, but is not conclusive (Boyd, Covington, Stanaszek and Cousson, 1974; Closson and Kikugawa, 1975; Hulka, Cassel, Kupper and Burdett, 1976; Klein, Lynn, Axelrod and Dluky, 1973; Sackett, Gibson, Taylor, Haynes, Hackett, Roberts and Johnson, 1975). Taglizcozzo and Ima showed that poor control of diabetes is inversely related to knowledge (1970). Knowledge of how to manage the disease would seem to be necessary for compliance, but knowledge alone, is probably not sufficient to produce compliance. The type and amount of knowledge that is necessary for compliance and control of diabetes needs to be determined.

Social support is the encouragement and assistance given to patients by family members or close friends to help the patients follow the prescribed regimen. The limited amount of research on the effect of social support on compliance indicates that there is increased compliance with the health regimen when family members expect and assist the patient to be compliant (Caldwell, Cobb, Dowling and DeJongh, 1970; Caplan, Robinson, French, Caldwell and Shinn, 1976; MacDonald, Hagberg and Grossman, 1963; Oakes, Ward, Gray, Klamber and Moody, 1970). The relationship of social support to compliance needs to be validated, and thus, it is an important variable in this study.

The studies on compliance suggest that patients may comply totally or partially with all, some or none of the health prescriptions. When several prescriptions are given, patients often comply with the least restrictive requirements or the prescriptions that do not require changes in personal habits and activities. Patient compliance with health recommendations is very low, especially with long term care which requires many life-style changes (Davis, 1971).

Diabetes Mellitus has been chosen as an example of a highly prevalent chronic illness which has many prescribed changes in life-style. "Despite variations in population sampling and in use of different criteria for diagnosis of diabetes, a common prevalence of approximately 2 percent emerges" (Knowles, Meinert and Prout, 1976, p. 11). In 1973, the Health Interview Survey conducted by the National Center for Health Statistics reported that there were 4.8 million people with diabetes in the United States with 612,000 people diagnosed with diabetes each year. Of the approximately 4 million people in the United States with diabetes, 2-3 million are known diabetics and one half to one million people have undiagnosed diabetes. Another 5.5 million people will develop diabetes (Knowles et al., 1976).

A gross estimate of the number of people with diabetes in Michigan per year is 25,641 (Diabetes Data, 1978).

Uncontrolled diabetes may lead to many debilitating complications and an increased risk of early mortality. There is a wide range of possible complications including: mild insulin reaction lasting a few minutes, blindness, amputations, vascular disease and death. Diabetes is the sixth leading cause of death in the United States and an underlying cause of 37,000 deaths annually (Diabetes Data, 1978). This figure does not include the total contribution of diabetes to mortality because people die as a result of vascular complications which may be related directly or indirectly to diabetes.

It is estimated that in 1975 diabetes cost the nation six billion dollars in indirect cost, through loss of productivity due to morbidity and mortality, and direct cost through expenditures for health services. Approximately three million dollars of direct cost is attributed to complications of diabetes (Diabetes Data, 1978).

As can be seen, diabetes is a serious chronic illness that requires life-style changes, and compliance to health prescriptions to maintain control of the disease and prevent or slow down debilitating complications and early death. Scientific knowledge that helps to explain noncompliance, find ways for people to improve their self-management of diabetes and gain control of the disease may decrease complications which may, in turn, decrease the national cost for health services to people with diabetes.

There have been a limited number of studies using some of the variables in this study: (1) locus of control, knowledge and compliance (Lowery and DuCette, 1976), (2) health locus of control, social support and compliance with hypertensive patients (Lewis, Morisky and Flynn, 1978), (3) social support and compliance (Oakes et al., 1970), and (4) compliance and therapeutic outcomes (Watkins, Williams, Martin, Hogan and Anderson, 1967; Williams, Martin, Hogan, Watkins and Ellis, 1967). There has not been reported a study combining health locus of control, knowledge, social support and compliance variables with therapeutic outcomes for patients with diabetes. It is not known to what degree each variable must be present to promote compliance and what degree of compliance is necessary for control of diabetes. This study will attempt to answer these questions.

Purpose of the Study

The purpose of the study is to identify to what extent each of the variables, health locus of control, knowledge of diabetes, social support, and compliance affects therapeutic outcomes, singly and in combination with the other variables. The study will attempt to determine the interrelationships between these variables as they affect therapeutic outcomes.

Statement of the Problem

The central question of this study is: What is the interrelationship between multidimensional health locus of control, knowledge of diabetes, perceived social support, self-reported compliance and therapeutic outcomes six weeks after the adult patient has been diagnosed with Diabetes Mellitus?

Research Questions

The following section includes the questions studied. Specifically, the questions reflect the effect of the variables on therapeutic outcomes. The research questions used in this study with patients who have newly diagnosed diabetes are:

Health Locus of Control

What is the relationship between health locus of control and

a. knowledge in patients with diabetes?

b. social support in patients with diabetes?

c. compliance in patients with diabetes?

d. therapeutic outcomes in patients with diabetes?

e. knowledge and social support in patients with diabetes?

f. social support and compliance in patients with diabetes?

g. compliance and therapeutic outcomes in patients with diabetes?

h. knowledge, social support and compliance in patients with diabetes?

i. social support, compliance and therapeutic outcomes in patients with diabetes?

Knowledge of Diabetes

What is the relationship between knowledge and

a. social support in patients with diabetes?

b. compliance in patients with diabetes?

c. therapeutic outcomes in patients with diabetes?

d. social support and compliance in patients with diabetes?

e. compliance and therapeutic outcomes in patients with diabetes?

f. social support, compliance and therapeutic outcomes in patients with diabetes?

Social Support

What is the relationship between social support and

a. compliance in patients with diabetes?

b. therapeutic outcomes in patients with diabetes?

c. compliance and therapeutic outcomes in patients with diabetes?

Compliance

What is the relationship between compliance and therapeutic outcomes in patients with diabetes?

Summary Research Question

What is the interrelationship between multidimensional health locus of control, knowledge of diabetes, perceived social support, self-reported compliance and therapeutic outcomes six weeks after the adult patient has been diagnosed with Diabetes Mellitus?

Rationale for Research Questions

Rationale for Health Locus of Control

Previous studies have indicated that locus of control orientation influences the amount of knowledge gained. Internals initially learned more than externals and were more compliant in an attempt to gain control of the disease. However, these studies did not use the Multidimensional Health Locus of Control (MHLC) scale, nor did they separate orientation into internal, external and powerful others to determine the effect of these various orientations on knowledge acquired.

Locus of control orientation may have a direct effect on compliance, especially with people who have a high powerful others orientation. People who are highly influenced by powerful others could have a low knowledge level, but follow the instructions of the physician. For example, patients may take their medications every day because they were told to do so, and not because they understood what the medication would do for them. It is more likely that therapeutic outcomes would be reached through compliance than as a direct effect of health locus of control.

According to one previous study, health locus of control orientation with social support affected compliance (Lewis, Morisky and Flynn, 1978). It is important to determine if locus of control with social support affects knowledge as well as compliance, and to determine which locus of control orientation is most affected by a lack of social support. Health locus of control is a variable that indicates if the patient expects to: (1) control his health (internal), (2) have no control over his health (chance), or (3) follow the suggestions of other people (powerful others). This expectancy variable of control could influence the patient's response to health prescriptions and affect the other four variables. Patients who think they have no control over their health may not be concerned about following the prescribed regimen. It is necessary to determine the importance of this variable to the other variables.

Rationale for Knowledge of the Disease

The patient needs to know how to manage the disease at home, and must have a minimum knowledge of diabetes and its treatment. Patients need to know how to modify their life-styles in order to follow the prescribed regimens. Social support could positively influence the amount of knowledge gained. Knowledge with social support could increase compliance. A study by Boyd and colleagues showed that even with high knowledge, only 22 percent of the prescriptions were being consumed properly and 31 percent of the prescriptions were being misused in a manner that posed a serious threat to the patients health (Boyd et al., 1974). Other authors agree that knowledge, alone, is probably not sufficient to obtain compliance (Klein et al., 1973; Podell and Gray, 1976; Sackett et al., 1975). A patient may use knowledge of diabetes to affect directly the therapeutic outcomes without being compliant to the prescribed regimen. It is conceivable that a patient could manipulate his medication to cover for excess food intake which would maintain a normal blood sugar but would not be in compliance with the prescribed regimen.

It is necessary to determine the quantity and character of diabetes knowledge necessary to allow compliance and attainment of therapeutic outcomes.

Rationale for Social Support

Social support may influence positively both knowledge and compliance. If someone close to the patient receives instruction on diabetes with the patient, there is someone to discuss content, stimulate learning and answer questions about information that may have been missed by the patient. The limited number of studies on social support have indicated that social support is an important variable in obtaining compliance to the health regimen. Patients are more inclined to exercise or follow the correct diet if someone is doing it with them. The patient's health locus of control orientation may affect differentially the amount of social support needed for compliance depending on whether the patient has an internal or external orientation. For example, internally oriented people may require less social support because their desire to control the situation is strong. However, Lewis et al. found higher levels of self-reported compliance in patients with internal orientation and high levels of perceived social support (1978). The direct effect of social support on therapeutic outcomes without compliances is not likely, but needs to be ruled out.

How important this variable is to the total number of factors that influence compliance and therapeutic outcomes is not known. It is necessary to determine the importance of social support in relationship to the other variables.

Rationale for Compliance

Compliance should have a direct effect on therapeutic outcomes. The desired therapeutic outcome is a blood sugar within a normal range which indicates control of the disease. Theoretically, patients compliant to the health prescriptions should obtain control of the disease. However, not enough is known about diabetes and its progression to state that compliance affects blood sugar control, or decreases complications. Even with good compliance there may not be sufficient blood sugar control to prevent complications and maintain control of the disease. If compliance does yield positive therapeutic outcomes, it is not known how much compliance is necessary to gain control.

It is important to learn if compliance leads to positive therapeutic outcomes with people who have diabetes and, if so, how much compliance is necessary to reach these outcomes. Therefore, compliance is an essential variable in this study.

Assumptions

Assumptions for this study are as follows:

1. The instruments are able to measure the variables in the study. Because of the state of the art in health research, there are no adequate instruments to measure the knowledge of diabetes, social support, compliance or therapeutic outcomes. Additional assumptions include:
    a. Patients' knowledge of their condition can be ascertained by a measuring instrument, the Knowledge of Diabetes Test. The test adequately reflects what patients know about managing their diabetes.

b. Patients' perception of social support adequately represents the amount of help they think they are receiving with maintaining the prescribed regimen.

c. Patients' stated compliance to health regimen is closely aligned to actual compliance level.

d. The patients' self-report of therapeutic outcomes gives an indication of their state of wellness and control of diabetes. Self-report of therapeutic outcomes combined with serum glucose and weight gives the most adequate representation of control available with current knowledge of diabetes.

2. Diabetes Mellitus is typical of chronic illnesses and the implications of research on chronic illness applies to diabetes. Diabetes meets the criteria for the definition of chronic illness described by the Commission on Chronic Illness (1956) with all the implications of physical deterioration, social and psychological risks, economic dependence and the stress of impending death. Diabetes, like other chronic illnesses, requires life-long changes in daily living.

3. There is a relationship between health locus of control, knowledge, social support, compliance and therapeutic outcomes that can be measured.

Operational Definitions

Blood Glucose Levels - The concentration of glucose in the blood (serum). Glucose is the simple sugar in the blood that is used by the body for energy. Blood glucose is also known as blood sugar or serum glucose and is usually measured in milligrams per deciliters (100 milliliters), mg/dl. Normal blood glucose levels vary throughout the day in relation to food intake. A common measurement of blood glucose is called F.B.S., fasting blood sugar, which is drawn in the morning before food is ingested (Guthrie and Guthrie, 1977).

Compliance - This term generally describes the extent to which the patient follows health instruction and advice. However, the term compliance has confusing and negative connotations for many health care providers implying a superior-subordinate hierarchical relationship (Etzioni, 1961). Although the term compliance is most common and frequently used, therapeutic alliance and adherence are used interchangeably with compliance since all three terms are currently being used by health professionals.

There is a lack of agreement about what constitutes compliance and the wide variety of methods used to measure compliance adds further confusion to the problem of defining this term. For the purpose of this study, the term compliance means the extent to which the patient's behavior (in terms of taking medication, following diets and executing other life-style changes, such as exercising regularly), coincides with the health regimen prescribed by the health care provider (Sackett and Haynes, 1976). Total compliance implies that the patient will follow the prescribed regimen precisely as ordered, for the full period of time that it is ordered (Rosenstock, 1975).

Noncompliance - Any regimen other than that originally prescribed. This includes frank divergence from original orders, incorrect dosage, incorrect administration times, and any significant omission of a prescription, such as medication or exercise (Clossen and Kikugawa, 1975).

Health Care Provider - Any member of the health professions (physicians, nurses, pharmacists, dietitians) who recommends a health regimen. Although the physician is the only one legally allowed to prescribe medications, other health professionals recommend positive health behaviors such as personal hygiene and teach the patient how to carry out the physician's orders.

Health Locus of Control - A health behavior expectancy which relates to peoples' perception of the degree of power or lack of power they possess in relationship to what happens to their health.

(a) Internals/Internal Locus of Control - "Refers to the perception of positive and/or negative events as being a consequence of one's own actions and thereby under personal control" (Lefcourt, 1966,

p. 207). Individuals perceive that the reward is controlled by forces from, or contingent upon, their own behavior or attributes (Rotter, 1966).

(b) Externals/External Locus of Control - "Refers to the perception of positive and/or negative events as being unrelated to one's own behaviors in certain situations and therefore beyond personal control" (Lefcourt, 1966, p. 207). Individuals perceive the reward is controlled by forces outside of themselves and may occur independently of their own actions (Rotter, 1966). Recent studies have indicated that external locus of control has two components: (1) external control by powerful others (P), and (2) chance expectations (C) (Levenson, 1974).

Health Regimen - A systematic course of precise advice (diet, exercise, medications), prescribed by a health care provider to improve or maintain the patient's state of health. Health regimen implies the total prescriptions for a healthier life.

Prescribe - To designate or order the use of, as a remedy to promote health. A health regimen is prescribed by a health care provider.

Prescription - Instruction or advice given by a health care provider to promote and maintain wellness, such as advising the patient to stop smoking. Several prescriptions are included in a health regimen.

Hyperglycemic Reaction - Elevation of fasting blood glucose level above 150 mg/dl. Measurement is by patient self-report of symptoms of hyperglycemia: excessive urination; thirst; weak, tired feeling; nausea and vomiting; flushed, dry skin; pain in the abdomen; drowsiness; deep, rapid breathing; acetone odor to the breath and unconsciousness.

Hypoglycemic Reaction - Low blood glucose level below 60 mg/dl. Measurement is by patients self-report of symptoms of hypoglycemia: hunger, sweating, tremor, nervousness, drowsiness, headache, tingling sensation of the lips, dizziness, weakness, staggering gait, pallor, dilated pupils, change in behavior, especially in children, unconsciousness may occur if early symptoms are not treated.

Insulin - A medication prepared from animal pancreas injected into diabetic patients to replace the deficit of insulin hormone normally secreted by the human pancreas. Insulin is essential for the proper metabolism of blood sugar (glucose) and for maintenance of proper blood sugar level.

Oral Hypoglycemic Medication - Synthetic agents that regulate blood sugar in patients who have pancreatic function.

Knowledge - That information about Diabetes Mellitus which is learned and can be recalled and/or applied to actual situations. The recall and application in this study is measured by a paper and pencil test on diabetes, treatment, diet, exercise, personal hygiene, complications and medications. Knowledge of diabetes is a score obtained on a Knowledge of Diabetes Test administered six weeks after the patient is diagnosed with diabetes.

Patient - Recipient of health care. In this study, patients are people (18-70 years of age) who have been recently diagnosed with Diabetes Mellitus and referred to a diabetes education program.

Self-Care/Self-Management - A process whereby a layperson can function as the primary health resource in the promotion of wellness and the prevention of complications (Levin, 1976). It is the effective implementation of the prescribed health regimen. "Self-care includes the knowledge and skill needed to provide good health care" (Pratt, 1977, p. 122).

Social Support - The patient's perception of input provided by persons who are family or close friends with the intent of assisting the patient obtain desired therapeutic outcomes.

Therapeutic Outcomes - Evidence and measurement of the patient's progress in reaching the desired goal of normal serum glucose, normal weight, absence of cuts, abrasions, illness, hyperglycemic reactions, and diabetic complications. There is one score for therapeutic outcomes based on a combination of scores from: (1) serum glucose obtained from the physician's office, (2) weight obtained from the physician's office, and (3) scores on the Results of Treatment Questionnaire.

Limitations

There are many limitations of the research mainly due to studying a group of patients who have a disease, diabetes, which is progressive, has no cure, requires life-style changes, has many manifestations, has a wide variety of complications, especially in juvenile-onset diabetes, has a shortened life span, and is affected by many intervening variables.

Some of the limitations are:

1. Inadequacy of Therapeutic Outcome Indicators

The primary goal of diabetes management is the maintenance of normal serum glucose levels. However, experts in diabetes do not agree on what constitutes a normal range for serum glucose. A normal range for serum glucose was determined based on a consensus of diabetologist's opinions. Some diabetologists do not agree that serum glucose is the most important measure of diabetes control. Serum glucose levels undergo minute to minute variations and since there are often wide swings throughout the day, one or two selected measurements may not accurately reflect what is happening during the rest of the day or the rest of the week. However serum glucose is the most commonly used indicator of diabetes control. There is another laboratory test available that gives an indication of the serum glucose level over the past six weeks. However, that test is very expensive and the results would not be available for most of the patients.

Another problem is that the patient may not be in adequate control in the first six weeks after diagnosis of diabetes. The first follow up visit gives the physician an opportunity to modify the prescribed regimen based on the patient's progress in maintaining control. One serum glucose obtained six weeks after the diagnosis of diabetes is made may not be a true indication of diabetes control. The expense, inconvenience and possible danger to the patient of more frequent serum glucose tests limits the effectiveness of serum glucose levels as an indicator of therapeutic outcomes.

The presence of sugar in the urine indicates that the serum glucose level is high enough that the kidneys respond by eliminating excess sugar from the body. However, people with diabetes have different renal threshold levels for serum glucose. Therefore, the presence of sugar in the urine is an indication of elevated blood sugar, but does not indicate the amount of elevation and will not be the same for everyone.

Weight is an indicator of therapeutic outcomes because maintaining a normal weight minimizes the metabolic changes of diabetes, decreases the known risk factors of vascular disease and decreases the possibility of hyperglycemic and hypoglycemic reactions (Carey, Tompkins, Russell, Pohl, Newman, Paulsen, Lomax and Owen, 1978). Obesity increases the insulin requirement and the majority of adult-onset diabetics are obese. It is important for people with diabetes to obtain and maintain normal body weight.

2. Instruments

Another limitation of the study is that compliance and therapeutic outcome scores are mainly based on the patient's self-report. Patients may under or overestimate compliance, the frequency of reactions and the amount of weight loss depending on the accuracy of their memory and a desire to present a picture of compliance and good health. The only validation of the patient's self-report is the serum glucose and weight obtained from the physician's office. The serum glucose will give an indication of compliance. However, a normal serum glucose does not necessarily indicate compliance and conversely, compliance to the regimen may not produce a normal serum glucose. These direct measures of therapeutic outcome are combined with the indirect measures of number of reactions, subjective feelings of well being and sick days.

All of the instruments, except the Multidimensional Health Locus of Control (MHLC) scale, were developed for the purpose of this study and have not been previously tested for validity and reliability.

3. Time

Because diabetes is a chronic illness requiring long-term management by the patient, the adequacy of management may change over time. This study provides information on patients within the first six weeks of diagnosis and is not necessarily applicable to patients who have had diabetes for a longer period of time. The six week follow up period may indicate a trend for newly diagnosed diabetics, but is too short a period of time span to give an indication of long-term results.

4. Refusal of Some Patients to Participate

Patients who had just been diagnosed with diabetes were asked to begin their participation in the study and complete the first two questionnaires when they may have been overwhelmed, anxious or hostile about the implications of the disease for their life. This may have caused some patients to refuse participation. The refusal of some patients to participate in all or part of the research raises the concern that patients who knew they would not be compliant refused to participate. The patients who did participate may have received some reinforcement for following the health prescriptions through the instruments. Patients who participated in the study may have learned more about diabetes and been more compliant initially because they were told that they would be questioned on their knowledge of diabetes and how they were getting along with their diabetes.

5. Disease Process

The study is limited to one disease process. Although the results of the study may have implications for other chronic illnesses, the results may not be generalized beyond diabetes management.

It is not known how much compliance with the health regimen is required to maintain control of diabetes. One hundred percent compliance may be too much since most health care providers do not expect total compliance and may overprescribe. Because not enough is known about diabetes and its treatment, secondary complications may still occur and affect the future compliance of the patient. It is not known what causes some cells to age faster than others and the rate of cell aging may affect the amount and severity of secondary complications.

The patients in the study have different therapeutic requirements: diet only, diet and oral hypoglycemic agents, and diet and insulin, and therefore, have different numbers of health prescriptions and required life-style changes. Many of the patients with diabetes have other chronic illnesses which require additional life-style changes. No attempt was made to classify patients according to severity except therapeutic regimen. The patients are a combination of inpatients and outpatients and do not have similar experiences with health care providers.

6. Other

There are other factors which may affect compliance which were not considered in this study, such as patient-physician relationship, age and developmental stage. Also, one does not know what other diseases are occurring at a pre-clinical stage that may affect clinical outcomes.

Overview of the Study

The study is organized into six chapters. Chapter I presents an introduction to the nature of the study, the need for the study, statement of the problem, rationale for the research questions, operational definitions, assumptions and limitations of the study.

Chapter II provides an overview of the conceptual framework within middle range theory. The concepts of health locus of control, knowledge of diabetes, social support, compliance and therapeutic outcomes are examined and the indicators of these concepts are explained.

Chapter III provides the review of literature pertaining to this study illustrating the complexity of the problem and describing the current state of the art.

Chapter IV explains the methodology, design and procedures used in the study. The procedures for collecting research data and the method of data analysis is explained.

Chapter V contains an analysis of the data collected to answer the research questions.

Chapter VI consists of a summary of findings and conclusions drawn from the study as well as recommendations for future research.

CHAPTER II

CONCEPTUAL FRAMEWORK

The theoretical framework for this study is middle range theory. The purpose of middle range theory is to develop specific theories which are applicable to limited situations and to test the theory empirically. Several of the tested middle range theories may eventually lead to a grand theory (Merton, 1967). Willer states the criteria for middle range theory are: (1) concepts involving middle level of generality which are specific enough to test and general enough to use over a range of phenomenon, (2) logically interrelated concepts, (3) a rationale which allows prediction, (4) testable and (5) a source for deviation of scientific laws which are statements of invariance (1967). Consistent with middle range theory, the theoretical framework involved abstractions which are similar enough to observed data to be incorporated in propositions that permit empirical testing (Merton, 1967).

The abstractions or concepts of this study: health locus of control, knowledge, social support, compliance and therapeutic outcomes, can be tested empirically by the indicators used in the study: MHLC scale, Knowledge of

Diabetes, Barriers to Implementing Therapy, Self-Management Questionnaire and Results of Treatment Questionnaire. The concepts are general enough to be applied to other phenomena, for example, social support applies to many different phenomena. Depending on the results of testing, the theory could provide for prediction, and therefore, be logically extended. Knowledge gained from future research could be cumulative and add to the middle range theory. The interrelated concepts and their indicators for the middle range theory in this study can be conceptualized as shown in Figure 1.

Although the review of literature provides contradictory information on the possible interrelationships of the concepts, testing the proposed model will add to the existing body of knowledge and possibly clarify some of the confusion.

The discussion that follows includes the concepts and indicators contained in the middle range theory for this study, possible interrelationships between concepts and the relationship of the middle range theory to nursing theories.

Locus of Control Concept

The concept of locus of control has its origin in social learning theory (Rotter, 1954; Rotter, Chance and Phares, 1972). Social learning theory is one theory by which attempts can be made to explain human behavior. Social learning theory is the theory of how individuals

Theoretical Concepts	Health Locus of Control	Knowledge of Diabetes	Perceived Social Support	Self-Reported Compliance	Therapeutic Outcomes
Empirical Test or Indicators	Multidimensional Health Locus of Control (MHLC) Scale	Knowledge of Diabetes Test	Barriers to Implementing Therapy	Self-Management Questionnaire	(1) Serum Glucose (2) Weight (3) Results of Treatment Questionnaire

Fig. 1.--Conceptualized Middle Range Theory for this Study.

make choices from the variety of potential decisions available to them (Phares, 1976). Social learning theory consists of four classes of variables: behavior, expectancy, reinforcement and psychological situations (Rotter, 1975). Individuals' previous experience with certain behavior and the outcomes determines the degree of a given expectancy. Expectancies can also be determined by experiences in other situations which the individual perceives as similar (Rotter, 1975). The expectancies for the outcomes of behaviors are learned and based on previous success or failure (Phares, 1976). A reinforcement is anything that affects the occurrence, direction or type of behavior (Phares, 1976). The value of reinforcement is the degree of preference for a particular reinforcement to occur if the possibilities of their occurring were all equal (Rotter, 1954). Therefore, the possibility for a behavior to occur in a certain psychological situation is the function of an expectancy that the behavior will result in a reinforcement and the value of that reinforcement (Rotter, 1975).

Locus of control as a concept relates to whether or not individuals expect to possess or lack power over what happens to them. The role of reinforcement and reward has been recognized as a stimulus for individuals to obtain and perform knowledge and skills. However, what one person perceives as a reward may not be interpreted the same way by someone else. The extent that individuals perceive the reward following from or contingent on, their own behavior or attributes (internal), as opposed to, the extent that they feel the reward is controlled by forces outside of themselves and may occur independently of their own actions (external) influences their interpretation of reward (Rotter, 1966). The degree to which individuals attribute personal control to reward in the same situation varies among individuals. "The prediction that persons who expect that a contingent relationship exists between actions and outcomes (internals) will respond differently in a variety of situations from persons who expect that effort and reward are uncorrelated (externals) has been substantiated" (Lowery and DuCette, 1976, p. 358). However, people are not totally "internals" or "externals."

> The terms are used as expressive shortcuts and are not meant to imply that perception of control is a trait or typology. The perception of control is a process, the exercise of an expectancy regarding causation; and the terms internal and external control depict an individual's more common tendencies to expect events to be contingent or noncontingent upon their actions (Lefcourt, 1976, p. 153).

The concept of locus of control is introduced as a variable that could influence patient compliance behavior. Health care providers have been searching for an explanation of the individual differences that account for the variation in what people do to maintain and promote wellness (Wallston and Wallston, 1978). One explanation of individual difference is the concept of locus of control, and research has focused on measures of expectancy of control over reinforcements (Wallston and Wallston, 1978). Researchers are trying to determine if the extent to which people think they can exercise control over events will influence their health behaviors. "Assuming responsibility for one's health constitutes a set of functionally related goal directed behaviors which, from the perspective of a naive psychology, parallels the espousement of an internal locus of control orientation" (Wallston and Wallston, 1978, p. 1). Therefore, it seems feasible to try to explain individual differences in health behaviors through the measurement of locus of control beliefs. "However, even with this more specific measure, it should be recognized that locus of control is only one of a complex of factors (e.g., the value of health, motivation, social supports, previous behavior, perceived costs and benefits of special actions), which individually or in interaction with one another explain the variance in health-related behaviors (Wallston, Wallston and DeVellis, 1978, p. 113).

Locus of Control Indicator

The Multidimensional Health Locus of Control (MHLC) scale developed by Wallston et al. (1978) was chosen to measure patients' locus of control orientation because it is the most recently developed and comprehensive locus of control scale that measures patients' expectancy for health behaviors. Other studies, notably the Lowery and DuCette study (1976), used the generalized expectancy Rotter I-E scale (1966) for identification of locus of control orientation of people with diabetes. However, current literature reports an instrument should be used that test for the specific area of interest. Rotter acknowledges that measures of broad generalized expectancies permits predictions for many situations, but at a low level. A greater prediction should be obtained by using a more specific expectancy scale for a certain subclass (Rotter, 1975). If one is interested in predicting health behavior, one should use a narrowly defined scale related to health beliefs rather than a generalized expectancy scale such as the I-E scale.

The original Health Locus of Control (HLC) scale was developed by Wallston, Wallston, Kaplan and Maides (1976) as a unidimensional measure of people's beliefs that their health is or is not determined by their behavior. Concurrent validity of the HLC established by Pearson's correlation of .33 ($p < .01$) with Rotter's Internal-External Locus of Control (I-E) scale (Lewis et al., 1978). This moderate-sized coefficient between the I-E scale and the HLC scale which suggested the two scales measured different phenomena. "This is consistent with the proposition that the HLC scale measures generalized reinforcement expectancies for health, whereas the I-E scale measures global reinforcement expectancies" (Lewis et al., 1978, p. 140).

Levenson suggested the dimension of externality has two components, chance (C) and powerful others (P) (1974).

Further studies on the HLC scale demonstrated that internal beliefs are orthogonal to external beliefs, but understanding and prediction could be improved by studying fate and chance expectations separately from external control by powerful others yielding three dimensions: I, P, and C. The internal scale is negatively correlated with both power and chance, which have high positive correlation with each other, thus validating the two dimensions of externality.

Knowledge of Diabetes Concept

Knowledge of diabetes is the understanding and utilization of aspects of the disease process and therapy that health care providers consider necessary for the patient to acquire in the self-management of diabetes and attainment of treatment goals. Patient/family education is of utmost importance in the management of diabetes patients. "In few other areas of medical practice is the cooperation of the patient as important as in the management of Diabetes Mellitus" (Bacchus, 1977, p. 113). Because of the crucial nature of patient cooperation, it is imperative that treatment regimens and their rationale be discussed with the patient (Bacchus, 1977). Patients diagnosed with diabetes require knowledge of diabetes management to be able to modify their life-styles and maintain self-care of diabetes. "The effective limits of self-care development are unknown, but are theoretically limited only by society's interest in educational investments in self-care, and definition of tolerable limits in the risk-benefit ratio" (Levin, 1977, p. 118).

Diabetes education programs for patients, health care providers and the public are inadequate for a disease that is one of the leading causes of morbidity and mortality (National Commission on Diabetes, 1976). The management of diabetes pervades the daily life of the patient and family. The National Commission on Diabetes states that the improvement of instruction on diabetes to patient, families, health professionals and the general public will significantly decrease the physical and psychosocial aspects of the disease (1976). The National Commission on Diabetes also states that patient education is part of the treatment of diabetes, and all diabetes programs should be based on this premise (1976). Effective educational programs which prepare the patient for self-care may decrease hospital days and the complications of diabetes (National Commission on Diabetes, 1976).

The review of literature presents contradictory information on the effect of knowledge on compliance. Closson and Kikugawa found that patient education had a substantial effect on compliance with cardiac patients (1975). Tagliacozzo and Ima showed poor control of diabetes is inversely related to knowledge (1970). A study of hypertension education led Sackett and colleagues to conclude that there did not appear to be a relationship between knowledge of the disease or therapy and compliance with prescribed regimens (Sackett et al., 1975).

It would appear that knowledge of disease management would be necessary for compliance. Knowledge of the diabetic diet is necessary for adherence to the diet. Knowledge of disease management is necessary, but not sufficient to produce compliance. Information alone does not seem to be a sufficient condition for compliance because of the many intervening variables such as the importance of health to the family and social support (Caplan et al., 1976). This study examines some of these intervening variables that may affect compliance.

Knowledge of Diabetes Indicator

There is concensus among educators and authors of articles on diabetes education as to the essential content for diabetes education programs (Guthrie and Guthrie, 1977; Simon and Steward, 1976; Tribble and Hollenberg, 1977). In the following section, content usually covered in a diabetes education program is discussed as rationale for the test questions in the knowledge of diabetes indicator.

Most experts agree that the patient needs to know what diabetes is and have a basic understanding of the pathophysiology of the disease (Graber, Christman, Alogna and Davidson, 1977; Guthrie and Guthrie, 1977; Simon and Steward, 1976; Tribble and Hollenberg, 1977). Diabetes is a disease of uncertain cause, characterized by chronic hyperglycemia and other disturbances of carbohydrate and lipid (fat) metabolism (Felig, 1975) and associated with the development of vascular complications which may affect specific organs, the eye (diabetic retinopathy), and kidney (diabetic nephropathy) or associated with accelerated artherosclerosis with an increased frequency of congestive heart disease and peripheral vascular disease (Diabetes Data, 1978). The abnormalities of metabolism results in a failure of normal storage and mobilization of fuel, and an accumulation of fat and/or glucose in the blood (Carey et al., 1978). Diabetes is a "chronic disease in which there is an inefficient or inadequate supply of insulin or a complete lack of insulin to assist in the body process of metabolizing of burning carbohydrates" (Guthrie and Guthrie, 1977, p. 259). This inefficient or inadequate supply of insulin is due to a deficiency in the insulin secretory mechanism of the beta cells in the pancreas. "This secretory abnormality may vary from virtually complete failure to a partial defect apparent only in circumstances of interested peripheral demands such as obesity, pregnancy and aging" (Sherwin and Felig, 1978, p. 697).

Insulin is a hormone secreted by the pancreas to maintain blood glucose levels within a narrow range. When a small amount of carbohydrate is in the blood stream a small amount of insulin is secreted, when a larger amount of carbohydrate is in the blood stream a larger amount of insulin is secreted (Guthrie and Guthrie, 1977). In simple language that patient can understand, insulin allows the sugar (carbohydrate) to leave the blood stream and enter the cells of the body. The sugar must get into the cells to provide energy for body activities.

The chronic hyperglycemia and interference with metabolism leads to the presence of the classical diabetes symptoms polyuria (increased urination), polydipsia (increased thirst), polyphagia (increased appetite), and weight loss (Casey et al., 1978). Additional symptoms may include paresthesia, fatigue, change in eyesight, problems with teeth and gums, and slow healing of cuts and abrasions. These classical symptoms of diabetes usually lead the patient to seek health care (Beland and Passos, 1975).

There have been many attempts to classify the different types of diabetes but the two main classifications of diabetes are primary, "idiopathic" or genetic Diabetes Mellitus, including (1) growth-onset (juvenile) and (2) maturity-onset (adult) and secondary diabetes caused by a loss of pancreatic tissue through surgery, infection or tumor (Beland and Passos, 1975; Rifkin and Ross, 1975; Smith, 1977). Although the cause of primary diabetes is not known, there are several factors that increase the likelihood of getting diabetes including: (1) age, (2) obesity, (3) blood relative with diabetes, (4) female and (5) non-white (Beland and Passos, 1975; Diabetes Data, 1978; Felig, 1975; Smith, 1977).

Another way of classifying diabetes is by therapeutic requirement. The three classifications are: (1) diet only, (2) diet and oral hypoglycemic agents, and (3) diet and insulin. Maturity-onset diabetic patients would be most often controlled by diet only or diet and oral hypoglycemic agents, although there will be some maturity-onset diabetic patients who require insulin. Juvenile onset diabetic patients require insulin.

Diabetes is found in all ages although the prevalence rises rapidly after age 45 and reaches a peak between 65 and 74 years of age (Beland and Passos, 1975; Diabetes Data, 1977). Prevalence of diabetes in men was considerably higher in the age group 40-49 than in 30-39 year old age group and there was little increase in the 50-59 and 60-69 years age group (Ostrander, 1976). There are more women than men with diabetes (Diabetes Data, 1977). Obesity is closely related to diabetes with between 60 and 80 percent of people with maturity-onset diabetes being overweight when the disease is diagnosed (Felig, 1975; Kalkhoff, 1976). Heredity is a factor in diabetes but the pattern of inheritance is obscure (Beland and Passos, 1975; Diabetes Data, 1978; Guthrie and Guthrie, 1977).

"The major modalities in diabetic management are dietary control with appropriate physical activity and insulin therapy" (Bacchus, 1977, p. 113). Maintaining the diabetic diet has the goals of: (1) minimizing the metabolic changes of diabetes, (2) decreasing the known risk factors of vascular disease, (3) obtaining and maintaining normal body weight and (4) avoiding hyperglycemia and hypoglycemia (Carey et al., 1978).

The long-term management of diabetes requires a thorough knowledge of the diabetic diet which is explained in a patient education booklet entitled, "Exchange List for Meal Planning," from the American Diabetes Association (1976). The exchange list is concerned with the total caloric intake with six divisions for food groups including: milk, vegetable, fruit, bread, meat and fat. The number of calories is prescribed that will balance with the patients exercise and medication regimen. The dietitian utilizing knowledge of the patient's life-style prescribes the number of each food group the patient should have at each meal and snack based on the total number of calories prescribed and the patient's medication. For example, a patient may be allowed one bread exchange, one milk exchange, one fat exchange, one fruit exchange and one meat exchange for breakfast. Breakfast could include: fruit juice, toast with margarine, milk and an egg or cereal with milk and fruit and a small slice of ham.

Although the exchange list has been simplified in the last few years, it is still complicated and difficult to follow. A 1964-1965 National Health Survey indicated that 25 percent of patients with diabetes interviewed did not follow their prescribed diet and 53 percent of the patients with diabetes said they followed the diet but one third of those patients did not know the number of food exchanges allowed (1967). "The exchange list is rigid and does not always consider the patients' life-styles and their economic situations" (Stucky, 1977, p. 132). Another problem that leads to noncompliance with the diet and is of interest to this study, is the promise of good health through dietary control, which does not always happen. Because the diabetic diet is so complicated, the patient may not realize his dietary control is poor (Stucky, 1977).

When planning a dietary regimen, it is important to distinguish between juvenile-onset, insulin-dependent diabetic patients and the adult-onset, usually obese patient, who needs no insulin to prevent ketoacidosis (Carey et al., 1978). Both the juvenile-onset and adult-onset diabetic patient require a diet that supplies the necessary calories and nutrients for normal growth, development and activity (Arky, 1978; Smith, 1977). The juvenile-onset diabetic patient is usually more active than adults and is normal to below normal weight.

The goal of diet therapy for adult-onset diabetes is to provide needed nutrients while restricting calories (Arky, 1978). There is a greater prevalence of diabetes among overweight individuals. Both fasting and postprandial blood sugars in the maturity-onset diabetic patient have higher plasma insulin concentrations than nonobese, diabetic patients (Kalkhoff, 1976). Therefore, insulin is less effective in controlling glucose levels when diabetic patients are obese (Kalkhoff, 1976). "Substantial data are available to demonstrate that weight loss in obese diabetics lowers the fasting blood sugar and improves glucose tolerance" (Arky, 1978, p. 656). Most adult-onset diabetic patients can achieve complete control of their diabetes through dietary therapy (Carey et al., 1978). The University Group Diabetes Program (UGDP) reported the first phase of their research indicated that diet only may be more effective in prolonging the life of people with diabetes than therapeutic agents of oral hypoglycemic agents or insulin (1970). However, the success rate for dietary control is very low.

Because of the importance of dietary control and the problems associated with it, most diabetes education programs have a dietitian on the teaching staff and devote a large percentage of time to teaching the diabetic diet to the patient and family.

Another important area of the educational program is teaching the patient about hypoglycemic and hyperglycemic reactions (Diabetes Data, 1978; Garber, Christman, Alogna and Davidson, 1977; Guthrie and Guthrie, 1977; Tribble and Hollenberg, 1977). Patients must recognize when they are having a hyperglycemic or hypoglycemic reaction and know how to treat the reaction. Hypoglycemia occurs when the blood glucose levels are too low because there is too much insulin and not enough food (glucose). Hypoglycemia may result from too much medication, either insulin or oral hypoglycemic agents, an insufficient food intake, or excessive exercise. Overdosage of insulin can be avoided if the lowest effective dose of insulin is prescribed for maintaining blood glucose. Inadequate food intake and excessive exercise problems are preventable by patient education (Bacchus, 1977). People with diabetes who are regulated by diet only can also have a hypoglycemic reaction.

The classical symptoms of hypoglycemia include: hunger, nervousness, restlessness, shakiness, weakness, sweatiness, palpitations, headache, and blurred vision (Arky and Arons, 1971). These symptoms indicate the blood sugar is falling. If the patient does not respond to the need for food intake usually in the form of an easily available sugar, such as hard candy or a sweet drink, the symptoms can progress and eventually lead to coma and death (Jordan, 1977). Prevention of hypoglycemia includes: (1) avoiding sudden changes in diet, insulin and exercise, (2) good dietary control including prescribed snacks, and (3) eating extra slow-acting carbohydrate or protein before extra exercise.

Hyperglycemia is the opposite of hypoglycemia. There is too much glucose and not enough insulin with hyperglycemia. There are several causes of hyperglycemia: (1) omission of insulin or oral hypoglycemic medication, (2) ingestion of large quantities of carbohydrates without an increase in exercise, (3) emotional stress, (4) infection and (5) medications such as thiazides and corticosteroids (Jordan, 1977).

Early symptoms of hyperglycemia include polyuria (increased urination), polydipsia (increased thirst), and polyphagia (increased appetite). When there is an insulin deficiency, fat tissue is broken down and ketones appear in the blood and urine. As hyperglycemia progresses to ketonuria, symptoms include tiredness, nausea, abdominal cramps, decreased appetite, and Kussmaul's respiration (labored breathing). As the central nervous system becomes depressed, the symptoms are: headache, drowsiness, stupor, decreased muscle tone, acetone breath (sweet smell), and unconsciousness (Jordan, 1977). The onset of hyperglycemia is usually gradual and the patient usually requires hospitalization and care by a physician. Patients with diabetes must take their insulin or oral hypoglycemic agent <u>every</u> day to prevent hyperglycemia, even when they feel ill.

People who have diabetes have a higher incidence of infection than the general population. However, Bacchus states that the increased incidence of infection is seen in the poorly controlled or uncontrolled diabetic patient and the incidence of infection is no more frequent in the well controlled diabetic patient than in the general population (1977). The increased incidence is due to high blood glucose. The presence of infection considerably increases the need for insulin, and the patient needs to be monitored carefully while the infection is being treated. Therefore, people with diabetes should be instructed in personal hygiene and prevention of infection.

The most common infection involves the urinary tract most frequently due to the presence of glycosuria (Bacchus, 1977). Foot infections and the resulting gangrene are associated with vascular complications. There are three reasons why foot problems are so common in patients with diabetes: (1) infections, (2) neuropathy and (3) arterial disease (Bacchus, 1977). The normal response to infection is an increase in local circulation, but with vascular insufficiency, the reaction is thrombosis and necrosis. The foot is frequently subjected to trauma, even with patients who have good circulation, but patients with neuropathy may be unable to feel the trauma and therefore not recognize its presence. If the patient is unable to feel the discomfort of ill-fitting shoes, tissue death may occur without the patient's knowledge. People with diabetes should cleanse their feet daily in luke warm water, dry thoroughly and apply lotion. The feet should be inspected daily. Clean socks or stockings should be worn with well fitting shoes. Corns, callouses, blisters and infection should be treated by a physician. Other principles of foot care are improving circulation through exercise and avoiding trauma (Jordan and Nickerson, 1977). The main principle for preventing infection is to maintain skin integrity. Therefore, good total body hygiene, including care of the gums and teeth, is required for infection prevention.

It has long been recognized that exercise decreases blood glucose. Moderate exercise is recommended to maintain normal weight (Carey et al., 1978). "If the amount of exercise increases or decreases, the food intake must vary accordingly" (Guthrie and Guthrie, 1977, p. 47). Extra carbohydrate or protein should be taken before extra exercise to maintain a normal blood glucose. Although exercise is recognized as an important aspect of diabetes education programs (Bacchus, 1977; Carey et al., 1978; Guthrie and Guthrie, 1977; Zinman, 1977), there is very little reference to exercise in most of the writing on management of diabetes. A routine exercise program should be carried out daily to maintain the balance between food, exercise and insulin.

Many adult-onset diabetic patients are prescribed oral hypoglycemic agents when diet only does not maintain normal blood glucose. There is a great deal of controversy over the use of oral agents. The University Group Diabetes Program (UGDP) reported that drugs do not significantly prolong life or prevent complications and the use of some agents had high risk of sudden death (UGDP, 1970). Although many experts in the field of diabetes recommend the use of insulin for maturity-onset diabetic patients who are not regulated satisfactorily by diet only, oral hypoglycemic agents are still being prescribed (Carey, et al., 1978). The oral agents are for patients who have some endogenous insulin. Oral agents are not insulin but stimulate the release of insulin. Although the most dangerous oral agents have been removed from the market, oral hypoglycemic medication has many potential side effects. Hypoglycemia is the most common and serious side effect of oral agents (Colwell, 1977; Feldman, 1977; Forbath, 1977). They are not a replacement for dietary control (Nickerson, 1977).

The goal of insulin therapy is to bring the patient as close as possible to the nondiabetic blood glucose levels without incurring symptomatic hypoglycemia (Carey et al., 1978). Although insulin therapy is prescribed for some adult-onset diabetic patients whose blood sugar is not controlled sufficiently with diet only, the only patients in whom chronic insulin therapy is indicated are insulinopenic (patients who are hyperglycemic and below ideal body weight) juvenile-onset diabetic patients (Bacchus, 1977).

Temporary indications for insulin are: (1) acute complications, (2) hyperglycemic pregnant patients, (3) hyperglycemic patients who are undergoing surgery and (4) hyperglycemic patients in stressful situations (Bacchus, 1977). The most common method of insulin therapy currently is the injection of one dose of medium acting insulin daily. This dose can be supplemented by regular (short acting) insulin based on the amount of sugar in the urine. However, there has been a trend towards returning to split doses of insulin, 2, 3, or 4 times a day (Bacchus, 1977; Carey et al., 1978).

Patients taking insulin should know how and when to administer the insulin and how to recognize hypoglycemia and hyperglycemia. Patients also need to know about the equipment and how to store insulin (Burke, 1977).

One area that is somewhat neglected by diabetes education programs is rules for sick days. It is essential that patients take their insulin or oral medication every day even if they are unable to eat because illness increases the need for insulin. During illness the urine needs to be tested for sugar before each meal and at bedtime. Acetone should be tested if there is repeated sugar in the urine, fever or nausea and vomiting.

There is a large amount of knowledge the patient must acquire to be prepared for self management of diabetes. The indicator of knowledge of diabetes includes questions on the pathophysiology of diabetes, complications of diabetes such as hyperglycemic and hypoglycemic reactions, sick day rules, personal hygiene, diet and medications.

Social Support Concept

Social support is defined as the input provided by person(s) who are family members or close friends of the patient with the intent of assisting the patient obtain desired therapeutic outcomes. Social support implies a long term relationship of physical and emotional closeness to be of frequent and sustained assistance, if not in the same household, within close proximity. The definition is not intended to include community resources (Caplan et al., 1976).

The support system becomes important in chronic illness where long-term life-style changes are required. As is the case with many chronic illnesses, the life-style changes required by patients with diabetes may alter the family's life-style. The dramatic increase in chronic illness morbidity has necessitated a shift in health care goals and strategies from cure to care (Levin, 1977). The care component does not require the high-technology and professional service that acute care demands. Most chronic illnesses require maintenance management and places a new emphasis on the critical role of the lay resource (Levin, 1977).

The family as a social unit has a considerable potential for performing health care especially in personal attention, support, body care service and sharing another member's role when necessary (Pratt, 1977).

Rakel states that positive family support can contribute significantly to patient satisfaction and compliance with the prescribed regimen (1977). A stable home situation provides positive reinforcement of health prescriptions. Social support and encouragement are especially necessary when the prescriptions require modification of life-style. Few patients are likely to modify life-styles without additional support (Rakel, 1977). Persons living alone and having no support or persons living in a unstable family situation are likely to have poor compliance. "The spouse is the most valuable and influential family member, whose support is a necessary component in the management of long-term illnesses" (Rakel, 1977, p. 151).

A distinction can be made between objective and subjective social support. An "objective" instrument or a third person can measure objective social support. On the other hand, subjective social support is a measure of patients' perception of their social support (Caplan et al., 1976). For the purpose of the study, social support was determined subjectively through a self report of the patients' perception of the amount of social support the patient expected and received from family members or close friends.

Support can be positive or negative. "Some behaviors of others free us to pursue our goals, other behaviors hinder us, and still others may fall somewhere in the middle of the continuum neither helping nor hindering our pursuits"

(Caplan et al., 1976, p. 43). "While most physicians readily acknowledge the importance of significant others in the diabetic's psychosocial system, it has been difficult to identify these persons and document the exact importance of the relationships in modifying the natural history of the disease" (Wishner and O'Brien, 1978, p. 849).

The data on patients use of available resources during crisis are limited and contradictory. Urbanization and industrialization may have precipitated the change of nuclear families seeking support from formal institutions and agencies of society rather than the extended family or kinship group (Croog, Lipson, and Levin, 1972). "Reactions of the family to presence of a chronic illness depends on composition of the family, presence of significant others, cultural background of the family, education of its members, the stage of family development, and finally, the health-belief model adopted by the family" (Wishner and O'Brien, 1978, p. 849). How the various support groups of family and friends serve as resources in times of health crisis has rarely been studied systematically. There are still gaps in information regarding factors related to support provided by family and nonfamily groups (Croog et al., 1972).

Only one study has combined health locus of control with social support. Lewis and colleagues hypothesized that "the greater the perceived assistance from a significant other in the home environment and the greater the reinforcement value of health, the more internal orientation positively affects compliance behavior" (1978, p. 140). If the patient perceived high social support and highly valued health, the more powerfully internal locus of control orientation predicts health behavior. The Lewis et al. study proved the hypothesis was true with hypertensive patients. The results of Lewis et al. study need to be validated with patients who have other chronic illnesses, such as Diabetes Mellitus.

Social Support Indicator

The indicator for social support was a subjective appraisal of the patient's perception of positive support by family members or close friends directed towards helping the patient reach therapeutic outcomes. The social support indicator was composed of two sections. One section primarily determined the importance the patient placed on social support to maintain therapeutic outcomes with some questions on amount of supportive input. The second section was a measurement of the amount of perceived social support and some questions on the family's expectation of the patients compliance to the health regimen. The support input reflected encouragement to follow prescriptions and direct assistance by cooking the diabetic diet, exercising with the patient, or attending the diabetes education program. There were some questions that indicated the amount of modification of family life-styles. Reciprocity of relationships, temporal aspects, size and role specialization were not determined.

Compliance Concept

Compliance refers to "the extent to which the patient's behavior (in terms of taking medications, following diets or executing other life-style changes) coincides with the clinical prescription" (Sackett and Haynes, 1976, p. 1). The term compliance has a negative connotation implying superior (health care provider) and subordinate (patient) hierarchical relationships. The term is offensive to people who "view the development of a clinical prescription as an essentially dictatorial process in which a clinician, unaware of and unconcerned about the patient's wishes, hopes and fears issues an edit to be obeyed" (Sackett and Haynes, 1976, p. 1). Although other terms have been suggested, such as therapeutic alliance, concordance and adherence, compliance remains the most commonly used term. The term describes the extent to which the patient follows the providers' instruction and advice, whether declared by autocratic, authoritarian provider or developed as a concensual regimen through negotiation between health provider and the patient (Sackett and Haynes, 1976).

Compliance has both an attitudinal and behavioral component. The attitudinal component is made up of the orientation of willing readiness for action. Behavior is when the patient actually carries out the prescribed regimen.

Research on compliance has progressed along both of these two lines. Sackett and Haynes (1976) are the major proponents of the behavioral aspect of compliance while Becker is the proponent of the attitudinal aspect of compliance with the Health Belief Model (1974). The simplistic approach to compliance has been in the form of "information-transfer" without paying attention to the attitude change of the educational process. Both the behavioral and attitudinal components of compliance and their interrelationship need to be addressed by researchers.

Whether compliance is a process or outcome of care has been debated by experts of compliance theory. Compliance has elements of both process and outcome. The goal of compliance is to improve patient state of wellness. When compliance is viewed as an outcome, the underlying assumption is that compliance to the prescribed regimen will yield the desired health goals. Compliance as an outcome is desirable because high compliance should lead to better control of the disease process. However, this is not always true. A few people will obtain the goal without compliance while others may not obtain the goal at all.

Compliance Indicator

The objective measurement of compliance has been a major concern of health care providers. There are few objective methods for testing compliance: (1) pill counts and (2) samples of blood and urine for medication, its metabolites or tracer substances (Komaroff, 1976). Although blood glucose is being used as an indicator of therapeutic outcomes, some of the limitations of this measurement will be discussed. Blood glucose measurement is an indicator of therapeutic outcome and not necessarily an indicator of compliance since patients could maintain a near normal blood sugar by compromising their regimen. Compliance was viewed as a process towards reaching therapeutic outcomes. The indirect measure of the patient's self-reported compliance to the prescribed regimen was behaviorally oriented. No attempt was made to determine the attitude of willing readiness. Since there were no adequate instruments found to measure compliance to the prescribed regimen for diabetes, one was developed for the purpose of the study.

Therapeutic Outcome Concept

At the present time, the goal of compliance can best be tested by measuring therapeutic outcomes. Therefore, compliance is viewed as a patient process towards reaching therapeutic goals. "The presentation of compliance data has relevance only when it is related to the simultaneous achievement of the treatment goal" (Sackett and Haynes, 1976, p. 3). This is conceptualized in the diagram designed by Sackett and Haynes (1976) shown on the following page.

As can be seen in the lower left hand corner of the diagram, patients with low compliance who do not achieve their therapeutic goals are of major interest to the health

		Treatment Goal	
		Achieved	Not Achieved
Compliance	High	Ideal	Inadequate Therapy
	Low	Wrong Diagnosis or Over Prescribing	Noncompliance

Fig. 2.--Relationship of Compliance to Treatment Goal.

care providers who study compliance. The patient who achieves the treatment goals but has low compliance may have been prescribed higher doses than needed, be receiving treatment for a disease that has already run its course, or be manipulating the regimen with potentially dangerous effects.

Donabedian (1966) differentiated between outcome, process and structure. Methods for evaluating structure (facilities, personnel) were developed first. Then, assessment tools were developed for process (what the provider does). Outcomes (results of care provided) were the last area of development, possibly due to the difficulty of quantifying outcomes and the belief that structure and process are directly related to health outcomes, therefore indirectly measuring outcomes (Williamson, 1978). The major benefit of health care outcome concept is the potential for assessing and improving current health care. "Identifying deficient outcomes furnishes the most direct assessment focus for isolating deficient process that require improvement" (Williamson, 1978, p. 6). Therefore, the ultimate test of criteria for standards of care for people with diabetes is in the outcome of patients whose treatment conforms to the standards presented (Carey et al., 1978).

Therapeutic Outcome Indicator

Traditionally, outcome has been measured by morbidity and mortality statistics. The multiple factors involved and the amount of time between diagnosis and morbidity or mortality renders these statistics less than helpful. One desired outcome, patient satisfaction, has been tested to some degree but adequate instruments are not yet available. Some intermediate or more proximate outcome measures have been used, such as the incidence of preventable complications, length of hospital stay, bed days saved, and cost of alternative care. Unfortunately, there has been little attempt to accumulate and assign values to the data (Institute of Medicine, 1976).

The desired therapeutic outcome for patients with diabetes is to control the disease process and prevent complications. In order to achieve this outcome, the goal of diabetes treatment is to achieve blood glucose levels as close to those of the nondiabetic state as feasible (Cahill, Etzwiler and Freinkel, 1976). Although there has been much controversy over this statement since the development of insulin almost fifty years ago, a recent policy statement of the American Diabetic Association states, "In summary, current clinical and experimental data clearly demonstrates that optimal regulation of glucose levels should be achieved in the treatment of diabetes, particularly in young and middle-range individuals, who are at greater risk of developing the microvascular complications" (Cahill et al., 1976, p. 237).

Opponents of strict blood glucose level control point out that complications of diabetes occur in patients who are supposedly well controlled. Forbath states that the effectiveness in prevention of diabetes complications is a highly controversial issue and there is no proof that good blood sugar control, as can be achieved by present methods, can prevent complications (1977).

The University Group Diabetes Project (UGDP) was initiated to help settle the strict control of blood glucose level controversy. The purpose of the UGDP study was to examine the effects of various hypoglycemic treatments on the development of vascular complications in patients with adult-onset diabetes.

> The UGDP findings provided no evidence that insulin or any other drug lowering blood glucose levels will alter the course of vascular complications in the type of diabetes that is most common, adult-onset diabetes. Weight reduction has been shown to be feasible and effective in lowering blood glucose levels; thus dietary management deserves greater emphasis in this type of diabetes than it has received to date, as others have suggested. In any case, the UGDP results suggests that the use of any additional therapeutic agent must be

> justified on grounds other than the prevention of macrovascular complications (Knatterud, Klimt, Levin, Jacobson, and Goldner, 1978, p. 42).

In the past, the major threat to life due to diabetes was inability to control the carbohydrate defect and the associated dangers of dehydration, ketoacidosis, and rapid fatality. Due to the development of insulin and better understanding of circulatory and electrolyte effects of the uncontrolled diabetic state, we now know that the most serious threat to life is the insidiously developing vascular complications (Bondy and Felig, 1974).

The relationship between control of the metabolic disorder and the incidence of progression of the vascular complications is difficult, if not impossible to measure. Under ordinary circumstances, the normal blood sugar concentration is between 50 and 150 mg. per 100 ml. (or 1 dl.) (Bondy and Felig, 1974). Normal, nondiabetic people do not exceed 200 mg./ml. for more than a few days throughout their life time whereas people with diabetes frequently exceed this level and may have blood glucose concentrations of several hundred milligrams per 100 ml. for prolonged periods of time (Bondy and Felig, 1974).

"When treatment is instituted, whether with insulin or one of the oral agents, the degree of elevation can be reduced, but usually abnormal fluctuations of blood glucose concentration persist to some degree in spite of medication" (Bondy and Felig, 1974, p. 890). It is not possible to normalize the abnormalities produced by complete or almost complete absence of insulin and there is ample evidence that serum glucose stability is unattainable with current treatment methods regardless of the intensity of the regimen (Metz, 1975). However, there is increasing evidence that suggest suboptimal control of diabetes hastens microvascular degeneration (Cahill et al., 1976).

Because there is so much that is not known about diabetes, it is extremely difficult to determine appropriate therapeutic outcomes. Complications, other than hypoglycemic and hyperglycemic reactions, will not be visible until the diabetic patient has been out of control for a number of years. Therefore, this study has not attempted to analyze complications other than the short term complications lack of blood sugar control, hypoglycemic and hyperglycemic reactions. Even though there is some question of what constitutes a good therapeutic outcome in patients with diabetes, the American Diabetic Association has taken a stand that it is important to achieve optimum blood glucose levels. Therefore, a normal blood glucose is a desired therapeutic outcome.

A normal serum glucose level indicates the blood sugar is within physiological limits and carbohydrate metabolism is normal. A normal serum glucose level requires a balance between diet, energy and insulin (exogenous or endogenous). If the balance is correct, there should be a normal serum glucose level and a general feeling of well being with decreased fatigue and increased energy than when the blood sugar is out of control. Excess weight increases the body's requirement for insulin. The importance of diet has been stressed by the UGDP and diabetologist. Illness and injury may disrupt the balance between diet, exercise and insulin. When there is a disruption of the balance and the blood sugar is abnormal, hypoglycemic or hyperglycemic reactions can occur. An elevated serum glucose can lead to complications, such as vascular problems and an increased need for the kidneys to filter sugar and acetone out of the body. Therefore the desired therapeutic outcomes for patients with diabetes included: (1) normal serum glucose levels, (2) maintaining normal weight, (3) absence of reactions, infections and illnesses, (4) absence of sugar and acetone in the urine, (5) increased energy and (6) presence of a feeling of well being.

Interrelationships Between Concepts

Although the purpose of this study is to determine the interrelationship between the concepts, some possible interrelationships have been reported in previous research. The concept of locus of control is introduced as a variable that could have an influence on the other variables. Locus of control appears to affect the initial amount of knowledge gained. When "internals" are told they have a disease, their immediate response is to seek information about the disease. Seeking information is an antecedent to using information for control. Patients with an internal locus of control orientation knew more about their own condition, questioned doctors and nurses more and expressed less satisfaction about the amounts of feedback they received about their condition (Rotter, 1966). "External" diabetic patients do not actively seek information about the disease, but eventually gain a considerable body of facts about diabetes. "He is not interested in control, even if he were, he seems to believe that having information is of little value. Instead he follows what is for him the normal course of compliance with authority" (Lowery and DuCette, 1976, p. 361). Lowery and DuCette demonstrated that internal subjects had more information initially than externals but this difference decreased over time until internals and externals were identical in the amount of information possessed (1976).

Lewis and colleagues studied the effect of health locus of control and social support on compliance and demonstrated that perceived levels of home assistance differentially affect compliance for internally versus externally oriented respondents (1978). The highest levels of self-reported compliance behavior was found in internally oriented patients with high levels of perceived home assistance. The second highest compliers were externally oriented respondents with low levels of perceived home assistance which appears to counter theoretical expectations. The third level of compliers were internally oriented individuals with low perceived levels of home assistance. Patients reporting the lowest level of compliance were externally oriented with a high perceived level of home assistance. Patients who lacked a sense of personal control over the outcomes of their behavior were not good self-reported compliers even in the presence of environmental support (Lewis et al., 1978).

Locus of Control	Degree of Social Support	Level of Compliance
Internal	High	Highest
External	Low	Second highest
Internal	Low	Third highest
External	High	Lowest

Fig. 3.--Summarized Results of Lewis et al. (1978) Locus of Control, Social Support and Compliance.

Oakes and colleagues agree that social support seems to have a positive effect on compliance. Patients with Rheumatoid Arthritis complied with splint regimen a greater proportion of time when they perceived that their family members expected them to do so. When age, sex and social class were controlled, family expectations remained a significant factor in compliance to splint regimen (Oakes et al., 1970).

Although locus of control orientation is thought to affect compliance, there is disagreement about the direction. Becker suggests that individuals (externals) who feel that fate controls much of their lives are less likely to comply than internals who feel they can exert control over events (1974). Lowery and DuCette suggested that internals will resist attempts to influence their behavior unless it is viewed as beneficial to accede. "An external, on the other hand, is more passive and will comply with such influence attempts, especially if the source of the manipulation is a person of high status" (Lowery and DuCette, 1976, p. 359). Subjects high in externality were found to conform significantly more than subjects low in externality (Lefcourt, 1966). Patients with high external orientations also display less risk-taking behavior than those with low external orientations (Lefcourt, 1966) which may affect their compliance behavior. There has not been a reported study of patients using the chance and powerful others orientation.

Tagliacozzo and Ima showed that poor control of diabetes is inversely related to knowledge (1970). A study on people with diabetes by Williams and colleagues found that knowledge about the disease correlated negatively with control of the disease and there was no correlation between performance of a prescribed regimen and actual control of the disease (Williams et al., 1967). Since the disease process is poorly understood and complications may occur even when the therapeutic regimen is followed closely, internally oriented people with diabetes find that the information they have about the disease is of less value than they originally thought to be true. At this time, the internally oriented person with diabetes takes less control over his disease and incurs problems (Lowery and DuCette, 1976).

Wilson agrees that the relief of symptoms should increase compliance, but the reverse is true. Decreasing symptoms causes the patient to stop the prophylactic treatment. The severity of the disease and extent of the disability often show an unexpected inverse correlation with compliance (1973).

The patients' locus of control orientation, whether it is internal or external, is interrelated with knowledge, social support and compliance. (Studies have not utilized the MHLC scale.) The diagrams on page 69 show the interrelationships of these variables as reported by previous research.

People with high internal locus of control orientation and high social support report high compliance. Internals with low social support have lower compliance. High internality also leads to an initial increase in knowledge which leads to high compliance. The relationship of

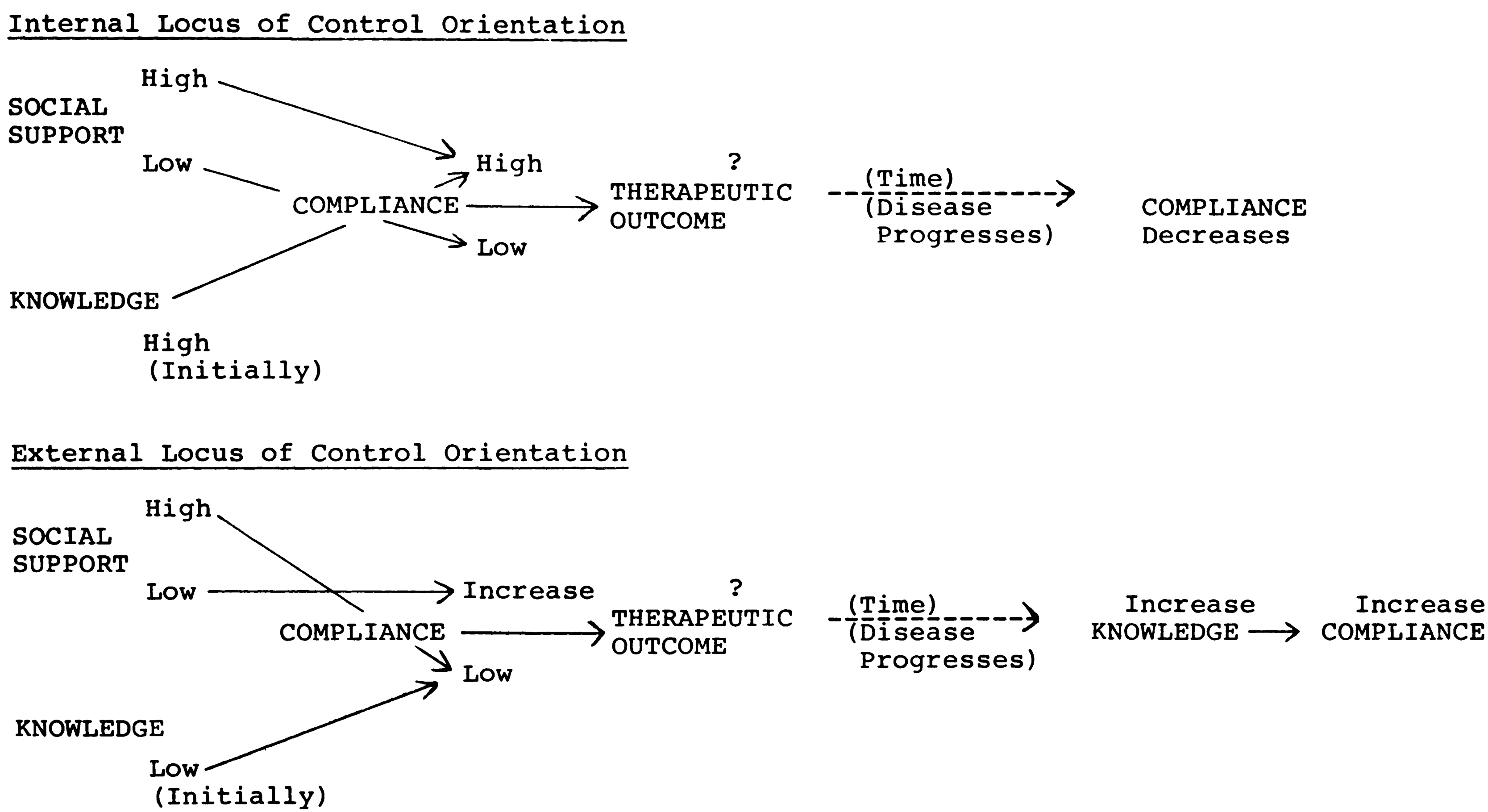


Fig. 4.--Possible Relationships of the Variables Reported by Other Studies.

compliance to therapeutic outcomes is not known. However, as the disease progresses, compliance may decrease.

People with high externality and low social support may have some increase in compliance, but people with high externality and high social support are the lowest reported compliers. High externality will probably have a low knowledge level initially, which leads to low compliance. Externals do learn the prescribed regimen over time and may have as much or more compliance to the regimen as internals as the disease progresses.

There have been some research studies indicating various relationships between some of the concepts in the theoretical structure. This study may validate previous research and provide evidence of the interrelationship of all of the concepts.

Relationship to Theories of Nursing

The concepts in this middle range theory are related to nursing theories in varying degrees. In the following section a discussion of the relationship of this study to nursing theories represented by Rogers, Roy and Orem is presented.

Although stated in different terms, nursing theorists generally agree that the goal of nursing is to assist the patient obtain high level wellness. Rogers states, "professional practice of nursing seeks to promote symphonic interaction between Man and environment, to strengthen the coherence and integrity of the human field and to direct and redirect patterning of human and environment fields (Rogers, 1970, p. 122).

The relationship between the proposed theoretical model and Roger's theory is in regard to repatterning and making people aware of alternatives of action. Repatterning relates to continuous interaction between the human field and the environmental forces, but the Man-environment interaction process is continuously repatterned. "With each repatterning, subsequent interaction is revised and new patterning in both man and environment emerges" (Rogers, 1970, p. 97).

Rogers' concept of repatterning and the concept of compliance have the same goal of assisting people to realize their maximum health potential. The goal of compliance is consistent with Rogers' theory, but Rogers would not agree with the term compliance or the connotation of hierarchical relationships between provider and patient.

Although the definition of compliance does not rule out patient participation in goal setting, it does not necessarily include patient participation. The definition of compliance implies that the patient is a recipient of a health prescription given by the provider, rather than an active participant. This is the major discrepancy between Rogers' theory and the model presented in this paper. Rogers states, " . . . whatever goals may be set, the mutuality of the process is a significant factor in their achievement" (Rogers, 1970, p. 123). Mutual goal setting may be another method of increasing compliance which needs to be empirically verified. The amount of patient compliance may be proportionate to the amount of mutual goal setting. In the case of mutual goal setting, the term therapeutic alliance is more appropriate.

The main difference in repatterning seems to be directed towards the strong emphasis on individual differences. Compliance can take individual differences into account, but this is not inherent in the definition. If individual differences and mutual goal setting are included in the prescription, it is because of the individual provider. If the provider does engage in mutual goal setting, the provider has to be prepared to compromise on treatment goals. If the patient did not obtain the therapeutic outcomes the provider thought necessary, but did participate in the goal setting and followed the prescribed regimen that was determined together, Rogers would say that the patient had obtained a higher level of wellness. Achieving some of the therapeutic outcomes is better than not achieving any, mainly because the patient was an active participant in the goal setting.

According to Roy, Man is a biopsychosocial being who is confronted by a changing environment which requires adaptation. Nursing is a social necessity with the goal of promoting Man's adaptation (Roy, 1973). When this adaptation affects life dimensions of health and illness, nursing activity (or the nursing process) is utilized to obtain the goal of nursing, adaptation in the four adaptive modes: physiologic, self-concept, role function and interrelationships (Riehl and Roy, 1974; Roy, 1976; Roy, 1973).

The nursing process in the Roy Adaptation Model has a two stage assessment of the "system of man and his interaction with the environment" (Roy, 1976, p. 3). The first level is the identification of Man's behavior is each of the adaptive modes and the position on the health-illness continuum. Identification of a problem leads to the second stage, identification of focal, contextual and residual stimuli that affects the adaptive modes. The nurse formulates a nursing diagnosis, and often with the patient, determines goals in relation to patient behavior. Nursing interventions are the activities performed to promote adaptation.

Roy agrees these four modes overlap with other disciplines such as medicine, social work and psychiatry. She states that the Roy Adaptation Model distinguishes nursing in two ways. "First, the nurse deals with each mode as it is affected by stimuli present because of the person's position on the health-illness continuum" (Roy, 1976c, p. 690). Secondly, the nurse is interested in the person's response to pathological process not the pathological process itself (Roy, 1976b).

In maintaining positive adaptive responses and promoting positive adaptation, compliance theory could be very helpful. Roy states that Man has both innate and acquired mechanisms which are biologic, psychological and social in origin to cope with the changing world. Compliance is an acquired mechanism which can be used to promote health. Man is not born with the ability to comply to the health regimen, but learns how to comply from the health provider. Mans' life experiences influence their perceptions of health and illness which will, in turn, influence their desire to comply with the health regimen.

This study's middle range theory is most closely aligned with Orem's theory. Orem states that nursing helps the patient to initiate self-care activities that will maintain life, health and well being (Orem, 1971). Orem emphasizes that Man is a responsible, thinking being who makes choices and engages in deliberate action to control the environment and participate in self-care. "Self-care is only one aspect of healthful living, but without continuous self-care which has therapeutic quality, integrated human functioning will be disrupted" (Orem, 1971, p. 44). Three nursing systems are suggested which are a variation in the roles of the nurse and the patient in the performance of health care activities required by the patient: (1)

Wholly Compensatory System, where acting and doing for the patient is essential, (2) Supportive-Educational System, where the patient is able to perform or can and should learn to perform required measures of externally or internally oriented therapeutic self-care, but cannot do without assistance, and (3) Partially Compensatory, where either nurse or patient may have a major role (Orem, 1971).

For the purpose of this study, the second nursing system is most important. Valid assisting techniques of the nurse for the patient in these situations include a combination of: (1) support, (2) guidance, (3) provision of a developmental environment, and (4) teaching (Orem, 1971). Man and environment is an integrated system related to self-care. Knowledge of the nature of the interchanges between individuals and their environment is basic to deliberate efforts to introduce new elements into the environment which may bring about changes and affect the balance of the system. Selection of activities which are unhealthy may arise when self-care values and other values conflict.

All of the theorists refer to Man's interaction with the environment. Rogers refers to the environmental field which is in constant interaction with the human field. Roy agrees with Rogers that the environment is constantly changing but states that Man must adapt to the changing environment. Rogers states that Man does not adapt to the environment but the Man-environment interaction process is continuously repatterned. Orem states that Man engages deliberate actions to control the environment. The concept of locus of control is a way of viewing and interacting with the environment. If people feel they have no control over their fate, they are termed an "external." How people respond to changes or influences in their environment is partially due to their locus of control orientation. The theorists would probably not agree with labeling people as "internals" or "externals," but would agree with using the knowledge about the individual's locus of control to promote wellness and adaptation.

Roy states that Man's adaptation level is determined by three classes of stimuli: (1) focal, (2) contextual and (3) residual (Riehl and Roy, 1974). Locus of control could be classified as residual stimuli--beliefs, attitudes or traits which have any indeterminant effect on the present situation (Riehl and Roy, 1974).

All of the theorists discuss nursing in the context of Man and environment. The support system is an implied part of the environment. Neither Rogers nor Roy refer to the support system other than the environment. However, Rogers does make a reference to family. "Nursing is directed toward taking these data, evaluating them, determining immediate and long-range goals for the individual, family and society, and initiating intervention that seems most likely to achieve these goals (Rogers, 1970, p. 125). Roy does not define environment but does state that it impinges on the system of Man through physical, social and psychological changes (Riehl and Roy, 1974). Orem talks about the family helping the patient with self-care. She states that self-care and care of dependents deliberately brings about relationships between individual human beings and physical, biologic and human elements in the environment (Orem, 1971).

None of the theorists suggest methods of measuring therapeutic outcomes, however, therapeutic outcomes would be achievement of the nursing goal as defined by each nursing theorist. Rogers states the goal of nursing is to help Man achieve maximum health potential. The dynamic nature of the Man environment interaction purports continuous revision of the assessment, intervention and evaluation. Roy's nursing goal is to help the patient attain positive adaptation. Success in promoting adaptation is judged by a "positive response made by the recipient to the stimuli" (Riehl and Roy, 1974, p. 139). Orem states that nursing assists the patient with self-care activities that maintain life, health and well-being (Orem, 1971).

Although the concepts were not derived from theories of Rogers, Roy and Orem they have a relationship with each theory. All of the theorists discuss the need for health education, but do not discuss unsuccessful health education. The theorists support utilization of knowledge of the individual to increase compliance to the health regimen.

This middle range theory combines concepts of generality with empirical measures. The results of this study may add information to the nursing theories developed by Rogers, Roy and Orem.

In the next chapter, a review of the literature on the concepts of the study is presented.

CHAPTER III

REVIEW OF LITERATURE

A review of literature on the concepts of this study revealed a literature explosion over the past fifteen years for two of the variables, locus of control and compliance, a scarcity of literature for two other variables, social support and therapeutic outcomes, and a fairly constant number of knowledge studies.

The review of literature has the following objectives:

1. To review the major or classic studies in health locus of control, knowledge of the disease, social support, compliance and therapeutic outcomes.
2. To point out major discrepancies or gaps in knowledge about the relationships between the variables.

Multidimensional Health Locus of Control

In the past fifteen years there has been a large number of research studies concerning some aspect of internal versus external control of reinforcement, locus of control. The introduction of the locus of control concept led to a literature explosion. Hundreds of studies have examined the use of the I-E scale (Rotter, 1966) in various settings as an explanation and predictor of individual differences (Joe, 1971). There have been at least six hundred published articles on locus of control, and the number of unpublished investigations, master's theses and doctoral dissertations are impossible to estimate (Rotter, 1975).

A number of literature reviews and bibliographies are available on locus of control (Joe, 1971; Lefcourt, 1966, 1972; Phares, 1973, 1976; Rotter, 1966, 1975; Throop and MacDonald, 1971; Wallston and Wallston, 1978). The following section is a discussion of the: (1) general characteristics of different control orientation based on research using the I-E scale, (2) need for and development of a health related scale, (3) discovery of multidimensions in the externality component, and (4) literature on locus of control related to health. The focus of this section is on the utilization of the locus of control construct to health-related behaviors.

Many of the studies on locus of control attempted to describe individual characteristics with locus of control orientation. "Externals" were reported to be less trustful (Hamsher, Geller and Rotter, 1968), more aggressive and hostile (Williams and Vantress, 1969), display more anxiety and neurotic symptoms (Feather, 1967), greater death anxiety (Patton and Freitag, 1977), more defensiveness and less task-oriented coping behaviors (Anderson, 1977), larger self-ideal discrepancy, lower self-concept and lower self acceptance (Chandler, 1976) than "internals."

The I-E scale (Rotter, 1966) measured just as reliable as conventionally-used ability scales in predicting grades and more accurate in predicting degree attainment. "Externals" were more persistent academically, while "internals" were more likely either to obtain the degree or dropout of college within five years (Otten, 1977). Locus of control was related to father's educational level (Lao, 1976). The relationship between control and intelligence was positively related to perceived control ("internal") (Bialer, 1961; Crandell, Katkovsky and Preston, 1962). Battle and Rotter found a significant relationship between intelligence and "externals," lower class Negroes with high IQs were more external than middle class Caucasians with lower IQs (1963). However, the numbers were small and the authors questioned the validity of these findings. Gordon found that locus of control orientation was related to grades for boys and achievement test scores for girls (1977).

In regard to risk taking, it is usually contended that "internals" prefer intermediate risk, while "externals" prefer extreme risks, but the relationship between control orientation is unclear and may depend on the nature of the task. Extreme risks were either extremely easy or extremely difficult so the subject could receive immediate feedback. DuCette and Wolk's study of 173 females showed externals characterized by a preference for extreme risks, low persistence and atypical shifts in level of aspiration (1972).

Internally oriented people described themselves as active, striving, achieving, powerful, independent and effective (Hersch and Scheibe, 1967). Hersch and Scheibe found the data supported the conclusion that internality was consistently associated with indexes of social adjustment and personal achievement (1967). Internality is positively correlated with socioeconomic status (Battle and Rotter, 1963), higher self-confidence (Lao, 1976), and more involvement with social action (Gore and Rotter, 1963; Lao, 1976; Strickland, 1965).

There was no significant correlation between empathy and locus of control, but there was a correlation with trait anxiety. Persons overly focused on themselves (high anxiety) may not be sensitive to the needs of others (empathy). Greater anxiety was associated with strong feelings of not being in control of one's environment. One possible way of decreasing anxiety is to increase one's feelings of control over the environment (Deardorff, Kendall, Finch and Sitarz, 1977).

Lao found that locus of control orientation was age related and may have different meaning for older people (1976). Boor suggested that perceptions of control did not change in the same direction or to the same extent among older people as among younger people (1976). Older people may be less sensitive to the cultural influences that affect perceived locus of control among younger people (Boor, 1976).

A study with alcoholics concluded that individuals with external control expectancies gave anxious and passive appearances, exhibited greater pathology and were deficient in adaptive defensiveness. In normal subjects, important clinical symptoms do not appear (Burnes, Brown and Keating, 1971). In both the alcoholic and normal population, the I-E scale's correlations with MMPI scales suggested that a sense of control over external events is related to self control and competence in handling internal events (Burnes, Brown and Keating, 1971).

Spanish-Americans ranged in the middle of the locus of control scale, while Caucasians were more internal. The most external were low socioeconomic Negroes compared to middle class Negroes and low class to middle class Caucasians (Battle and Rotter, 1963; Rotter, 1966).

The I-E scale (Rotter, 1966) is the most frequently used measure of generalized expectancy, but there are many other scales available for measuring generalized expectancy in children (Battle and Rotter, 1963; Bialer, 1961; Crandall, Katkovsky and Crandall, 1965; Nowicki and Strickland, 1973), and adults (Dies, 1968; Nowicki and Duke, 1974). The I-E scale and most of the other scales designed to measure locus of control are related to generalized expectancies or "world views."

Wallston, Wallston, Kaplan and Maides made an assumption that a health specific locus of control scale would provide more sensitive predictions of the relationship between locus of control orientation and health behaviors (1976). Rotter agrees that a narrower or more specific expectancy should allow greater prediction for a situation of the same subclass (Rotter, 1975).

Ninety-eight college students tested an original pool of 34 items of locus of control expectancies related to health with the I-E scale and Marlowe-Crowne Social Desirability Scale (Crown and Marlowe, 1964). Eleven items were chosen from the pool. The mean was 35.57, standard deviation 6.22, and alpha reliability .72. A negative correlation was found with the Marlowe-Crown Social Desirability Scale. Concurrent validity of the HLC to the I-E scale was .33 correlation ($p < .01$) (Wallston, Wallston, Kaplan and Maides, 1976).

There was no significant difference on the HLC scores between males and females (Wallston et al., 1976). Further testing of the HLC indicated that HLC correlated with weight loss and program satisfaction but the I-E scale did not correlate with the same variables (Wallston et al., 1976). The health specific instrument appears to be a better indicator of health related behaviors.

Several authors began to question the unidimensionality of the I-E scale (Gurin, Gurin, Lao and Beattie, 1969; Lao, 1970; Mirels, 1970) mainly due to some discrepancies in reported results. Levenson designed three new scales internal, powerful others and chance (I, P and C) to measure the belief in chance expectancies as separate from a powerful others orientation (1974). The I scale was significantly different from both the P and C scales. The P and C scales correlated moderately with each other and were negatively related to the I scale (Levenson, 1974). Rotter tried to examine externality in the dimensions of defensiveness and passivity, but failed with college adults (1975). However, Crandall et al. did find some differentiation with children (1965). Research studies did indicate externality had more than one dimension.

The Health Locus of Control (HLC) scale only contained one item regarding powerful others, so the HLC scale was rewritten and became the Multidimensional Health Locus of Control (MHLC) scale incorporating Levenson's I, P and C (Wallston, Wallston and DeVellis, 1978). The scale was tested on "healthy" adults. The Internal Locus of Control (IHLC) and Chance Health Locus of Control (CHLC) were negatively correlated.

Locus of control has been studied with different health problems. The studies on locus of control and weight loss are inconsistent. Manno and Marston found no relationship between weight loss and locus of control in their treatment groups. However, locus of control was

was important in the control groups. External subjects weighed more initially, and lost less weight (1972). Balch and Ross found significant correlations between internality and a self-controlled weight reduction program both in completion of the program and in number of pounds lost (1975). Wallston, Wallston, Kaplan and Maides found that "externals" lost more weight in the externally oriented group and "internals" lost more weight in the internally oriented group (1976). Saltzer identified internal and external locus of control individuals by a Weight Locus of Control Scale. Internals who highly valued health and/or physical appearance placed a greater importance on personal attitudes while externals placed a greater importance on social norms (1978). The results of these studies indicate that patients may accomplish the treatment goals better if they are in a group compatible with their control orientation.

Females who were internally oriented practiced contraception much more than "externals" (MacDonald, 1970). However, a more recent study has not validated these differences. Seeley could not find any difference between successful and unsuccessful contraception users in five groups of women (1976).

Two studies found that nonsmokers were more likely to be internally oriented than externals (James, Woodruff and Werner, 1965; Straits and Sechrest, 1963). Men who believed the Surgeon General's Report and quit smoking were more internal than men who believed the report but did not quit smoking (James et al., 1965). Kaplan and Cowles found that internally oriented individuals who valued health highly were more successful in achieving and maintaining changes in smoking behavior (1976). Some studies do not validate the relationship between locus of control and smoking (Best and Staffy, 1971; Lichtenstein and Keutzer, 1967).

Williams found that internality was related to greater seat belt use (1972a) and to preventive dental care (1972b). Johnson and colleagues studied locus of control orientation with females having abdominal surgery. Internal patients received more analgesics than "external" (Johnson, Leventhal and Dabbs, 1971).

Internally oriented tuberculosis patients knew more about their condition, asked more questions of doctors and nurses about their condition, and were less satisfied with the information they received than equally matched externals (Seeman and Evens, 1962). Lowey and DuCette reported that internally oriented diabetic patients initially learned more about their condition than external patients. As the disease progressed over time, there was little difference between "internals" and "externals" (1976). The relationship of locus of control and compliance to health regimen is unclear. However, Marston found no relationship between locus of control and compliance in myocardial infarction patients (1970).

The review of literature on locus of control shows that there has been a large number of studies using the I-E scale (Rotter, 1966). Some of the studies relate to health behaviors such as smoking, weight loss and birth control. There are very few studies using the HLC scale (Wallston, Wallston, Kaplan and Maides, 1976) and even fewer studies using the MHLC (Wallston, Wallston and DeVellis, 1978). More studies need to use the MHLC for more complete data on a health specific, multidimensional locus of control scale.

In summary, there are a large number of studies on locus of control orientation. The personality characteristics of "externals" differs from "internals" in many areas that affect patient teaching such as trust, aggression, anxiety. Internality is positively correlated with socioeconomic status, and educational level. Low socioeconomic Negroes were the most "external" compared to middle class Negroes and low to middle class Caucasians. Spanish Americans ranged in the middle of the locus of control scale. The effect of locus of control orientation with weight loss, contraception use and smoking are inconsistent. "Internals" learned more about their conditions, but the relationship between locus of control and compliance is unclear.

Knowledge of the Disease

In the past, it was assumed that if patients understood the disease and recommended treatment, they would follow the prescribed regimen and attain the desired therapeutic outcomes. The studies on compliance and outcomes do not bear out this assumption. Patient education is fundamentally a learning process that aims to change attitudes and influence behavior favorably towards health practices. In this interactive process between teacher and learner, deterrants must be recognized and overcome (Katz, Halstead and Wierenga, 1975). Some of the deterrants identified by Katz and colleagues are: (1) prescription without explanation, (2) prescription explanation without cultural context, (3) improper use of available materials, and (4) inattention to the psychosocial adaptation to illness (Katz et al., 1975).

Simon and Steward assessed clinic patients' knowledge about diabetes in the areas of urine testing, personal hygiene, diet, hypoglycemia and hyperglycemia. The mean and median scores were 47 percent. The lower scores were obtained by patients who were older, less well educated, treated for less than three or more than nine years, Spanish speaking and reliant exclusively on the clinic for information (1976). Collier and Etzwiller's study indicated the greatest lack of knowledge in juvenile diabetic patients was in the areas of symptoms of acidosis, testing of acetone, and diet (1971).

Patient comprehension of treatment does not seem to be a factor in compliance, but is not conclusive (Boyd et al., 1974; Hulka et al., 1976; Klein et al., 1973; Podell and Gray, 1974; Sackett et al., 1975).

General information about blood pressure, by itself, probably has little effect on most patients pill-taking compliance or on long-term blood pressure control (Podell and Gray, 1976). An experimental group teaching program and quizzes on blood pressure showed no decrease in dropout or increase with pill taking than the control group after six months (Sackett et al., 1975).

Boyd and colleagues reported that patients have difficulty interpreting "b.i.d." and "t.i.d." directions and need to be given hourly directions. Physicians overestimate the medical knowledge of patients and patients make no aggressive demands for information (Boyd et al., 1974). No difference was found between errors and education, but there was a significant difference in comprehension levels, people forty-five to sixty-four years old had the highest comprehension levels, while people over sixty-five had the lowest comprehension levels (Boyd et al., 1974).

Contrary to other studies reported, Closson and Kikugawa found that patient education had a substantial effect on compliance in cardiac patients (1975). Sharpe and Mikeal reported 85 percent compliance to antibiotic therapy with a higher level of knowledge (1974). Hypertensive patients' knowledge about their medication was positively correlated with compliance (Given, Given and Simoni, 1978).

An experimental group education program conducted by pharmacists met with a group of patients every two months to discuss general education about blood pressure, details of the regimen, and clarification of instruction. The pharmacist also questioned compliance, and sought out problems with complications and side effects. After the pharmacist completed the program, compliance fell to pre-intervention rates. This implies intervention to promote compliance must be continuous, but general information about hypertension probably requires little reinforcement once learned (Podell and Gray, 1976).

Caplan and colleagues found that patients who had the most accurate knowledge of their regimens had the lowest blood pressure. "In fact, knowledge of one's regimen seemed to be more important than general knowledge about the nature of high blood pressure and its control" (Caplan et al., 1976, p. 5). Patients with more complex regimens were less likely to have accurate information about their regimen (Caplan et al., 1976). There was not a direct effect of knowledge on adherence in this study. The authors stated that knowledge was necessary but not sufficient to produce adherence (Caplan et al., 1976).

Starfield and Sharp postulated that compliance with the regimen for treating children with chronic enuresis would improve if nurses intervened by: (1) enhancing family's knowledge of the regimen elements, (2) assisting in its execution, (3) educating the families to eliminate the practice of detrimental procedures, (4) instilling a concept of causation consistent with the treatment, and (5) helping solve other family problems interfering with implementation. The evidence indicated that the nurse was effective in facilitating acceptance of those aspects of treatment which were new to the family and not in conflict with existing ideas and practices. The experimental group clearly did better than comparison group on measures reflecting knowledge and practice of it. On the other hand, most detrimental practices traditionally employed by families, such as punishing, shaming and restricting fluids, continued to be practiced by both groups (Starfield and Sharp, 1968).

Varisrub suggests that even though 50 percent of the patients do not comply to the prescribed regimen, 50 percent do comply with the regimen. More attention must be paid to the patient need for education and encouragement (1975a). People receive their health education from newspaper and television. Traditional education may tell patients very little new information. Varisrub recommends health care providers be less traditional and more imaginative, pay less attention to indoctrination and exhortation and more to patient participation in their own treatment (1975b). "Commitment, which transforms the patient from a passive recipient to a participant, is the enemy of indifference and noncompliance" (Varisrub, 1975b).

There have been a few studies that relate knowledge to outcome. Tagliacozzo and Ima showed that poor control of diabetes is inversely related to knowledge (1970). Findings suggest that knowledge of illness may be selectively involved in different types of illness behavior, conceivably more in acceptance of health care than in compliance with the prescribed regimen (Tagliacozzo and Ima, 1970). There was a statistically significant relationship between knowledge and attendance behavior, patients with low knowledge scores were considerably more prone to terminate care prior to the fourth post-diagnosis visit. Knowledge of illness and its consequences appears to be particularly relevant in the case of an illness characterized by few problems in self-management, less past illness experience, and less demanding treatment (Tagliacozzo and Ima, 1970). High anxiety, low knowledge led to attendance at the clinic as did low anxiety and high knowledge (Tagliacozzo and Ima, 1970).

Patients who had a general knowledge about diabetes managed better than patients who did not have a general knowledge about diabetes. Overall knowledge correlated significantly with overall management and the correlations held true for specific areas, patients who understood the meaning of sugar in the urine made better use of urine tests (Watkins et al., 1976). The longer patients had the disease, the more errors they made in insulin doses and the more they needed help. Possible reasons suggested were: (1) increase in poor eyesight; (2) misunderstanding of prescribed treatment; (3) lack of actual knowledge as why recommended treatment is important and how to carry it out; and (4) lack of motivation (Watkins et al., 1967). This was reiterated by Williams and colleagues who stated that well directed, continuing support of the patient is as important as teaching (Williams et al., 1967).

Knowledge was positively correlated with performance of therapeutic regimen; the higher the patient's knowledge of diabetes, the better patient performed the regimen. However, performance of the regimen was not correlated with control of the disease (Williams et al., 1967). Results of diabetes knowledge tests indicated that "knowledge about diabetes is inversely correlated with control; that is, patients who on average have known more about diabetes have been in poorer control" (Williams et al., 1967, p. 445). For some patients, relatively good control of diabetes is possible with low levels of knowledge (Williams et al., 1967).

In the Watkins and colleagues study, duration of the disease was not related to knowledge, but Lowery and DuCette had different results. Patients with internal locus of control orientation more actively sought information than externals and initially possessed more information relevant to their needs (Lowery and DuCette, 1976). However, the knowledge level of the "internal" diminished over time until "internals" and "externals" possessed the same amount of information (Lowery and DuCette, 1976). "Internals" have fewer problems in the initial period after diagnosis than "externals" because they assume that the information is of value. When internals discover that the assumption is false, they have no adequate response and compliance decreases (Lowery and DuCette, 1976). "Externals" do not actively seek information but eventually gain a considerable body of knowledge about the disease as it progresses. "Externals" may follow a course of compliance with authority causing them to keep scheduled doctor's appointments and follow the prescribed regimen (Lowery and DuCette, 1976).

The review of literature indicates that knowledge, especially of the regimen as opposed to the condition, is an important factor in compliance, but is not sufficient for compliance. Locus of control affects the amount of knowledge acquired particularly in initial stages of the disease. The literature also indicates that education should be an ongoing process to be effective and have an impact with chronically ill patients and their families.

Social Support

There were very few research studies on social support and the relationship of this variable to the other variables in the study. One notable exception was a study by Caplan and colleagues examining the effect of patient education and social support on adherence to the health regimen for hypertension (Caplan et al., 1976). They found that support by the spouse was associated with low levels of depression, but social support from other sources than the spouse did not have the same effect. "On the other hand, social support from the spouse and physician tended to be the highest for patients who were highly motivated to adhere, and social support from the physician was an important correlate of perceived consequences of nonadherence" (Caplan et al., 1976, p. 6). Social support from one source was not always able to be interchanged for support from other sources (Caplan et al., 1976). Although the variables were linked to each other, there was no direct link between social support, or knowledge and adherence. These variables may be necessary but not sufficient conditions for adherence (Caplan et al., 1976).

Social support seems to have a positive effect on compliance. Patients with Rheumatoid Arthritis complied with splint regimen a greater proportion of time when they perceived that their family members expected them to do so. When age, sex and social class were controlled, family expectation remained a significant factor in compliance to splint regimen (Oates et al., 1970).

Patients with Rheumatic fever followed for four years showed that good interpersonal relations within the family tended to predict good cooperation and problems with interpersonal conflict tended to predict the reverse situation (MacDonald et al., 1963). Patients with anxious spouses showed greater anxiety towards their kidney disease (Malmquist, 1973).

A study of dropouts from a hypertension treatment program found that 14 percent of the patients reported the reason for discontinuing treatment was lack of family support and family support was the inferred reason for 38 percent of the patients continuing treatment (Caldwell et al., 1970). Thirty-five patients studied by Diamond and colleagues found that unmotivated patients had poor or nonexistent family relationships (Diamond, Weiss and Grynbaum, 1968).

Lewis et al. tested the construct validity of the Health Locus of Control (HLC) scale on social support and compliance in hypertensive patients (1978). Median splits divided the respondents into high or low categories for the HLC and home assistance (social support measures). The highest level of compliance was reported by "internals" with high levels of perceived home assistance. Surprisingly, the next highest level of reported compliance was in externally controlled patients with low levels of social support. The third highest level of compliance was reported by "internals" with low perceived home assistance, and the lowest level of compliance was reported by externally oriented patients with high perceived home assistance (Lewis, 1978).

An interesting study conducted by New and colleagues, recognizing the importance of social support, compared the amount of agreement of patients and significant others expressed in the evaluations of the patient's functioning capacity of Activities of Daily Living (ADL). The data show some lack of agreement between significant others and patients with significant others attributing more or less independence to the patients than they were able to do (New, Ruscio, Priest, Petritis and George, 1968).

Crooz, Lipson and Levine studied help patterns in severe illness, including kin, nonkin and community resources. They stated,

> In practical terms, these findings may also mean that (a) the better integrated the individual, the higher the degree of assistance he receives, and (b) that nonfamily sources are apparently as available and helpful to him as most categories of the kin group (Crooz, Lipson and Levine, 1972, p. 39).

In addition, ethnic origin, social class and perceived setbacks were not associated with the help pattern (Crooz et al., 1972).

Although there have been relatively few studies on social support, all of the studies indicate that social support positively affects compliance. People with internal control orientation and high social support have high compliance. The lowest level of compliance was reported by externals with low social support.

Compliance

There has been a large increase in compliance literature in the last one and a half decades. This section of the review of literature examines selected, major or classic studies and papers on compliance. The problem of noncompliance, the effect of demographic and personality factors on compliance, reasons for noncompliance and methods used to increase compliance are addressed.

Other reviews of literature on compliance have been done by Marston (1970), Mitchell (1974) and Sackett and Haynes (1976).

It is generally acknowledged that compliance to health regimens varies greatly, but 50 percent average compliance is most often reported (Rosenstock, 1975). One reason for this variation in reported compliance is due to the degree of acceptable compliance as described by the researcher. Error rates have been described by several researchers (Boyd et al., 1974; Closson and Kikugawa, 1975; Hulka et al., 1976; Klein et al., 1973; Reibel, 1969; Weintraub, William and Lasagna, 1973).

Noncompliance with prescription medications varies from 78 percent (Boyd et al., 1974) to 58 percent (Hulka et al., 1976). Boyd and colleagues found that 31 percent of their patients were missing medications in a manner that posed a serious threat to the patient's health (Boyd et al., 1974). In another study, cardiac drugs and antidiabetic agents which have the greatest effect on the patient's health status, were subject to less than average medication-taking errors (Hulka et al., 1976).

The most frequent errors with prescription medications concerned improper dosage intervals and premature discontinuing of medications: improper dosage intervals, 143 out of 256; prematurely discontinuing, 116 out of 256; doses forgotten, 90 out of 256; and dosage knowingly omitted, 89 out of 256 (Boyd et al., 1974). Hulka and colleagues found the average error rates were: omission 19 percent, commission 19 percent, misconceptions 17 percent, and scheduling noncompliance 3 percent (Hulka et al., 1976).

Closson and Kikugawa stated that undefined characteristics of certain drug classes relate them to greater than average patient error potential. The percentage of errors for tranquilizers, antacids and absorbents was significantly higher than those of other drugs. Cardiac drugs were taken in error significantly fewer times than other drugs (Closson and Kikugawa, 1975).

Davis states that the patient may comply with all, some, or none of the regimen. The patient may also comply with each regimen in different degrees, and assuming the patient complies at all, it is clear that this may occur either consistently or intermittently through time (Davis, 1971). Changes in personal habits which restrict behavior are the most difficult, while taking medications is the easiest to follow. Davis asked patients how closely they followed the physician's advice with the following results: (1) 14 percent compliant all the time, (2) 49 percent compliant most of the time, (3) 23 percent less than half the time, (4) 9 percent very seldom, and (5) 5 percent none of the time (Davis, 1971). Types of recommendations were medications, diet, limiting smoking and alcohol consumption, and changes in work activity.

A study of patients with mandibular fractures (jaw) found that 17 percent had previous fractures of the same type. They found that patients noncompliance consisted of discontinuing immobilization, failing to return for follow-up and even, removing intermaxillary fixation. They recommended the simplest method of fracture treatment to try to counteract this noncompliance (Karin, Lynch and Whitaker, 1976).

Chronic hemodialysis, a long-term, life saving treatment, does not seem to generate any better compliance. Adherence to diet based on weight gain between dialysis found: 5 excellent, 10 good, 8 fair, 13 abuse, and 7 greater abuse (Kaplan and Czackes, 1972).

Ludwig and Adams studied rehabilitating patients and found that of 406 patients in the Rehabilitation Center, 43.8 percent completed the recommended service. The remainder 56.2 percent left before service was completed or were discharged by the staff because of failure to make satisfactory use of services (Ludwig and Adams, 1968). Compliance with wearing splints in Rheumatoid Arthritis patients was only 34 percent (Moon, Moon and Black, 1976).

These studies describe the problem of noncompliance to health regimen but what are the reasons for this noncompliance. Reasons for noncompliance have been extensively studied in the past years, providing much useful information and many inconsistent findings.

The effect of demographic information on compliance is inconclusive and depends on the study. Blackwell reports that errors and noncompliance increase in occurrence at extremes of age, and women under thirty years of age defaulted twice as often as men. Findings for education, economic and ethnic factors were inconsistent (Blackwell, 1973). Boyd and associates found that there was an increase in comprehension levels (knowledge of medications) of females and whites but this difference was not seen on compliance (Boyd et al., 1974). Boyd states that the literature fails to offer consistent conclusive relationships between noncompliance and demographic variables (Boyd et al., 1974). Age generally has little effect on compliance except for a slight increase in noncompliance at the extremes of age, especially older age people (Boyd et al., 1974; Komaroff, 1976).

Socioeconomic factors are obscure. There is some evidence of increase defaulting in lower socioeconomic groups. However the major problem is lack of balance in socioeconomic distribution in any given study group. There is some decrease in defaulting in patients seen in private practice than clinics which could suggest a socioeconomic factor (Boyd et al., 1974).

Davis' study found that none of the demographic characteristics of the patient were associated with compliance (Davis, 1971). These findings were collaborated by Francis, Korsch and Morris (1969). Age, sex, marital status, education, current activity, number of people in household and social status showed no significant difference (Hulka et al., 1976). Klein and colleagues found no significant relationship between drug-taking behavior and age, sex, diagnosis, length of hospitalization, type and amount of medication (Klein et al., 1973).

A study of the Rheumatoid Arthritic patients found that complying and noncomplying groups were comparable with respect to sex, but there was a trend for the complying group to be older than the noncomplying group. There was also a trend for compliers to be overrepresented by married patients. This may imply a favorable role for social support in maintaining exercise regimens (Carpenter and Davis, 1976).

Employed patients were proportionally equal between compliers and noncompliers. However, housewives were more frequently compliers (35 percent) than noncompliers (4.4 percent), while retirees and students were more frequently noncompliant (57 percent) than compliant (24 percent) (Carpenter and Davis, 1976).

Sackett and Haynes reviewed over one hundred studies that reported demographic data. These data show no association to compliance or noncompliance in over twice as many studies as those that showed some relationship and Sackett and Haynes stated that the differences can be explained beyond those occurring from sampling variation and overworking data. Most of the studies are clinic-based populations, or those people who have already entered the health care system.

> Prospective community-based studies, however, suggest that demographic factors may play an important role in the utilization of medical services. For example, those who are both poor and black use health facilities less than more affluent whites. If the "disadvantaged" former group could be brought under medical care, it remains to be seen whether their compliance with therapy would be independent of demographic features (Sackett and Haynes, 1976, p. 29).

Demographic factors seem to have a greater effect on access to health care than upon compliance with therapy among patients who are already in the system.

What part certain personality factors play in compliance is still uncertain. Blackwell describes several relationships between personality and compliance. The longer a person has remained well the more he will be prepared to gamble on continued good health. Unfavorable attitudes towards authority in schizophrenics increase defaulting. Women who default on Birth Control Pills are more immature, irresponsible and impulsive. Other types of defaulting are obsessional with fear of losing control or becoming drug dependent. Paranoid or hypochondrial patients fear medications may harm them (Blackwell, 1973).

Hague and associates tested one hundred and ten volunteer inpatient alcoholics and found no significant difference among the three treatment disposition groups on any of the personality, cognitive and perceptual variables. Level of personality adjustment, intellectual, cognitive abilities, perceptual differentiation, perceived responsibility over personal behavior and defensive style after detoxification are not predictors of significant treatment disposition (Hague, Donovan and O'Leary, 1976). They suggest that studies are needed which provide a multivariate analysis which utilizes demographic, life history, psychosocial and personality variables as predictors (Hague et al., 1976).

There have been a few studies of patients response during rehabilitation. Hyman gathered data from interviews and rating forms of medical staff on the patient's self concept, attitudes towards pre-morbid life situation and attitudes towards illness upon motivation and functional improvement during stroke rehabilitation program. The patient's feeling of stigma (lower self concept) affected adversely both motivation and functional improvement (Hyman, 1972).

Ludwig and Adams studied the client and his role in a rehabilitation setting which they described as entailing a relationship with health personnel involving submission to an arduous regimen with only limited success possible. Persons whose normal social relationships contain elements of dependency or subordination were found more likely to complete rehabilitation services (Ludwig and Adams, 1968). This involves role theory or the behavior expectations of the sick as described by Parsons. Sick role behavior involves exemptions from certain normal role responsibilities and the right to have people take care of them. Sick role duties entail the obligation to want to get well as soon as possible and to seek and cooperate with technically competent help to accomplish that end. Hospital roles enforce passivity and dependency. Rehabilitation, however, requires an active role yet considerable submission of the patient for highly regulated activities which are often tedious, fatiguing, physically painful or frustrating. Rehabilitation frequently involves a painful process of relearning the elementary

Activities of Daily Living. Ludwig and Adams hypothesized that certain aspects of the patient's social position and normal role relationships before his illness or disability will aid or impede him in accepting and adequately playing the role expected (1968). Specifically, patients whose social position places them in a status of dependency or subordination, will be more adept at assuming the client role and continuing treatment to a successful completion (Ludwig and Adams, 1968).

Ludwig and Adams had some interesting results that do not go along with other studies on demographic data. This may be due to the Rehabilitation setting. For age, the greatest compliance was among the very young, 10-19 years (78.9 percent) and over sixty (70.6 percent). They believed this was because these groups were more used to being dependent. Forty to fifty-nine year old people had the largest percentage of not completing the program. These years correspond with the greatest time of independence. Women were more submissive than men and complied 71.1 percent to 53.8 percent. Nonwhites completion was 73 percent compared to whites 54 percent. Those possessing the security of employment had 53.1 percent compliance as compared to those who were unemployed, 78 percent. The lowest rate of completion were people who were employed in the independent age status (51.9 percent). The highest rate was in the dependent age status (81.8 percent). The employed have some place to go when they leave the hospital. Employment status makes a great deal of difference; age and sex make some difference, particularly among the unemployed, but are overshadowed when unemployment is a factor contributing to dependency (Ludwig and Adams, 1968).

Ludwig and Adams also stated that people referred to Rehabilitation by an agency or whose treatment is being paid by an agency are more likely to complete Rehabilitation except those whose treatment is paid by Worker's Compensation. Selective factors may contribute to this. There are no selective factors in Worker's Compensation. People who receive Worker's Compensation are in a situation of attempting to demonstrate their disability to continue receiving compensation, while at the same time being expected to cooperate in efforts to improve their condition (Ludwig and Adams, 1968). The medical staff's evaluation of the patient's favorable versus unfavorable attitude proved 67.6 percent with favorable evaluation completed the program in comparison to 18.8 percent unfavorable attitude. However, this may be due partly to the artifact of measuring (Ludwig and Adams, 1968).

Kaplan and Czackes studied the effects of a number of personality factors on noncompliance with medical regimen (diet) with forty-three patients on chronic hemodialysis. The study showed that low frustration tolerance and gains (primary and secondary) from the sick role were the most frequent causes for noncompliance, and these differentiated significantly between compliers and noncompliers. "Acting out" was frequent in both groups though more severe in noncompliers. Suicide thoughts were expressed by both compliers and noncompliers. The high rate of noncompliance was believed to be due to aggression. The dependency of dialysis and loss of mastery causes increase hostility and aggression (Kaplan and Czackes, 1972).

Farmers with high work orientation (determined by a questionnaire) tended to have a negative attitude toward health agencies and physicians and to report noncompliance with advice of their physician. The high work orientation group was less likely to know their reasons for medications (Willis and Dunsmore, 1967). Komaroff, in an editorial, describes noncompliant patients as having hostility towards authority figures, immature and impulsive personality, obsessional patients for whom dependence on a drug threatens self-control, or paranoid patients who see medications as evil (Komaroff, 1976). Wilson suggests that some patients are more susceptible to drug errors than others, implying subtle interpersonal or psychological relationships which moderate error frequency (Wilson, 1973).

Given and colleagues found that patients' knowledge about their medication and perception of the medication's benefits were positively correlated with compliance (1978). The patient's perception of the medication's benefits had a stronger relationship with compliance after a five month study period (Given et al., 1978).

Rosenstock states that a patient will not comply to the health regimen unless he exhibits the following set of characteristics: (1) health motivation, (2) perceived susceptibility to a particular illness, (3) perceived severity, (4) perceived benefits of professional intervention, (5) perceived barriers to taking action, and (6) knowledge of the medical condition and the prescribed regimen (Rosenstock, 1975). Perceived severity implies that the patient believes a future occurrence of a given illness would have a serious impact on his life or in an existing illness state, if left untreated, could have an undesirable impact. Perceived barriers to action means that the patient believes the cost (financial, psychological, social) of the recommended action are outweighed by the perceived benefits (Rosenstock, 1975).

"Fear arousal" has only been effective in changing behavior in certain circumstances and then only for a short period of time. Fear arousal attempts to influence the person's perception of severity. It was assumed that if a person thought his disease was serious, he would be more likely to do something about it. However, high fear arousal may immobilize the individual or incite massive denial or other escapist behavior, whereas too low fear arousal may not be enough to motivate. Moderate fear arousal often appears to be most effective, but fear messages must be accompanied by a specific action recommendation that the individual can take to reduce his fear (Becker and Maiman, 1975). Boyd found that fear producing messages generated desired effects among low socioeconomic status groups and more reassuring messages had better results among high socioeconomic status groups (Boyd et al., 1974).

With chronic illness, the patient's perceptions of the severity of his illness and his control over the disease is a problem. The chronic illness course usually is or appears to be altered only slightly by treatment. Noncompliance is common. The same is true of acute minor illnesses or asymptomatic long term illnesses where the symptoms are brief but treatment is required for prophylactic purposes (Komaroff, 1976).

Ludwig and Gibson studied the self perception of sickness and seeking medical care. They found that two life situational factors of income and welfare contact, and three measures of systems orientation were found to be related to the seeking of health care, but urgency and number of systems were not. Subjects with low income, recent welfare contact, and negative systems orientation were most likely to fail to seek medical attention. Systems orientations proved to be associated with low income and welfare experience suggesting that orientations may be created by situational factors and serve as rationalizations for failure to seek care when situational factors make it difficult to do (Ludwig and Gibson, 1969).

Suchman studied host, agent and environmental factors as they applied to an analysis of the acceptance or rejection of an accident preventive measure among sugar cane cutters in Puerto Rico. Host factors of "personal readiness" as measured by attitudes towards prevention, concern about having an accident, belief in one's vulnerability, job satisfaction, general adjustment, fatalism and health knowledge and behavior were found to affect acceptance of preventive measures (1967). Agent factor as represented by negative and positive characteristics of the protective measure also strongly affected acceptance. While environmental factors related to exposure to mass media and social participation were found to be related to acceptance, attempts to utilize social pressures to secure acceptance did not prove as successful as direct health education (Suchman, 1967).

Wilson states that the relief of symptoms should increase compliance, but the reverse is true, decreasing symptoms causes the patient to stop the prophylactic treatment. The severity, seriousness of the disease and extent of the disability often show an unexpected inverse correlation with compliance (Wilson, 1973). The composite picture of a mother who complies with medical orders has a high level of concern for health care, believes the illness is a threat to the child, is emotionally "stable," has confidence in the physician and the efficacy of the medication (Wilson, 1973). Most of these parameters can be altered through learning or intervention techniques.

Kasl and Cobb reiterate Rosenstock's ideas by stating that the perceived amount of threat, and attractiveness or value of behavior affect compliance. Threat depends on: (1) the importance of health matters to the individual, (2) perceived susceptibility to disease, and (3) perceived seriousness of consequences. Attractiveness depends on the perceived probability that action will lead to desired preventive results, and the unpleasantness or cost of taking action compared with taking no action and suffering the consequences (Kasl and Cobb, 1966).

Although the patient-provider relationship is not considered in this study, some results from previous research has implications for compliance theory. Compliance is better in private practice patients than in clinic patients where the patient and physician do not know each other (Blackwell, 1973). If the mother of a sick child was satisfied with the initial visit, the physician was perceived as friendly and understood the complaint, compliance increased. The physician's attitude toward medication also made a difference. If the physician asked about improvement, side effects and was reassuring, compliance was greater (Blackwell, 1973). Weintraub and colleagues, in studying patients taking Digitoxin and diuretics, reported one physician who had 100 percent patient compliance. The physician went over each drug with the patient at each visit (Weintraub et al., 1973).

The ways on which doctors and patients initially fit their activity into presumable institutionalized patterns of behavior appropriate for provider-patient interaction and the way they deviate over time from institutionalized role expectations was found to be related to variation in patient compliance. The doctor and patient are unable to exercise control over their cooperative efforts in an integrated way and are unable to satisfy their individual needs for control; they are unsuccessful in their attempts to conform with institutionalized prescription for doctor and patient. Consequential insecurity results in expressive-malintegrative behavior and patient's noncompliance. The focus is on the structure of the interaction and not the individual profiles. Compliance was associated with patient agreement and tension release and with patient activity oriented toward seeking the doctor's opinion and analysis (Davis, 1971). Francis et al. explored the effect of verbal interaction between the doctor and patient on patient satisfaction and follow-up on medical advice with 24 percent grossly dissatisfied, 38 percent moderately compliant and 11 percent noncompliant (1969). The extent to which patient's expectation from the medical visit were left unmet, lack of warmth in doctor-patient relationships and failure to receive explanation of diagnosis and cause of child's illness were key factors in noncompliance. There was a significant relationship between patient satisfaction and compliance. Illness that the mother regarded as very serious was associated with increased compliance (Francis et al., 1969).

One hundred twenty-three Rheumatoid Arthritic patients answered a questionnaire on perceived length of time waiting for appointment, physician time spent with the patient, nature of the doctor-patient relationship, and the patient's perception of the success of the treatment. People who were kept waiting for clinic appointments were significantly lower compliers, 60 minute wait, 31 percent compliance; 30 minute wait, 67 percent compliance. Twenty-two percent of the people who felt the doctor did not spend enough time with them were noncompliers as compared to 56 percent compliers among those who felt the doctor spent enough time with them (Geertsen, Gray and Ward, 1973). When the doctor was felt to be personal, there was 61 percent compliance. There was only 35 percent compliance by people who felt the doctor was too businesslike. However, this was not true in another study on cardiacs, so one should not generalize to different types of illnesses. The patient's expectation of treatment was shown to be important for compliance. Only 37 percent of the patients who felt the crippling effects of Rheumatoid Arthritis were inevitable or that treatment will be unsuccessful are full compliers, compared to 61 percent of those that had greater faith. The physician needs to instill confidence in his clients and needs to be perceptive to the expectations of the patient (Geertsen et al., 1973).

Horenstein and Houston in relating confirmation or disconfirmation of initial client expectations to dropout from psychotherapy did not offer clear cut results. This study offered a curvilinear result while previous studies have offered linear relationships. Cultural and intellectual difference between the lower class patient population, which exhibited linear relationships between expectancy confirmation or disconfirmation and dropout, and the present college population, which was curvilinear, were discussed as factors that contributed to the divergent findings (Horenstein and Houston, 1976).

Communication represents the extent to which the physician is successful in transmitting information and instruction to the patient, while compliance measures the extent to which the patient's behavior is modified by these instructions. It has been assumed that the patient takes the drugs prescribed and the physician knows which drugs they are. In Hulka's study, only 40 percent of the patients with Diabetes Mellitus and 27 percent with Congestive Heart Failure were in complete agreement with the physician on all drugs prescribed (Hulka, Kupper, Cassel, Efird, and Burdett, 1975).

Partly due to the large amount of noncompliance and their own emerging professions, nurses and pharmacists are conducting much of the patient teaching regarding recommendations for treatment. Patient education has long been recognized as a nursing function (Pohl, 1968; Redman, 1972). Health associates (nurse practitioners) showed a tendency to report providing drug information to patients more frequently than physicians (West, 1975). Pharmacists have been clarifying medication information and teaching patients about their drugs (Podell and Gray, 1976; Sharpe, 1974). These other health professionals will need to be aware of the patient-practitioner relationships on and its influence on patient compliance.

Interviews with patients often do not describe accurately the amount of compliance. Gordis and colleagues interviewed mothers whose children were taking oral Penicillin for Rheumatic Fever. The mothers stated that 88 percent had taken Penicillin and 12 percent had not. The urine test showed 68 percent had taken Penicillin while 32 percent had not. During a six month period, 22 percent of the children were classified as noncompliers on the basis of the urine test, only 9 percent would be classified noncompliers by the mothers' statements. This discrepancy represented a tendency of the mothers to upgrade the levels of their children's compliance (Gordis, Markowitz and Lilienfeld, 1969). There are some patient interview forms that have been developed. The advantage of patient interviews is that they are a more indepth study of subtle types of errors, but the disadvantage is reliance upon the patient to respond truthfully. Mechanisms for checking reliance have been built into some studies. A discrepancy exists when comparing dosage unit counts, but not serious error when noncompliance is large. Accuracy can be increased on interviews by decreasing guilt (Boyd et al., 1974).

Reasons given for noncompliance are many and varied. In some cases, the reason given may not be the true reason for lack of compliance, for instance when the patient does not really know why he does not comply as with some of the personality characteristics. Therefore, the following stated reasons for noncompliance should be taken as cues, but they may not be the whole reason recommendations are not followed.

Blackwell found that people with chronic illness are more prone to lapses in compliance especially if the treatment is prophylactic or suppressive, when the condition is mild or asymptomatic, or when the consequences of stopping treatment are delayed. When relapse is immediate or severe, the patient is less likely to deviate. In chronic illness, forgetfulness complacency or boredom can all contribute to noncompliance (Blackwell, 1973). Reasons given were: (1) patient felt well--37 percent; (2) carelessness--27 percent; (3) failure to understand purpose of the treatment--19 percent; and (4) insufficient money--17 percent (Blackwell, 1973). Multiple medications and frequent dose regimen leads to noncompliance. The occurrence of side effects discourages compliance. Also, the setting in which the medication is prescribed and the extent to which taking it is supervised influences complications. Patients living alone have increased defaulting (Blackwell, 1973).

Drug side effects may affect noncompliance with medications like tranquilizers, sedation or pleasurable response; and antacids, problems with liquids, timing, questioning the effect of nonprescription drugs, cost and taste. On the other hand, cardiac drugs usually have a more intensive initial indoctrination and closer follow-up supervision (Closson and Kikugawa, 1975).

Shaw and colleagues studied the number of patient complaints to diabetes regimens of diet only, diet and oral hypoglycemic agents and diet and medications (Shaw, Bulpitt and Bloom, 1977). Compliance was not tested, but the results of the study have relevance to compliance theory. The highest complaint rate was on oral hypoglycemic agents. Patients under 59 years of age tolerated oral hypoglycemic agents less well than diet alone or diet and insulin while the reverse was true in older patients (Shaw et al., 1977).

A study of eight hundred outpatient clients showed that when three or more medications were prescribed or when both medications and treatment were prescribed, compliance was significantly lower. Reasons given for not making follow-up visits were lack of transportation, lack of money, and problems at home. Problems arose when the prescription was too complex for the mother to understand; the prescription made the child seem worse; the child had previously had that medication and it did not work or home remedies worked better (Francis et al., 1969).

Ninety-one of 225 patients interviewed by Brand et al. had not complied with one or more of the physician's orders. The most frequently cited reasons were: cost of drugs (31 patients); patient attitude (16 patients); misunderstanding of physician's advice (15 patients), negligence, senility or alcoholism (15 patients); community services not received (7 patients); no reason given (5 patients); and failure of referral (2 patients). "A significant component of noncompliance was the lack of adequate communication or understanding between hospital physicians, community health agencies, and patients" (Brand, Smith and Brand, 1977, p. 75).

There was an association between the size of the patient's prescription load and the patient's compliance. The difference between number of prescriptions was significant between compliers and noncompliers. The results were similar when compliers and noncompliers were compared according to the amount of their dosage (Brand et al., 1977). "These results suggest that prescription load, or dosage, when combined with the cost of drugs, can have a marked effect on compliance with physician's orders; it is the added financial burden imposed by drug costs that brings about the more pronounced effect" (Brand et al., 1977, p. 76). The average monthly cost of drugs prescribed for the patients who were noncompliers was almost three times higher than the cost for patients who complied: $14.65 compared to $5.16 (Brand et al., 1977).

Hulka's study showed that there was an increase in drug-taking errors when: (1) more drugs were involved between the doctor-patient pair, greater commission and omission, (2) greater complexity of scheduling, greater number of errors of commission and scheduling misconception, and (3) lack of information on drug function, greater errors of commission and scheduling misconception. Neither the characteristics of the patients nor the severity of the disease affected the number of errors (Hulka et al., 1976). Volitional noncompliance on the part of the patient plays a small role in overall problem of medication misuse. Scheduling noncompliance is a function of the patient and his symptoms rather than the physician and his recommendations, for example tranquilizers. Cardiac drugs and anti-diabetic agents, which have the greatest effect on patient's medical status, were subject to less than average amount of medication-taking error (Hulka et al., 1975).

Davis stated that noncompliant patients can be identified by examining coping mechanisms, dependency, defensiveness and externalization. Self-care that requires patient judgement are more closely associated with noncompliance. Family discord is associated with noncompliance while availability of local help and family cohesiveness during crisis are associated with increased levels of compliance (Davis, 1968). Bille found that patients who reported a more positive body image also reported a higher ratio of compliance with posthospitalization (Bille, 1977).

Donabedian and Rosenfeld found that the need for institutionalization arises partly from deficiencies in implementing care and supervision within the patient's environment. In a follow-up study of recommendations made to discharged patients with heart disease, Rheumatoid Arthritis and Diabetes, they found that:

> More than half (51 percent) of all patients did not comply with one or more recommendations. Deficiencies in the receipt of service arose most frequently with respect to rehabilitation services. Half the patients who had recommendation for such service did not obtain service in the manner recommended. Similarly a third of patients with recommendations with regard to personal regimen and a fifth of patients with recommendations for medical supervision and social services, respectfully, did not carry out recommendations. Nursing recommendations and recommendations for institutional care were not carried out in 17 percent and 14 percent of cases respectively (Donabedian and Rosenfeld, 1964, p. 853).

Reasons given for noncompliance were deficiencies in the hospital, 12 percent, and patient deficiencies, 70 percent, the latter including negligence, insufficient motivation, or inability to cooperate, 28 percent, doubt about value of recommended procedure, 14 percent, resistance to recommendations, 10 percent, lack of family cooperation, 4 percent, cost, 4 percent, reasons unknown, 10 percent (Donabedian and Rosenfeld, 1964).

These data indicate that there is some knowledge regarding the reasons why people do not comply with the recommended health regimen, but much more information is needed.

Many measures to increase compliance can be drawn from the preceding pages, particularly the reasons given for noncompliance and personality factors. Blackwell suggests to avoid poor compliance one should: (1) recognize the at-risk patient, (2) do thoughtful treatment planning (decrease number of drugs, and choose regimen compatible with patient's every day habits), and (3) make proper explanation to the patient. The most important contribution to compliance, according to Blackwell, is the understanding a patient has of his illness, the need for treatment and the likely consequences of both (Blackwell, 1973). Boyd and associates agree with Blackwell that the major contributing factor to drug defaulting problems was lack of complete and comprehensible directions from either the pharmacist or physician (1974). Written prescriptions and prescription labels are deficient in providing information concerning timing of administration and purpose of medication. Inconvenience in administering dose at a given time during a patient's daily routine is likely to lead to intentional noncompliance (Boyd et al., 1974). Boyd also states that therapeutic counseling by the pharmacist causes the patient to make fewer drug errors, but the physician is initially more accepted than the pharmacist for this function (Boyd et al., 1974). Closson feels that the low therapeutic index of many cardiac drugs (defined as the ratio between the median toxic dose and the median effective dose) causes health professionals to reiterate often the correct prescribed regimens to their patients. Cardiac drugs were taken in error significantly lower number of times than other drugs (Closson and Kikugawa, 1975).

Eshelman and Fitzloff studied hypertensive patient's response to PAK pill dispenser versus a bottle of tablets for chlorthalidione. All subjects were telephoned before their next visit and reminded to bring their medication containers with them. Urine specimens were examined. The results of the urine assay showed PAK users were significantly more compliant ($p < 0.05$). However, there was no difference in compliance rates as measured by pill counts. Not much credence can be given to counts when patients bring their containers in to the clinic. The patients who used the PAK dispenser stated it helped them remember drugs (Eshelman and Fitzloff, 1976). Komaroff suggests prescribing medication that looks different so the patient does not get them mixed up (Komaroff, 1976).

One new method having fairly good success is a contract between the practitioner and the patient. Steckel found that contracting with patients caused a significant reduction in blood pressure of Hypertensive subjects (Steckel, 1976). Advantages of formalized contracts are: (1) a clear definition of the responsibilities of the parties involved, (2) stimulation of a planned approach to meeting today's health care needs, (3) stimulation of improved comprehensive care, (4) enhancement of the team approach to health care by serving as an instrument of communication, thus keeping the numerous participants aware of each other's activities and progress, (5) fostering of accountability, (6) legitimizing the concept that the patient shares in the responsibility for his own health, and (7) protection against a claim of breach of contract or malpractice by either party (Etzwiler, 1973).

Decreasing "no shows" at clinic appointments, was accomplished by sending reminders that needed to be detached and sent back. It was concluded that a change in reminder notes produced a real addition to clinic attendance at no additional cost to the clinic (Cook, March and Noble, 1976). Gates and Coborn also found reminders by letter and to a lesser degree, telephone, increased return to clinics. The most compliance was noted in chronic illness follow-up and physical examination, while the least was for people scheduled for screening (Gates and Coborn, 1976). Fletcher and colleagues agreed that follow-up increased patient returns to clinic, but there was no difference in medical outcome, 51 percent of the intervention group and 53 percent of the control group had normal blood pressure five months later (Fletcher, Appel and Bourgeois, 1975).

Other different methods also show varying results. Traditional (clinic) care versus continuity (being seen by the same staff each visit) of care demonstrated no difference in compliance (Gordis et al., 1971). The use of indigenous neighborhood aids for teaching primiparas showed no difference in long-range behavior, although the aid was more immediately effective (Holder, 1972). The Memphis Chronic Disease Program helped to break down the barriers of the rigid Out-Patient Department through utilization of decentralized units near the patient's home where he can receive advice or a home visit. The study group had significantly reduced hospitalization compared to the control group (Runyan, 1976).

Approximately 50 percent of patients will not comply to the recommended health regimen completely. Demographic data apparently has little effect on compliance but the patient's personality and health beliefs do affect compliance. The practitioner/patient relationship is also a factor. The effect of patient education has not shown conclusive results, but should not be ruled out as yet. Reasons stated for noncompliance are many and varied and need further study. The area of greatest need is in methods of increasing compliance to the health regimen, especially among the chronically ill group. As Becker and Maiman point out that patient noncompliance has been extensively documented, but remains the least understood health related behavior (1975).

Therapeutic Outcomes

There have been relatively few reports of therapeutic outcome studies beyond morbidity and mortality statistics. This section of the chapter will review the limited number of studies available with an emphasis on diabetes outcome.

A study by Given, Given and Simoni measured outcomes of hypertensive patients in terms of functional status, clinical health status, knowledge level of therapeutic regimen and perception of health status and care at the beginning and end of a five-month study (1979). Compliance with the health regimen was significantly related to outcomes as well as knowledge level and perception of the disease and its management (Given et al., 1979).

Most of the studies of outcome measurement for diabetic patients relate to vascular complications and mortality (Chugh, Parkash and Agarwal, 1976; Krolewski, Czyzyk, Janeczko and Kopczynski, 1977; University Group Diabetes Program, 1970). These studies are important because of the belief that the lowering of blood sugar levels to near normal postpones or prevents vascular complications (Cahill, Etzwiller and Freinkel, 1976; Prout, 1971).

Another study of outcome measures was conducted on patients with congestive heart disease by Romm, Hulka and Mayo (1976). Outcome measures were determined by an index of activity and symptomotology on eleven Activities of Daily Living from least energy requiring (dressing) to most energy requiring (heavy housework) (Romm et al., 1976). Over half of the patients could perform most activities of daily living without much difficulty. The final activity status was related to initial status. Other variables associated with greater final activity was fewer prior hospital admissions and greater patient satisfaction (Romm et al., 1976). The results supported the hypothesis that initial status was the primary indicator of health at the end of the study with process measures playing relatively little role (Romm et al., 1976).

One of the most significant and controversial studies on diabetes therapeutic outcome was conducted by the University Group Diabetes Program (UGDP) (1970). The study was a five-year longitudinal study of two hundred patients in each of five treatment groups, insulin variable, insulin standard, sulfonylurea oral agent, biguanide oral agent and placebo. The subjects were all maturity onset diabetics of equal severity who had been diagnosed one year before the start of the study. There was a large number of baseline vascular problems: hypertension, 31.5 percent, history of angina pectoris, 5.8 percent, electrocardiographic abnormalities, 44.1 percent, elevated cholesterol, 13.4 percent, decreased visual acuity, 5.4 percent, arterial calcification, 16.8 percent, and fundus abnormalities, 16.5 percent (UGDP, 1970). Fasting blood sugar was an outcome measure. Patients on diet only and placebos had a mean fasting blood sugar of 157 mg/dl. The insulin variable group had a mean fasting blood sugar of 110 mg/dl. In between these two extremes, patients taking oral hypoglycemic agents had fasting blood sugars of sulfonylurea, 152 mg/dl and biguanide of 147 mg/dl (UGDP, 1970). There were a significant number of deaths in the tolbutamide, sulfonylurea group, without evidence of baseline cardiovascular problems (Prout, 1971).

The results of the study did not provide any evidence that insulin or oral agents alter the trajectory of vascular complications in adult-onset, noninsulin-dependent diabetic patients. Weight reduction has been shown to lower blood sugar and therefore diabetes management should emphasize dietary control (Knatterud et al., 1978). "In any case, the UGDP results suggest that the use of any additional agent must be justified on grounds other than prevention of microvascular complications" (Knatterud et al., 1978, p. 42).

The controversial conclusion drawn by the UGDP was that "there is little hope that the vascular complications in patients with adult-onset diabetes will be prevented by simple control of blood glucose levels utilizing present methods of therapy" (Prout, 1971, p. 1072). This statement was strongly opposed by Cahill, Etzwiller and Freinkel (1976) in reporting the accepted policy of the American Diabetes Association.

In addition, the UGDP strongly recommended that oral hypoglycemic agents not be used, and if the patient could not be controlled by diet only, insulin was the medication of choice (UGDP, 1970; Prout, 1971). Insulin was preferred because the results of the UGDP showed that insulin was more uniformly effective in controlling hyperglycemia and unlike the sulfonylurea agents, was not associated with increased mortality (Prout, 1971). A study in Poland showed that mortality rates were not related to hypoglycemic therapy in men. In women, the highest mortality was in the insulin treated group, next highest was in the oral hypoglycemic agents and the lowest mortality was in the diet only group (Krolewski et al., 1977). The authors concluded that the results of the study do not confirm the oral agents increasing the risk of cardiovascular disease (Krolewski et al., 1977).

Although obtaining and maintaining near normal blood sugar levels is still controversial, most of the limited

number of outcome studies include blood sugar levels or incidence of hypoglycemic or hyperglycemic reactions as outcome measures (Lowery and DuCette, 1976; Sczypak and Conrad, 1977; Williams et al., 1967).

Lowery and DuCette included some outcome measures in their study of locus of control and compliance of diabetic patients. The outcome measures used were clinic record incidences of: elevated blood sugars, infection, hyperglycemic or hypoglycemic reactions, weight gain or missed appointments. Weight gain and missed appointments were considered to be direct measures of outcome. The average number of problems for weight and missed appointments per month are: (1) internal locus of control orientation with diabetes for three years, weight--.159, missed appointments--.138; (2) internal locus of control with diabetes for six years, weight--.130 and missed appointments--.093; (3) external locus of control with diabetes for three years, weight--.185 and missed appointments--.093; and (4) external locus of control with diabetes for six years, weight--.094 and missed appointments--.058 (Lowery and DuCette, 1976).

Two pharmacists, Sczupak and Conrad, monitored patient medication and provided information on the medications to a study group. They observed greater control in the study group compared to the control group as evidenced by significant reductions in patient symptomatology of hypoglycemia, complaints of nocturia, polyuria, polyphagia, and polydipsia (1977). Differences in weight change, and insulin reaction were not significant (Sczypak and Conrad, 1977). Differences in laboratory values for urine and two-hour postprandial blood sugars were significant for the study group. Fasting blood sugars did not have the same results (Sczupak and Conrad, 1977). Additional criteria included: number of changes in therapeutic regimen, incidence of hospital admissions, and number of clinic contacts. All of these were positively significant for the study group. The only outcome that was not significant was incidence of emergency visits (Sczypak and Conrad, 1977).

Since diabetes is frequently an asymptomatic disease, Shaw and associates hypothesized that patients who felt well would not tolerate side effects as a result of treatment (Shaw et al., 1977). Patients on diet only had the shortest duration of diabetes while those on insulin had the longest duration of diabetes. Patients on an oral hypoglycemic agent weighed more than patients on diet only or diet and insulin (Shaw et al., 1977). The outcome measures were: hypoglycemic reactions (complaints of sweating, apprehension or hunger); gastrointestinal symptoms, change in appetite, dry mouth or increased thirst, nocturia (getting up at night to urinate), cramps, sensory changes in limbs, slow walking pace, and weakness of limbs (Shaw et al., 1977). Oral hypoglycemic agents accounted for more complaints (8.5) than

diet only (7.6 out of a theoretical maximum of 31) (Shaw et al., 1977). High average blood sugars were associated with insulin therapy and oral hypoglycemic agents. A significant number of patients on insulin therapy complained of hypoglycemia (43.1 percent) compared to other groups (9.7 to 25.3 percent) (Shaw et al., 1977). "It can be anticipated that patients in the diet only group will have relatively mild diabetes, while those requiring oral hypoglycemic therapy will not only have possible symptoms from the tablets but will have somewhat higher blood sugars and diabetes of longer duration" (Shaw et al., 1977, p. 46). Young diabetics on insulin had a high complaint rate which suggests their recognition of the need for insulin and the feeling of well being on insulin (Shaw et al., 1977).

Williams and colleagues had one of the most notable earlier studies on clinical control of diabetic patients (Williams et al., 1967). Despite the use of relatively liberal criteria for good or fair control, it was found that over 70 percent of diabetic patients taking insulin were in poor control (Williams et al., 1967, p. 441). The frequency of errors with insulin therapy increased over time. The strongest association found between measures was the age of onset and control, or there was a later mean onset of diabetes in patients who had good to fair control (Williams et al., 1967). "In brief, there was a positive correlation between knowledge and performance, i.e., the more patients know about the disease, the better they carry out recommended therapy" (Williams et al., 1967, p. 445). No significant correlation was found between performance of recommended therapy and day-to-day control (Williams et al., 1967). The results verified Taglicizzo and Ima's (1970) results. Knowledge about diabetes was inversely correlated with control at a statistically significant level (Williams et al., 1967).

Watkins and colleagues studied diabetic patient's home management on insulin administration, insulin dosage, urine testing, meal spacing and foot care (Watkins et al., 1967). Only 22 percent of the patients were classified as good or fair. The results were similar to the Williams study. "No relationship was found between management and control, but those in poorer control knew more about the disease" (Watkins et al., 1967, p. 457).

In summary, locus of control appears to affect the amount of knowledge gained, especially initially. "Internals" with high social support report high compliance. Social support positively affects compliance. Knowledge of the disease management may affect compliance, but knowledge, alone, does not ensure compliance to the regimen.

The review of literature points out that there are many questions regarding each of the variables left unanswered. There have not been any reported studies on the effect of powerful other and chance locus of control orientations on knowledge, social support, compliance or therapeutic outcomes. There are few studies of social support with the variables. The study reporting "externals" with low social support as the second highest compliers needs to be validated because this appears to contradict theory. There are inconsistent findings on the effect of knowledge with compliance and therapeutic outcomes. The most notable deficit in understanding of the variables is that it is not known if compliance to the health care regimen affects therapeutic outcomes. Also, there are no reported studies that describe the interrelationship between the variables in the study presented in this dissertation.

In the next chapter the methodology of the study is presented, including population, settings, data collection procedures, instruments and scoring, pilot study and data analysis.

CHAPTER IV

METHODOLOGY AND PROCEDURES

In this survey, correlational analysis was used to examine the interrelationship between several variables, health locus of control, knowledge of diabetes, social support, compliance and therapeutic outcomes the patients with diabetes were able to obtain. The variables used in the study were developed as a result of a review of the literature on factors that interfere with compliance behavior.

Five data collection instruments were developed for the purpose of the study: (1) Sociodemographic Data Questionnaire, to obtain general descriptive information about the sample (see Appendix A), (2) Knowledge of Diabetes Test (see Appendix B), (3) Barriers to Implementing Therapy (see Appendix C), (4) Self-Management Questionnaire (see Appendix D), and (5) Results of Treatment Questionnaire (see Appendix E). Questions on the instruments were based on the four major life-style changes necessitated by the diagnosis of diabetes: diet, exercise, personal hygiene and medication. The Multidimensional Health Locus of Control (MHLC) scale (see Appendix F) used in this study was developed by Wallston, Wallston and DeVellis (1978).

When patients were first diagnosed with diabetes, they completed the first two questionnaires, the Sociodemographic Data Questionnaire and the MHLC scale. Six weeks later, the remaining questionnaires were sent to the patient. The results were analyzed to determine the relationship between the variables and the therapeutic outcome.

A pilot study using eight insulin-dependent diabetic patients was conducted to test the procedures, readability and patient understanding of the instructions and questionnaires. The pilot study indicated that the criteria for patient inclusion were too strict and would severely limit the number of patients available for the study. The methodology, patient criteria and instruments were all revised based on information obtained from the pilot study. After the revisions were made, the study was conducted utilizing the format described in this chapter.

The purpose of this chapter is to present the research design used in this study. Specific areas included are: source of data, settings, data collection procedures, instruments, scoring, pilot study and data analysis methodology.

Population--Source of Data

Diabetes was selected as the condition for study because it is a chronic illness that requires many life-style changes and long term compliance to the prescribed regimen. The high incidence of diabetes and the potential of debilitating complications makes this chronic illness a major concern of health care providers.

The patients were adult diabetics between 18 and 70 years of age, but were not restricted to maturity-onset (adult) diabetes. Juvenile diabetic patients over the age of 17 were included because the regimen is the same as for maturity-onset diabetes with the exception that all juvenile-onset diabetic patients are placed on insulin where many maturity-onset diabetic patients can often maintain control of the disease by diet only or diet and oral hypoglycemic agents. Because juvenile-onset diabetic patients are more reliant on exogenous insulin, they have greater fluctuations in blood sugar when the prescribed regimen is not followed precisely. Noncompliance would be more easily demonstrated in the juvenile-onset diabetic patient. The variables of health locus of control, knowledge of diabetes, social support and compliance would be the same for both juvenile-onset and maturity-onset diabetic patients.

The lower age limit was set at eighteen because the growth spurts that cause problems with regulating serum glucose should be over. Patients eighteen years of age and older would be doing their own self-care and not relying on parents for insulin injections. The upper age of seventy-two was to decrease the possibility of having patients in the study who were confused or forgetful.

The subjects were in one of three severity levels determined by prescribed treatment: (1) diet only, (2) diet and oral hypoglycemic agents, and (3) diet and insulin. Diet seems to be the most difficult prescription to follow. As the literature points out, patients comply with the easier prescriptions. If there is evidence of noncompliance, it would be demonstrated in diet restrictions. All the questionnaires were the same for the three severity levels but contained additional questions on medications for patients who were regulated with diet and medication.

A study by Lowery and DuCette (1976) indicated that diabetic patients may vary the amount of compliance to the prescribed regimen over time. To prevent this possibility, only newly diagnosed diabetic patients were used in this study. All patients completed the last series of questionnaires six to ten weeks after the diagnosis of diabetes was made. It was determined that a minimum of fifty newly diagnosed diabetic patients was necessary to conduct this study (N = 50).

All patients were diagnosed with diabetes through serum glucose laboratory tests and referred to a diabetes education program by their physician. Diagnostic criteria of serum glucose for Diabetes Mellitus include:

I. University System

Add the fasting, 1 hour, 2 hour and 3 hour blood glucose values.

If the total is:

a. Less than 520 mg/dl --- Non-Diabetic
b. 520-599 mg/dl --- Non-Diagnostic for Diabetes Mellitus
c. Greater than 600 --- Diabetes Mellitus

II. Fajan-Comm System

If 1 hour specimen is greater than 185 mg/dl --- Diagnostic for Diabetes Mellitus

If 2 hour specimen is greater than 140 mg/dl --- Diagnostic for Diabetes Mellitus

III. Wilkerson

F > 125 mg/dl = 1 point
1 > 185 mg/dl = 1/2 point
2 > 135 mg/dl = 1/2 point
3 > 125 mg/dl = 1 point

Add 10 units to the mg/dl score for every decade over 50 years of age
2 points is diagnostic for Diabetes Mellitus
1/2 to 1-1/2 points is diagnostic for Diabetes Mellitus
0 points is non-diabetic

The main criterion of diagnosis of diabetes for the purpose of this study was that the patient was referred to a diabetic education program. This meant that the physician thought the patient's blood glucose level was sufficiently high to require the diet restriction, exercise and personal hygiene regimen of the diabetes program.

Patients who were in diabetic ketoacidosis, diabetic coma, mentally confused or unable to read English were excluded from the study. Pregnant diabetic patients were also excluded.

Settings

Six hospitals with diabetes education programs were utilized as patient referral sites; this included four hospitals in Lansing, one hospital in Grand Rapids and one hospital in Kalamazoo. One of the hospitals was an osteopathic hospital and the rest of the hospitals were allopathic.

Initially one hospital in Lansing with a long established diabetes education program was to be the source of participants. When it became apparent that enough patients would not be available from one source, the other three hospitals in Lansing were contacted for approval to conduct the study. The American Diabetic Association, Western Michigan Branch, was contacted for diabetes education program referrals. One hospital in Grand Rapids and one in Kalamazoo were added after this contact. Contacting and receiving approval from the additional hospitals took a period of four months. The majority of patients still came from the first hospital. Five other hospitals were contacted but declined participation. The reason given for nonparticipation was lack of time for the secretaries to look up blood sugars or for the diabetes instructors to explain the study and give out the first questionnaires.

Three hospitals, one in Lansing, Grand Rapids and Kalamazoo, had established diabetes education classes for both inpatients and outpatients. Two hospitals in Lansing had individualized patient teaching conducted by a team of health care providers. One hospital had an individualized teaching program at the start of the data collection and changed to formalized group diabetes classes during the study. All diabetes education programs had a nurse and dietitian on the teaching team. Some hospitals included a physician, pharmacist and/or social worker as a member of the teaching team. The content outlines from the four hospitals with classes are included in the appendix. It can be noted that the programs covered similar content areas.

Hospital A

Hospital A, located in Lansing, had an established Diabetes Education and Consultation Service conducted by one Registered Dietitian, one Registered Nurse and one half-time Registered Nurse. Diabetes education classes were held two hours a day, three days a week for both inpatients and outpatients (see Appendix G for course outline). Inpatients had diabetes instruction reinforced on the unit either by the diabetes instructor or a designated staff nurse.

The diabetes instructors were sent a referral on all patients with diabetes admitted to the hospital. In addition, they received referrals from small communities around Lansing and from physician's offices. Hospital A also made appointments on an outpatient basis for consultation.

Family members were encouraged to attend classes with the patient. Diabetes education classes ranged in size from three to twenty patients and families per week with an average class attendance of eight patients and family members.

Hospital B

Hospital B also is located in Lansing. The hospital did not have formal diabetes education classes, but all patients with the diagnosis of diabetes were admitted to one hospital unit. The nursing staff, Patient Care Coordinator, and dietitian followed an established protocol for teaching patients how to live with their diabetes (see Appendix H). Hospital B also had several outpatient clinics. Patients diagnosed with diabetes in an outpatient clinic were referred to a hospital dietitian for teaching on the diabetic diet.

Hospital C

Hospital C is located in Lansing, When the hospital first started referring patients to the study, nursing and dietary staff taught the patient at the bedside or in the clinic. Diabetes education classes were started four months into the study for patients who had been hospitalized at Hospital C or were patients of the hospital's outpatient clinics. The classes were held two hours a day, three days a week, for two weeks (see Appendix I).

Family members were encouraged to attend classes with the patient. Diabetes education classes ranged in size from three to twenty patients and families per week with an average class attendance of eight patients and family members.

Hospital B

Hospital B also is located in Lansing. The hospital did not have formal diabetes education classes, but all patients with the diagnosis of diabetes were admitted to one hospital unit. The nursing staff, Patient Care Coordinator, and dietitian followed an established protocol for teaching patients how to live with their diabetes (see Appendix H). Hospital B also had several outpatient clinics. Patients diagnosed with diabetes in an outpatient clinic were referred to a hospital dietitian for teaching on the diabetic diet.

Hospital C

Hospital C is located in Lansing, When the hospital first started referring patients to the study, nursing and dietary staff taught the patient at the bedside or in the clinic. Diabetes education classes were started four months into the study for patients who had been hospitalized at Hospital C or were patients of the hospital's outpatient clinics. The classes were held two hours a day, three days a week, for two weeks (see Appendix I).

Hospital D

Hospital D is located in Grand Rapids. The hospital has had a Diabetes Education Program for six years which is coordinated by a full time Registered Nurse. Classes are held one hour a day for five days, every week (see Appendix J). A dietitian and a diabetologist teach some of the classes with the nurse. The average inpatient census of diabetic patients is 35 per week with an average of fifteen patients per week attending diabetes instruction classes. Patients are encouraged to have their families attend classes with them.

Hospital E

Hospital E is located in Kalamazoo, Michigan. The diabetes education program was coordinated by a Registered Nurse, who was assisted by a dietitian, social worker and pharmacist (see Appendix K). The classes were open to both inpatients and outpatients, although most of the patients who attended class were inpatients. The average class size was eight patients and family members with an upper limit of eighteen. Classes were taught an hour a day for five days, and a new class started every week.

Hospital F

Hospital F is located in Lansing, Michigan. There was a diabetes education program coordinated by a Registered Nurse. Teaching was done on a one to one basis for inpatients by a team consisting of the Registered Nurse, Registered Dietitian, Social Worker and Registered Pharmacist (see Appendix L). The hospital averaged thirty diabetic patients per month. There was not any outpatient instruction.

Four months into data collection the number of patient referrals declined. There is some evidence that juvenile-onset diabetes is most prevalent in January, February and March. The diabetes instructors assured the investigator that patients were referred to the classes from all physicians in the area. The nurses at the physician's offices were contacted to validate if they did refer all their patients to diabetes education classes. Many nurses stated they did, but just as many stated they taught the patients in the office. The patients who were referred to diabetes education programs on an outpatient basis were patients who were difficult to manage or noncompliant. By the time these patients were referred to the diabetes instructor, they had been diagnosed with diabetes more than six weeks and had established some patterns of noncompliance. They no longer met the patient criteria for this study. All patients were referred to diabetes classes.

Letters explaining the study and asking for patient referrals were sent to physician's offices (see Appendix M). A follow-up phone call was made to verify that the information was received and enlist the help of the office nurse. One physician's office called the investigator with a referral.

Data Collection Procedure

The method of introducing the study to patients and contacting physicians varied according to the hospital procedures and locations. Figure 5 diagrams the basic differences in procedures according to hospitals.

Hospital A had regularly scheduled diabetes instruction classes each week on Tuesday, Wednesday and Thursday. All patients requiring diabetes instruction were referred to the program by their physician. The Diabetes Education and Consultation Service had a governing board, the Diabetes Unit Committee, which approved the research after the Human Subjects Committee approval was received. The Diabetes Unit Committee stated since physicians referred patients to the Diabetes Education and Consultation Service, the physician needed to be notified of the research, but individual physician approval was not necessary. Each physician who admitted patients to Hospital A was sent a letter explaining the study prior to the start of the pilot study (see Appendix N). Each time an inpatient was referred to the researcher a notification was put on the outside of the chart stating the patient met the criteria of the diabetes research study and would be included in the study unless the physician indicated he did not want the patient to participate.

Hospital	Contact Person (C.P.)	Referral	Physician Contact	Distribution of Packet
A	Diabetes Instructor	Investigator called C.P. for referrals weekly on Wednesday	Letter of explanation sent beginning of study Notification on chart for Dr. to indicate if did not want patient in study.	Researcher explained study, handed out packet of consent form, Sociodemographic Data Questionnaire, and MHLC scale. Picked up by investigator or diabetes instructors.
B	Patient Care Coordinator (Head Nurse) and Dietitian	Investigator called by C.P. when patient admitted. Dietitian called investigator with outpatient referral.	Called physician individually for permission to see each patient. If patient was from hospital clinic, no consent was obtained.	Given to patient in hospital by investigator. Picked up by investigator or mailed in by patient. If outpatient, called by investigator and packet sent to patient with stamped, addressed envelope.
C	Discharge Coordinator (R.N.)	C.P. called investigator for all referrals both inpatient and outpatient.	Not required	Investigator visited patient in hospital or called patient and sent packet.
D	Diabetes Instructor	C.P. identified patients by study criteria and gave out packet.	Letter of explanation sent to physicians before the study began.	Explanation of study and questionnaires consent form and mailing envelope given out by diabetes instructor. Sent list of names to investigator.
E	Diabetes Instructor	C.P. identified patients by study criteria and gave out packet.	Letter of explanation sent to physicians before the study began.	Explanation of study and questionnaires consent form and mailing envelope given out by diabetes instructor. Sent list of names to investigator.
F	Diabetes Instructor	C.P. called investigator when patient was admitted who met study's criteria	Called physician individually for permission if they did not return blanket permission slip	Packet given out by C.P. or called by investigator and sent packet with stamped, addressed envelope.

...ct Procedures and Distribution of Questionnaires by Hospitals.

The diabetes instructors received most of their referrals early in the week. By Wednesday morning they knew how many patients met the study criteria, and how many outpatients were attending class that week. The investigator visited each of the inpatients in their hospital room to explain the study and obtain the patient's consent for participation in the study (see Appendix O).

Initially, the hospitalized patients were asked to complete the questionnaire when it was given to them. The The researcher returned to collect the questionnaires approximately one half hour after they were given out. Because of treatments, physicians visits and other procedures, many patients were unable to complete the questionnaires at the time they were distributed. A stamped, addressed mailing envelope was given to patients who had not been able to complete the questionnaires. Patients given a mailing envelope frequently needed a telephone reminder to send in the questionnaires. Questionnaires were returned better when an appointment was made with the patient to have the researcher come back and pick up the questionnaires or when the questionnaires were asked for in class by the diabetes instructors.

Outpatients were introduced to the study and asked to sign the consent form just prior to the beginning of class on Wednesday. All patients were asked to bring the completed questionnaires (Sociodemographic Data and MHLC scale) to class the next day. The questionnaires were collected by the diabetes instructors or the investigator.

Hospital B had very few patients referred to the study. Most patients with the diagnosis of diabetes were admitted to one specific hospital unit. The Patient Care Coordinator (Head Nurse) on that unit was designated the contact person for the research. She called the investigator if any patients meeting the study's criteria were admitted to the unit or any other area of the hospital. The investigator would contact the patient's physician for approval to see the patient. After physician's approval was obtained, patients were visited in the hospital. The study was explained and consent for participation was obtained. Patients were asked when it would be convenient for them to complete the questionnaires and a time was designated for the investigator to pick up the questionnaires or the patient was given a stamped, addressed envelope to mail the questionnaires back to the investigator.

Hospital B has several outpatient clinics. The nurses in charge of the clinics was to refer patients to the researcher. No referrals were received from this source. However, the hospital dietitian received referrals for outpatient teaching from the clinic, and late in the study, she became the source of referral for the clinic patients. When the dietitian received a referral of a new diabetic patient, she called the investigator with the patient's name and telephone number. Since the hospital's Human Subject Committee approved the study, physician approval was not required for clinic patients. Patients were called, given an explanation of the study and asked if they would participate in the study. If the patient consented to participate, they were sent the consent form, Sociodemographic Data Questionnaire and MHLC scale with a return envelope.

The investigator met with the Head Nurses at Hospital C to explain the study and request their assistance in the identification of patients who met the study's criteria. The Discharge Coordinator was the designated contact person to the researcher because she made daily visits to each unit and would be notified of a new diabetic patient's admission. The outpatient clinic nurse was to notify the Discharge Coordinator of newly diagnosed diabetic patients. When Hospital C started formalized diabetes classes, the investigator was sent a list of patients attending classes who met the criteria of the study. The research was considered a nursing study and physician's approval to see patients was not required.

Inpatients were visited in the hospital, given an explanation of the study and asked to complete the consent form, Sociodemographic Data Questionnaire and MHLC scale. They were given a stamped, addressed envelope and asked to mail the questionnaires when they were completed.

Outpatients were called on the telephone for the explanation of the study and to request the patient's participation. When patients agreed to participate, they were sent the consent form, Sociodemographic Data Questionnaire and the MHLC scale with a stamped, addressed envelope to be returned to the investigator.

The investigator received permission to conduct the study at Hospital D from the Director of Nursing and the physician in charge of the diabetes education program. Physicians who referred patients to Hospital D's diabetes education program were sent a letter explaining the study. The diabetes instructor explained the study and gave each patient who met the study criteria a packet containing the consent form, the Sociodemographic Data Questionnaire, the MHLC scale and a stamped, addressed envelope. The diabetes instructor sent the investigator a list of names and addresses of people who had been given the packet.

Hospital E required the study be approved by the Human Subjects Committee which requested a different format for the consent form (see Appendix P). Once permission was received, the procedure was identical to Hospital D.

Hospital F was the last hospital to have the study approved by the Human Subjects Committee. The committee required physician approval to contact referred patients. The physicians who admitted diabetic patients were sent a letter explaining the study, and requesting blanket

Outpatients were called on the telephone for the explanation of the study and to request the patient's participation. When patients agreed to participate, they were sent the consent form, Sociodemographic Data Questionnaire and the MHLC scale with a stamped, addressed envelope to be returned to the investigator.

The investigator received permission to conduct the study at Hospital D from the Director of Nursing and the physician in charge of the diabetes education program. Physicians who referred patients to Hospital D's diabetes education program were sent a letter explaining the study. The diabetes instructor explained the study and gave each patient who met the study criteria a packet containing the consent form, the Sociodemographic Data Questionnaire, the MHLC scale and a stamped, addressed envelope. The diabetes instructor sent the investigator a list of names and addresses of people who had been given the packet.

Hospital E required the study be approved by the Human Subjects Committee which requested a different format for the consent form (see Appendix P). Once permission was received, the procedure was identical to Hospital D.

Hospital F was the last hospital to have the study approved by the Human Subjects Committee. The committee required physician approval to contact referred patients. The physicians who admitted diabetic patients were sent a letter explaining the study, and requesting blanket permission to contact their patients. Only one physician sent the permission slip back. The diabetes teaching nurse called the investigator when new diabetic patients were admitted to the hospital. The investigator called the physician's office for approval to call the patient. No physician refused permission. After physician approval was received, the investigator called the patients, explained the study and asked for their consent to participate. If patients consented, they were sent a packet containing a consent form, Sociodemographic Data Questionnaire, MHLC scale and a stamped, addressed envelope. If the patient was still in the hospital, the diabetes instructor explained the study and gave the patient the packet.

The follow-up procedure was the same for all participants. The second series of questionnaires, Knowledge of Diabetes Test, Barriers to Implementing Therapy, Self-Management Questionnaire and Results of Treatment, were sent to the patient six weeks after the patient was diagnosed with diabetes. The cover letter (see Appendix Q) requested the patient to complete the questionnaires and return them in the stamped, addressed envelope within two weeks. If the questionnaires were not returned within three weeks after they were mailed out, the patient was called and asked to return the questionnaires as soon as possible.

After the patient returned the final questionnaires, the physician's office was called for the patient's six week follow-up serum glucose and weight. When the physician's office was called, the investigator asked to speak to a nurse. The investigator explained the study, stated that the physician had received a letter of explanation and that the patient had consented to participate in the study. The investigator asked the nurse to look up the patient's six week follow-up blood sugar and weight. Only two nurses stated they could not give out information without the patient's consent. The patient's consent forms were copied and sent to the physician's office with a letter to be returned to the investigator containing the patient's blood sugar and weight.

Instruments and Scoring

Six instruments were used to gather data from the participants: (1) Sociodemographic Data Questionnaire, (2) Multidimensional Health Locus of Control (MHLC) scale, (3) Knowledge of Diabetes Test, (4) Barriers To Implementing Therapy (Social Support), (5) Self-Management Questionnaire (Compliance), and (6) Results of Treatment (Therapeutic Outcomes). All of the instruments, except the Multidimensional Health Locus of Control scale, were developed by the investigator and have not been tested for validity or reliability.

Sociodemographic Data Questionnaire

The Sociodemographic Data Questionnaire was developed to provide a general description of the patient population. It determined sex, age, educational background, employment status, household composition, anticipated social support, and some past medical history. Information was requested on occupation and education of both the patient and the spouse.

The information obtained from the Sociodemographic Data Questionnaire was used as descriptive data and was not included in the statistical analysis.

Multidimensional Health Locus of Control (MHLC) Scale

The MHLC scale, Form A, developed by Wallston, Wallston and DeVellis (1978) was a health specific instrument which measured the patient's locus of control orientation in the three dimensions of internal, powerful others and chance (see Appendix F). All items in the MHLC scale utilized a 6-point Likert-type format, ranging from "Strongly Disagree" (scored as one) to "Strongly Agree" (scored as six). Internal items were: 1, 6, 8, 12, 13 and 17. External items were: 2, 4, 9, 11, 15 and 16. The questions that determined powerful other orientation were: 3, 5, 7, 10, 14 and 18. The items were all written in a personal mode and developed for eighth grade reading level.

All data was reported in continuous scores. This presented a problem with the scores from the MHLC scale. The data from the MHLC scale was analyzed four different ways: (1) internal, (2) chance, (3) powerful others and (4) total score.

Although the MHLC scale needs further testing, especially with people who have been diagnosed with disease, the multidimensional (internal, chance and powerful others) approach to the measurement of health locus of control should provide more precise and accurate data for understanding and predicting health behaviors (Wallston, Wallston and DeVellis, 1978).

Knowledge of Diabetes Test

Although there are a few available instruments for measuring knowledge of diabetes, they do not represent the most current therapy for diabetes, specifically the revised American Diabetic Association diet and the use of U 100 insulin. Therefore a Knowledge of Diabetes Test was developed for this study (see Appendix B).

The test was developed to measure the areas identified by experts in diabetes as important knowledge for people with diabetes to possess for self care. The test asked for factual information only. The test consisted of thirty-six questions on diabetes, complications, diet, exercise and personal hygiene. All patients took the first part of the test. Patients who were regulated by diet only ended the test after question thirty-six. Patients who were regulated by diet and oral hypoglycemic medication answered questions thirty-seven through forty-one on oral medication. Patients who were on insulin skipped from question thirty-six to question Forty-two. The last five questions were on administration of insulin. The test contained eleven questions on the disease in general including basic pathophysiology, predisposing factors, symptoms, long-term treatment and urine testing. The rest of the questions included: (1) seven questions on diet, (2) five questions on complications, (3) five questions on personal hygiene, (4) four questions on care during short term illness, (5) four questions on exercise and (6) five questions each on oral medication and insulin. Each question counted as one point and one score was obtained for knowledge of diabetes.

Three instruments, Knowledge of Diabetes Test, Barriers To Implementing Therapy and Self-Management Questionnaire, resulted in larger possible total scores for patients on medication than for patients controlled by diet only. Data was analyzed for patients on diet only and diet and medication.

Barriers to Implementing Therapy (Social Support)

The indicator for social support was developed for the purpose of this study and labeled Barriers To Implementing Therapy (see Appendix C). The questions reflected the prescribed regimen for diabetes self-management taught in diabetes education programs, specifically, diet, exercise, personal hygiene and medications. The questionnaire was divided into two sections.

The first section of the instrument was a five-point Likert-type scale ranging from "Strongly Agree" to "Strongly Disagree." This section of the questionnaire elicited three aspects of social support: (1) the importance of social support to the patients, questions 1, 3, 4 and 21, (2) patient's perception of how much their personal life interferes with compliance to the prescribed regimen, questions 9, 15, 17 and 22 and (3) patients' subjective appraisal of the support they receive from family members or close friends, questions 2, 5, 6, 7, 8, 10, 11, 12, 13, 14, 16, 18, 19, 20, 23, and 24.

The questions on importance of social support were scored one point for "Strongly Agree" to five points for "Strongly Disagree." If a patient relied heavily on social support and it was not present, compliance to the prescribed regimen would probably decrease. Questions on life-style not interfering with compliance were scored in the opposite direction, five points for "Strongly Agree" to one point for

"Strongly Disagree." When patients' life-styles would be disrupted by compliance to the prescribed regimen, compliance is likely to decrease.

The majority of questions on perceived social support were scored five points for "Strongly Agree" to one point for "Strongly Disagree." Three questions in this area were reversed, questions 2, 14 and 23. These questions were scored five points for "Strongly Agree" to one point for "Strongly Disagree." Therefore, questions scored five points for "Strongly Agree," were: 2, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 22 and 24. Questions scored in the opposite direction were: 1, 2, 3, 4, 14, 21 and 23.

The second section of the Barriers To Implementing Therapy Questionnaire used a format suggested by Lewis, Morisky and Flynn (1978). There are four questions on each area of the prescribed regimen, exercise, diet, hygiene and medication, and two general questions on social support. The second section of Barriers To Implementing Therapy Questionnaire also elicited three aspects of the patient's perception of social support: (1) general help and encouragement, questions 1, 4, 5, 10, 11, 14, 16 and 17, (2) direct assistance, such as exercising with the patient, questions 3, 6, 7, 9 and 18 and (3) family expectation of patient compliance, questions 2, 8, 12, 13 and 15. The questions were on a five-point Likert-type scale ranging from "Never" (scored as one) to "Always" (scored as five). There were five negative responses, one each for exercise, hygiene, medication and two for diet. Questions 4, 5, 9, 10 and 17 were scored one point for "Always" and five points for "Never." With the exception of the medication section, all questions were randomized.

All of the data from the Barriers To Implementing Therapy Questionnaire yielded one score for perceived social support. There was a total of 32 possible points for patients on diet only and 42 possible points for patients on diet and medication. Data were analyzed for patients on diet only and diet and medication.

Self-Management Questionnaire (Compliance)

The Self-Management Questionnaire (Compliance) measured patients' stated compliance with the health prescriptions on a Likert scale of one "Never" to five "Always." The questions on exercise, hygiene and diet were randomized and questions on medication were put in a separate section. The questions include: exercise--7 questions, personal hygiene--7 questions, diet--9 questions, medications--7 questions and 2 questions on complications (see Appendix D). Question 4 was considered to be both exercise and hygiene, and question 5 was considered to be both exercise and diet. Therefore, the total number of questions on compliance is twenty-nine.

Fifteen questions had "never" as the desirable answer and were scored five points for "Never" and one point for "Always." These questions were: 3, 6, 7, 9, 10, 11, 12, 16, 21, 22, 23, 25, 26, 27 and 28. The remaining questions, numbers 1, 2, 4, 5, 8, 13, 14, 15, 17, 18, 19, 20, 24 and 29, were scored one point for "Never" and five points for "Always." One score was obtained for the Self-Management Questionnaire for everyone. Patients on medication had an additional seven points added to their score. Data was analyzed for diet only and diet and medication patients.

Results of Treatment Questionnaire (Therapeutic Outcomes)

The Results of Treatment Questionnaire contained fifteen questions designed to obtain patients' self-report of their progress with diabetes. The questions asked information about hyperglycemic or hypoglycemic reactions, sick days, calls to health care providers, weight gain or loss, sugar in the urine (renal threshold), energy level and a subjective assessment of well-being (see Appendix E). The sixteenth question asked patients' knowledge of their last blood sugar, and question 17 asked patients' weight. Patients' statement of blood sugar and weight was compared to the physician's office blood sugar and weight.

The patient with diabetes with optimal progression towards high level wellness would not have reactions, sugar in the urine, sick days or severe cuts that would not heal.

A normal fasting blood sugar and a gradual weight loss of eight to thirteen pounds in six weeks for the adult-onset diabetic patient indicated good control of diabetes. If the patient was a juvenile-onset diabetic, weight gain or normal weight indicated good control.

A total score for therapeutic outcome was determined by using the scores from the Results of Treatment Questionnaire and the blood sugar and weight obtained from the physician's office. The Results of Treatment Questionnaire was scored on a five point scale with five being the highest level of well being. The highest possible score for the Results of Treatment Questionnaire was seventy which indicated good control of diabetes. The lowest score possible was fourteen which indicated poor control. The questionnaire was scored as follows:

1. Questions 1 and 2, number of hypoglycemic or hyperglycemic reactions: five points for zero, four points for one to three, three points for four to seven, two points for eight to twelve and one point for more than twelve.
2. Question 3, weight loss. If the patient was overweight based on normal height and weight scales, the score was one point for zero, four points for one to seven pounds, five points for eight to thirteen (most desired), three points for fourteen to twenty pounds, and two points for more than twenty pounds.

If the patient was underweight or normal weight, the score was: five points for zero, four points for four to seven pounds, three points for eight to thirteen pounds, two points for fourteen to twenty pounds and one point for more than twenty pounds.

3. Question 4, weight gain. If the patient was normal or overweight based on normal height and weight scales, the score was five points for zero, four points for one to seven pounds, three points for eight to thirteen pounds, two points for fourteen to twenty pounds and one point for more than twenty pounds. If the patient was underweight, the score was: one point for zero, two points for one to seven pounds, three points for eight to thirteen pounds, four points for fourteen to twenty pounds and five points for more than twenty pounds up to normal weight.
4. Question 5, serious cuts or sores requiring treatment, five points for none up to one point for more than three.
5. Questions 6, 7 and 8 regarding sick days was scored from zero sick days (five points) to the highest level of sick days (one point).
6. Questions 9, 10 and 11, calls to health care providers, five points for zero calls up to zero

points for the highest number of calls to health care providers.

7. Question 12, sugar in urine, five points for zero to one point for more than six.
8. Question 13, energy level, was scored one point for a lot less energy to five points for a lot more energy.
9. Question 14, feeling better, was scored one point for feeling a lot worse to five points for feeling a lot better.

A normal blood glucose level (80-150 mg/dl) was worth ten points since a normal blood sugar is the main goal of diabetes therapy. Other scores for blood sugar were: nine points for 151-160, eight points for 161-170, seven points for 171-180, six points for 181-190, five points for 191-200, four points for 201-210, three points for 211-220, two points for 221-230, and one point for more than 230. If the patient did not return to the physician's office for a follow-up blood sugar, zero points were given for blood sugar. No follow-up was viewed as noncompliant behavior.

The patients received five points for normal weight based on height and weight charts. Other weight scores were: four points for ten to twenty-five pounds above normal weight, three points for twenty-six to forty pounds above normal weight, two points for forty-one to fifty-five pounds and one point for over fifty-six pounds above normal weight.

Points for blood sugar and weight were added to the score obtained on the Results of Treatment Questionnaire. Therefore, the range of possible scores for therapeutic outcomes was sixteen to eighty-five points. The score for therapeutic outcomes was a continuous score.

Pilot Study

A small scale pilot study was done with eight patients to test the instruments, and procedures of the study. Another purpose of the pilot study was to determine if a patient population would be available. At the time of the pilot study, only patients with newly diagnosed diabetes on insulin were used. It quickly became apparent that the criteria for patient inclusion was too strict. The patient population was changed to all newly diagnosed diabetic patients and the age range was expanded. The requirement that patients be hospitalized was dropped. Additional sites, both inpatient and outpatient, were added. Potentially, a wider range of scores on the instruments could be obtained with the variety of sites. The patients would be a less homogenous group, especially in regards to the educational programs.

During the pilot study, the researcher stayed with the patients while they filled out the questionnaires. (Home visits were made for the second set of instruments.)

The patient was asked if any of the questions were confusing and for general comments on the questionnaires. Based on patient response during the pilot study, all of the instruments were modified. The change in patient criteria from insulin users to three severity levels necessitated a separate section on medications for the Knowledge of Diabetes Test, Barriers To Implementing Therapy and Self-Management Questionnaire. The content of the MHLC scale was not changed because it was the only instrument that was not developed for the purpose of this study and does have validity and reliability data available. However, the instructions for the MHLC were simplified.

Several changes were made in the Sociodemographic Data Questionnaire based on the pilot study. Two questions were added on the name of the admitting physician and the name of the physician who would follow the patient for diabetes. Two patients in the pilot study had a different physician for follow-up treatment than the physician who admitted them to the hospital. The past medical history was expanded asking patients to give more information on the signs and symptoms that caused them to seek health care and history of other health problems. Originally, this information was to be obtained from the medical record, but the records were incomplete. The addition of outpatient sites also necessitated this change. Information obtained from the Sociodemographic Data Questionnaire assured a

certain amount of data on each patient to be used as a description of the patient sample. The patient's hospital record was not reviewed.

The Results of Treatment Questionnaire was substantially changed based on information gained from the pilot study. The original instrument was too vague. It requested patients to check if they had acquired certain therapeutic outcomes or difficulties, but did not give any indication of amount of success or difficulties. The revised Results of Treatment Questionnaire contained fifteen questions designed to obtain patients' self report of their progress with diabetes on a five point scale.

Procedural changes were necessary because of the number of additional sites. Each hospital had some requests regarding procedures, such as notification of new patients, and contacting physicians, that would not interfere with the basic design of the study. Whenever possible, these requests were accommodated.

Based on the pilot study, procedures, instruments and patient criteria were changed.

Data Analysis

Validity and Reliability

Since all the instruments except the MHLC were developed by the investigator, validity and reliability must be addressed. There are four types of test validity recognized in educational measurement: content, concurrent, predictive and construct.

Content validity is the degree to which the test items represent the content the test is trying to measure and the total universe of content in that area (Borg and Gall, 1974). Unlike other types of validity, content validity is tested subjectively (Borg and Gall, 1974). There is no statistical test for content validity. A review of the literature indicates material necessary for item construction but it is based on subjective judgment of the investigator (Crano and Brewer, 1973). The content areas for the instruments Knowledge of Diabetes, Barriers To Implementing Therapy, Self-Management Questionnaire and Results of Treatment were estimated by the judgment of the investigator based on the review of literature and by consulting experts on diabetes. The four major areas identified are diet, exercise, personal hygiene and medication. The instruments contained approximately the same number of questions on each of the areas. In addition, the Knowledge of Diabetes Test contained questions on the disease process and complications of diabetes. The Results of Treatment Questionnaire contained questions on desired therapeutic outcomes agreed upon by experts in the field of diabetes.

The validity of the instruments is often determined by the purpose of the study. The purpose of this study was to determine the interrelationships between the concepts. From construct validation one determines whether or not the hypothesized interrelationships exist (Crano and Brewer, 1973). There is not sufficient data from previous studies to determine construct validity. If there is a relationship between the concepts, later studies can be designed to determine predictability. Concurrent validity is not feasible to test because there are no available tests on the subjects covered in this study.

Construct, concurrent and predictive validity were not able to be tested because of insufficient previous data and a lack of available instruments to test the variables in this study. Content validity is the most appropriate test of validity for this study, and thus, validity was tested subjectively with content validity.

Reliability is the level of consistency of the measuring instrument (Borg and Gall, 1974). It is much easier to determine reliability than validity. A person's true score on an instrument is better determined by a longer test than a short test (Borg and Gall, 1974). The instruments were fairly long with a minimum of four questions per subclass. The subclasses may yield a lower reliability score than the total score because of the limited number of questions. Reliability is usually expressed as a coefficient indicating the extent the test is free of error variance

(Borg and Gall, 1974). Alpha coefficients were used to determine the reliability of the instruments in this study.

The MHLC was the only instrument that has been tested for validity and reliability. Wallston, Wallston and DeVellis found the alpha coefficient reliability for the MHLC (Form A) to be: (1) internal--.767, (2) power--.673 and (3) chance--.753. The means and standard deviations were almost identical (1978). The alpha reliability levels for the MHLC are higher than reliability levels reported for the original Health Locus of Control (HLC) scale because the major factor contributing to the low internal consistency, combining external and internal statements in the same measure, have been eliminated (Wallston, Wallston and DeVellis, 1978). "As an initial indication of predictive validity, correlations were computed between health status and the MHLC scores. As expected, health status correlated positively with IHLC ($r = .403$, $p < .001$), negatively with CHLC ($r = -.275$, $p < .01$) and did not correlate with PHLC ($r = -.055$)" (Wallston, Wallston and DeVellis, 1978, p. 167). "Low positive correlations with appropriate I, P and C scales represented initial construct validity. Correlations in the predicted direction of the MHLC scales with health status provided some evidence of predictive validity" (Wallston, Wallston and DeVellis, 1978, p. 169). The true validity and reliability of the MHLC will not be fully realized until it is used in a number of studies.

Frequency Tables and Cross Tabulations

Frequency tables are the distribution of variables' values summarized into a table. Cross tabulations are joint frequency distributions of two variables. The relationship is examined by means of association which indicates how strongly two variables are related to each other and to what extent two variables occur together.

Path Analysis

Path analysis was originated by Wright (1918) as a convenient approach to regression problems involving two or more regression equations. Path analysis "is primarily a method of decomposing and interpreting linear relationships among a set of variables by assuming that (1) a (weak) causal order among these variables is known and (2) the relationships among these variables are causally closed" (Nie, Hull, Jenkins, Steinbrenner and Bent, 1975, p. 383). Path analysis implies possible manipulation. If a variable is manipulated, it will bring about changes in other variables affected by the manipulated variable. Path analysis is a method of measuring the direct influence along each separate path and finding the degree to which variation of a given effect is determined by each particular cause.

Knowledge of the correlations among the variables combined with knowledge known about the causal relationships is necessary for path analysis. When relationships are not known, path analysis can be used to find logical consequences (Wright, 1921).

One method of depicting regression problems is by a simple diagram which represents the flow to cause and effect. Path analysis is a closed causal system consisting of primary factors or causes and resultant effects. The association of cause and effects is represented by a network of causal pathways. The diagram has arrows connecting cause (tail) to effect (head). The selection of the most meaningful and promising diagram was based on the judgment of the researcher (Turner and Stevens, 1972).

An arrow can never point to a cause, but there are no other restrictions on the positioning of the arrows. "The variable at the head of one or more arrows is interpreted as being a function of just those variables at the tails of these same arrows" (Turner and Stevens, 1972, p. 79).

There are two rules that help explain path analysis which are described by Turner and Stevens (1972):

1. A total path regression between a primary factor and an effect is the sum of the compound path regression connecting the primary factor and effect.

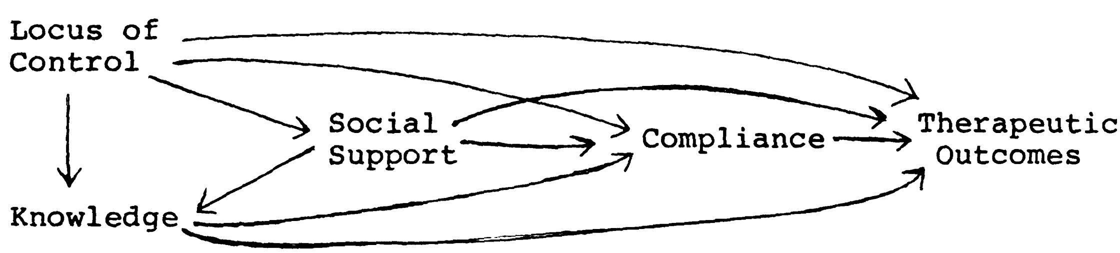
2. A total intercept for a particular effect n_i is the sum of the particular intercepts α_i and the products of all intercepts of effects determining n_i by the elementary path regression connecting the determining effect and n_i (p. 85).

"An advantage of path analysis is that each part of the total process is explicitly represented without regard to other parts of the process" (Turner and Stevens, 1972, p. 91). When parts of the process are changed, the path coefficient in one part is invariant.

Wright (1972) disagrees with Turner and Stevens regarding the cause and effect relationships of path analysis. Regarding path analysis, he states:

> The method is one for dealing with a system of interrelated variables. It is based on the construction of a qualitative diagram in which every included variable, measured or hypothetical, is represented (by arrows) either as completely determined by certain others (which may be represented as similarly determined) or as an ultimate factor. Each ultimate factor in the diagram must be connected (by lines with arrowheads at both ends) with each of the other ultimate factors to indicate possible correlation through still more remote unrepresented factors, except in cases in which it can safely be assumed that there is no correlation (Wright, 1972, p. 102).

The path analysis for the study is:



The arrows represent the questions asked in the statement of the problem and are based on the review of literature. There is some evidence that locus of control affects knowledge, that knowledge affects compliance and compliance affects therapeutic outcomes. The arrows to therapeutic outcomes are all one way because the patients are all newly diagnosed with diabetes. When patients have had diabetes longer and discover they cannot control the disease process as much as they thought they could, compliance may decrease. If the study was conducted over a longer period of time the arrow between compliance and therapeutic outcomes would have arrowheads at both ends. There is evidence that social support affects compliance and may affect knowledge. Knowledge may directly affect therapeutic outcomes. Locus of control with social support may affect compliance. If locus of control or social support directly affects therapeutic outcomes is unlikely but should be tested.

Path analysis really does not add anything to the conventional regression analysis as a statistical technique, but it is a pattern of interpretation which is invaluable in making explicit the rationale for a set of regression equations (Duncan, 1972). Path analysis makes the assumptions explicit and provides some concreteness for indirect effects (Duncan, 1972).

Level of Significance

The level of significance selected was .05. The significance test is based on the sampling distribution of the statistic given that the particular hypothesis is true. The actual decision to reject or retain the hypothesis is based on whether or not the sample statistic falls into a particular region of values (confidence interval) in the sampling distribution dictated by that hypothesis. The possibility of the significant results occurring by chance would only be five times in 100 when the significance level is at .05. The level of significance is a decision made by the researcher. The significance level was small to prevent the possibility of a Type I error, rejecting a true hypothesis, but a smaller significance level would increase the possibility of a Type II error, accepting a false hypothesis.

This chapter presented the research design used in this study, including the source of data, settings, data collection procedures, instruments and scoring, pilot study and data analysis methodology. In the next chapter, the findings from the study will be presented.

CHAPTER V

ANALYSES AND FINDINGS

This chapter presents findings based on the data collected from fifty newly diagnosed diabetic patients from three Western Michigan cities. The focus of the data collected is on the interrelated concepts that make up the middle range theory of this study. The concepts include: (1) multidimensional health locus of control, (2) knowledge of the disease, (3) perceived social support, (4) self-reported compliance, and (5) therapeutic outcomes. The data describe the interrelationship between these variables. Presentation of the findings is divided into:

1. Descriptive findings of the study population
2. Relationship of variables
    a. Relationship between health locus of control and
        (1) knowledge in patients with diabetes
        (2) social support in patients with diabetes
        (3) compliance in patients with diabetes
        (4) therapeutic outcomes in patients with disease

(5) knowledge and social support in patients with diabetes

(6) social support and compliance in patients with diabetes

(7) compliance and therapeutic outcomes in patients with diabetes

(8) knowledge, social support and compliance in patients with diabetes

(9) social support, compliance and therapeutic outcomes in patients with diabetes

b. Relationship between knowledge of diabetes and

(1) social support in patients with diabetes

(2) compliance in patients with diabetes

(3) therapeutic outcomes in patients with diabetes

(4) compliance and therapeutic outcomes in patients with diabetes

(5) social support, compliance and therapeutic outcomes in patients with diabetes

c. Relationship between social support and

(1) compliance in patients with diabetes

(2) therapeutic outcomes in patients with diabetes

(3) compliance and therapeutic outcomes in patients with diabetes

d. Relationship between compliance and therapeutic outcomes in patients with diabetes

3. Interrelationship between multidimensional health locus of control, knowledge of diabetes, perceived social support, self-reported compliance and therapeutic outcomes six weeks after the adult patient has been diagnosed with Diabetes Mellitus.

Frequency tables were used for the descriptive data. Path analysis was the method used to analyze the data and determine the relationships between the variables.

Descriptive Information

Sociodemographic Data

The study population consisted of fifty patients who were newly diagnosed with Diabetes Mellitus and referred to a diabetes education teaching program at one of six hospitals in lower Western Michigan. All newly diagnosed diabetic patients referred to a diabetes education program who met the study criteria were asked to participate in the study until a total of fifty patients had returned both sets of questionnaires.

Several patients either refused the first questionnaires or took the questionnaires but did not return them. The majority of those patients, six, did not have personal contact with the investigator. They were initially contacted by the diabetes educators during the education

program. The investigator was unable to reach them by telephone and the patients were sent the questionnaires, consent form, return envelope and letter of explanation. Three patients contacted by telephone stated they would complete the questionnaires but did not return them even with follow-up telephone contact. One man had a heart attack and did not feel strong enough to complete the questionnaires. One young male was concerned about anonymity. No other reasons were given.

One patient appeared to be having serious problems with diabetes and was referred to the hospital clinic by the investigator. This patient was not included in the study because of investigator intervention. Three patients filled out the first questionnaires, but data collection was completed before the second set was returned. They were not vigorously followed up.

Of the group who completed the first questionnaires, four patients did not complete the second set. One man had not been discharged from the hospital six weeks after the diagnosis had been made. One woman died. She had diabetes as a result of cortisone treatment for Systemic Lupus Erythematosus. Her death was probably not associated with diabetes. One man refused to complete the follow-up questionnaires because he was "cured" of diabetes which points out a problem with his understanding of the disease process. One woman could not be located by telephone and did not

return any of the follow-up questionnaires sent to her. Since the data collection was completed, one more study patient has died.

There were thirty-two (68 percent) women and eighteen (36 percent) men in the study. All of the patients were Caucasian except for one Hindu male. Two of the patients were of Hispanic descent but the questionnaire did not delineate different races and both marked Caucasian. Two Negroes and four Hispanics did not meet the study criteria because they could not read English, and one Negro did not return the questionnaires.

The age range of the group broken down by sex can be seen by examination of Table 1. The age range was from twenty-one to seventy-two. It can be seen that the incidence of diagnosis increased with age, especially for females.

Examination of Table 1 reveals that incidence increased to thirteen patients after the age of fifty. The last category has fifteen patients, ten females and five males. Two of those patients were over seventy, one female and one male.

Thirty-two of the patients were Protestant, six Catholic, and one Hindu. Two patients indicated they had no religion and nine left the space blank. Thirty-three of the patients were married, four divorced, five widowed and eight had never married.

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Table 1.--Age and Sex of the Study Population (N = 50).

Age	Female		Male		Total	
	Number of Patients	Percentage (%) of Patients	Number of Patients	Percentage (%) of Patients	Number of Patients	Percentage (%) of Patients
21-30	4	8	4	8	8	16
31-40	5	10	2	4	7	14
41-50	3	6	4	8	7	14
51-60	10	20	3	6	13	26
61-72	10	20	5	10	15	30
Total	32	64	18	36	50	100

Table 2 shows the education level for patients and spouses. As can be seen, educational level ranges from less than seven years of school to graduate degree. The mean for patients is 3.68 and the mode 4. For spouses the mean is 5.26 with a mode of 9. The high number of missing data for spouse education is from patients without spouses. The high number of graduate degrees for spouses may be due to the fact that four of the referral sites were in a university city.

Table 3 shows the occupational level of patients and their spouses. The levels are a modification of the Hollingshead Scale (1957). The modifications were to include homemakers as skilled manual employees and add a level (8) for retired people. The mean score for patients' occupational level is 5.5 and the mode, 5. Sixteen patients did not respond to spouse's occupational level. The mean for spouses' occupational level is higher than patient's at 4.2, without including the scores for missing data.

Thirty-four patients owned their own home, three rented a home or townhouse, seven lived in an apartment, four lived in a mobile home and one patient marked other. Eleven people lived alone, seventeen lived with spouse, four lived with children, sixteen lived with spouse and children and one lived with a friend. Fourteen people stated no one would assist them with diabetes, twenty-seven patients stated their spouse would assist them with diabetes, two

Table 2.--Educational Level by Number and Percentage of Patients and Spouses (N = 50).

Educational Level	Patient Education		Spouse Education	
	Number of Patients	Percentage (%) of Patients	Number of Patients	Percentage (%) of Patients
Graduate Degree	2	4	6	12
College or University Degree	8	16	2	4
Partial College	12	24	7	14
High School Graduate	17	34	9	18
Junior High School	7	14	8	16
Less than 7 Years	3	6	2	4
Missing Data	1	2	16	32
Total	50	100	50	100

Table 3.--Occupational Level by Number and Percentage of Patients and Spouses (N = 50).

Occupational Level	Patient Occupation		Spouse Occupation	
	Number of Patients	Percentage (%) of Patients	Number of Spouses	Percentage (%) of Spouses
1. Higher executives, proprietors of large concerns and major professionals	2	4	4	8
2. Business managers, proprietors of medium concerns and lesser professionals	2	4	2	4
3. Administrative personnel, small individual business and minor personnel	2	4	3	6
4. Clerical and sales workers, technicians and owners of little business	10	20	1	2
5. Skilled manual employees, including homemakers	13	26	12	24
6. Machine operators and semi-skilled employees	4	8	-	-
7. Unskilled employees	4	8	8	16
8. Retired	11	22	4	8
9. Missing Data	2	4	16	32
Total	50	100	50	100

identified their children, two identified other relatives, and one each for friends or neighbors, employee, nurse and other. Two patients did not respond to the question.

Table 4 describes the number of and percentage of patients whose family members received instruction about diabetes, insulin and diet. The missing data for insulin is from patients not taking insulin. Over half the patients had family members who had received instruction on diabetes.

Table 4.--Number and Percentage of Patients Whose Family Members Received Instruction About Diabetes, Insulin and Diet (N = 50).

Type of Instruction	Family Instruction		No Family Instruction	
	Number of Patients	Percentage (%) of Patients	Number of Patients	Percentage (%) of Patients
Diabetes	27	54	23	46
Insulin	25	50	22	44
Diet	32	64	18	36

According to the literature, the number of health prescriptions for the patient to follow affects compliance to the health regimen. The number of prescriptions the patient had been given prior to the diagnosis of diabetes is important. To determine the number of prescriptions given to the patient prior to the diabetes diagnosis, patients were asked: (1) if they were on a special diet and the type of diet, (2) to list the medications they were on,

and (3) to describe any other health prescriptions they had received such as stopping smoking. Eleven patients had been on a special diet, nine of those were for weight loss. Thirty-four had not been on special diets and five patients did not respond to the question.

Twenty-two patients were not on any medication, ten patients took one medication, seven patients were on two medications, three patients were taking three medications, four patients were taking four medications, and six patients were taking five medications. Twenty-two patients reported that their doctor suggested they lose weight, but only nine patients stated they had been on a special weight loss diet. Two patients reported the doctor suggested they stop smoking. Five patients reported being given two prescriptions for improving their health and one patient had been given three prescriptions for change in health habits. Four patients did not respond to the question and fifteen patients reported that they had not received any suggestions for changes in health habits from their physician.

Table 5 describes the total number of health prescriptions, including diet, medications and other prescriptions such as exercise, that the patients received before the diagnosis of diabetes was made. Losing weight was only counted once. The range for number of prescriptions is from zero to six with a mean of 3.28. Only ten patients had not received previous health prescriptions.

Table 5.--Total Number of Health Prescriptions Patients Received Before Diagnosis of Diabetes by Number and Percentage of Patients (N = 50).

Number of Prescriptions	Number of Patients	Percentage (%) of Patients
None	10	20
1	13	26
2	8	16
3	7	14
4	5	10
5	2	4
6	3	6
Missing Data	2	4
Total	50	100

In Table 6 the symptoms patients reported experiencing over the six month period before they were diagnosed are presented. Patients were asked if they had an increase in urination, thirst, hunger and so on. The symptoms were marked on a scale of 1--no increase (not a symptom), 2--slight increase, 3--moderate increase, and 4--large increase. Each of the symptoms is presented in the degree that the patient reported. The total reflects the number of 2, 3 and 4's reported. The total does not reflect the number of times 1 was marked because 1 represents no symptom. The

Table 6.--Number and Percentage of Patients Reporting Symptoms Over Past Six Months (N = 50).

Symptoms	1--No Symptoms		2--Slight Increase		3--Moderate Increase		4--Large Increase		Total	
	Number of Patients	Percentage (%) of Patients	Number of Patients	Percentage (%) of Patients	Number of Patients	Percentage (%) of Patients	Number of Patients	Percentage (%) of Patients	Number of Patients	Percentage (%) of Patients
Urination	17	34	13	26	8	16	10	20	31	62
Thirst	13	26	14	28	7	14	14	28	35	70
Hunger	22	44	13	26	6	12	7	14	26	52
Weight	34	68	8	16	2	4	4	8	14	28
Fatigue	11	22	11	22	11	22	14	28	36	72
Change in Eyesight	24	48	12	24	4	8	7	14	23	46
Problems with teeth and gums	35	70	10	20	2	4	3	6	15	30
Healing time of cuts and sores	37	74	7	14	1	2	3	6	11	22

symptoms with the highest numbers are fatigue (72 percent), thirst (70 percent) and increased urination (62 percent).

Table 7 represents the total number of symptoms reported by each patient. Again, 1--no increase, was not counted in these totals. The range is from no symptoms to eight symptoms. Seven patients reported having seven symptoms of diabetes. The mean is 4.14 and the mode is 4.

Nineteen patients reported no family history of diabetes, four had a parent with diabetes, two had siblings with diabetes, six had grandparents with diabetes, three had two close relatives, three had three close relatives, seven had more distant relatives with diabetes and one did not know. Two patients did not respond to the question.

Fifteen patients reported no previous surgeries. Ten patients reported one, nine patients each reported two and three, four patients had more than three surgeries and three patients did not indicate any previous surgery. Thirty-two patients had previous surgeries. Twenty-nine patients had not been hospitalized prior to the diagnosis of diabetes. Eight patients had been hospitalized once, six had two hospitalizations, two had three hospitalizations and five did not indicate any previous hospitalizations.

Table 8 is a description of the number and percentage of health problems other than diabetes reported by patients. No patients reported having any problems with cancer. Twenty-one patients (42 percent) reported problems

Table 7.--Total Number of Diabetes Symptoms Reported by Number and Percentage of Patients in the Six Months Prior to Diagnosis of Diabetes (N = 50).

Symptoms	Number of Patients	Percentage (%) of Patients
None	1	2
1	4	8
2	10	20
3	4	8
4	12	24
5	6	12
6	3	6
7	7	14
8	1	2
Missing Data	2	4
Total	50	100

Table 8.--Number and Percentage of Patients Reporting Problems with Present Illnesses Other than Diabetes (N = 50)

Present Illnesses	Number of Patients	Percentage (%) Patients
Allergies or Asthma	8	16
Anemia or Bleeding Tendencies	4	18
Cancer or Tumor	-	-
Heart Trouble	5	10
High Blood Pressure	21	42
Kidney or Bladder Trouble	8	16
Lung or Respiratory Problems	2	4
Rheumatism or Arthritis	14	28
Stomach, Intestine or Ulcer	5	10
Other	7	14

with hypertension. The next highest problem was rheumatism or arthritis at fourteen (28 percent), kidney, bladder problems and allergies or asthma both at eight (16 percent).

Table 9 shows the total number of present illness problems per patient. The range is from no present illness problems to six present illnesses, with three patients not responding to the question. There were no patients with four problems. Thirteen patients (26 percent) reported no present illness while ten (20 percent) reported one and fourteen (28 percent) reported two. Five patients each visited their physician every three months or every three

Table 9.--Total Number of Present Illness Problems Other Than Diabetes by Number and Percentage of Patients (N = 50).

Problem	Number of Patients	Percentage (%) of Patients
None	13	26
1	10	20
2	14	28
3	8	16
4	-	-
5	1	2
6	1	2
10	1	2
Missing Data	2	4
Total	50	100

to six months, seven every six to twelve months, eleven every twelve to twenty-four months, thirteen only when they felt ill and seven had not seen a doctor for more than two years prior to the diagnosis of diabetes.

Table 10 is the source of referrals. The majority of patients were referred from Hospital A, twenty-six (52 percent).

Table 10.--Number and Percentage of Patients Received from Each Referral Site for this Study (N = 50).

Site	Number of Patients	Percentage (%) of Patients
Hospital A	26	52
Hospital B	2	4
Hospital C	3	6
Hospital D	12	24
Hospital E	3	6
Hospital F	3	6
Other (Physician's Office)	1	2
Total	50	100

Twenty-nine (58 percent) of the patients were admitted to the hospital for diagnosis, regulation and instruction of diabetes. The rest, twenty-one (42 percent), were outpatients. Eighteen (36 percent) of the patients were prescribed diet only, four (8 percent) were on diet and

oral hypoglycemic medication and twenty-eight (56 percent) were on diet and insulin. Forty-five of the patients were classified as maturity-onset diabetics while five patients were considered to be juvenile onset. Juvenile onset was determined by patient criteria of under thirty years of age, losing weight instead of gaining and requiring insulin.

Multidimensional Health Locus of Control (MHLC) Scale

The total score for the MHLC scale ranges from 46 to 137 with a mean of 66.240, mode of 56 and a standard deviation of 13.898. The alpha reliability coefficient is .76957. The total score for the MHLC scale did not add information to the path analysis and is not included in the analysis (see Appendix R). The MHLC data are divided into three dimensions, internal, chance, and powerful others.

Table 11 describes the patients' scores on internal locus of control. The mean is 28.540, mode 27, and standard deviation, .838. There is a fourteen point spread between the last two scores.

Table 12 represents the scores on the MHLC scale for chance orientation. The range is from 6 to 51 with a large gap between the last two scores from 26 to 51. The mean is 14.900, mode 10, and standard deviation, 7.338.

Table 13 shows the scores for powerful others locus of control orientation. The mean is 22.800, mode 22 and the standard deviation is 6.630. The scores range from 6 to 36.

Table 11.--Scores of Internality on the MHLC Scale by Number and Percentage of Patients (N = 50).

Score	Number of Patients	Percentage (%) of Patients	Score	Number of Patients	Percentage (%) of Patients
17	1	2	30	3	6
18	1	2	31	6	12
22	5	10	32	2	4
23	2	4	33	1	2
24	1	2	34	1	2
25	3	6	35	1	2
26	3	6	36	3	6
27	7	14	40	1	2
28	6	12	54	1	2
29	2	4			

Table 12.--Scores of Chance Orientation on MHLC Scale by Number and Percentage of Patients (N = 50).

Score	Number of Patients	Percentage (%) of Patients	Score	Number of Patients	Percentage (%) of Patients
6	2	4	16	2	4
7	1	2	17	4	8
8	2	4	18	2	4
9	5	10	19	2	4
10	6	12	20	1	2
11	3	6	22	2	4
12	2	4	23	3	6
13	4	8	25	1	2
14	3	6	26	1	2
15	3	6	51	1	2

Table 13.--Powerful Others Locus of Control Orientation Scores by Number and Percentage of Patients (N = 50).

Score	Number of Patients	Percentage (%) of Patients	Score	Number of Patients	Percentage (%) of Patients
6	1	2	24	4	8
12	3	6	25	1	2
13	2	4	26	3	6
14	1	2	27	2	4
16	3	6	28	5	10
17	2	4	29	4	8
18	3	6	30	1	2
20	1	2	31	2	4
21	2	4	32	1	2
22	5	10	35	1	2
23	2	4	36	1	2

The knowledge of diabetes test scores range from 0 to 39 out of a possible total score of 46. The scores are examined in Table 14. One patient did not fill out the knowledge test although she completed all of the other questionnaires. A follow-up knowledge test sent to the patient was not returned. The patient attended diabetes education classes twice and apparently was having great difficulty with the content. Her score is included in the total because it appeared indicative of her knowledge.

The mode for the knowledge test is 32, the standard deviation, 7.194 and the alpha reliability coefficient is .87202. The mean for all patients on the knowledge test is 29.960 which is 65 percent for all questions. This score reflects the total score including medication questions. Patients on diet only did not answer the medication questions. The mean for the knowledge test answered by patients who were taking medication is 30.8 which is 67 percent. There is very little difference in scores of patients on diet only and diet and medication.

The analysis of the data shows very little difference between scores for patients taking medication and patients controlled by diet only. Thirty-one patients answered questions on medications. One patient answered the questions on oral hypoglycemic agents and insulin. The scores for patients on knowledge of medications ranges from 24 to 39 (see Appendix S).

Table 14.--Scores for Knowledge of Diabetes Test by Number and Percentage of Patients (N = 50).

Score	Number of Patients	Percentage (%) of Patients	Score	Number of Patients	Percentage (%) of Patients
0	1	2	30	2	4
14	1	2	31	3	6
15	1	2	32	8	16
16	1	2	33	3	6
19	1	2	34	4	8
23	1	2	35	2	4
24	2	4	36	1	2
27	2	4	37	4	8
28	3	6	38	3	6
29	6	12	39	1	2

Table 15 shows the percentage of the population who answered each test item correctly (see Appendix B for Questionnaire). The questions that were answered correctly less than 75 percent of the time are: #2--short-term illness (24 percent), #5--eating out (74 percent), #11--diet for the whole family (50 percent), #10--action of insulin (60 percent), #25--time to test urine (72 percent), #27--indication of positive urine test (64 percent), #28 and #29--exercise (46 percent and 66 percent, respectively), #32--the effect of infection (64 percent), #33--treatment of foot blisters (44 percent), #35--when to call the doctor (38 percent), and #36--the effect of medication on diabetes (40 percent). Some of the diabetes instructors did not agree with the answer choices for question #33, and told their patients not to use iodine. One of the patients wrote on the test that there was no right answer for #33.

Only three people answered questions on oral hypoglycemic agents. All three patients answered the questions on side effects incorrectly (#39). One patient answered questions #37, #39 and #40 incorrectly. The rest of the answers were correct. Four patients reported being on oral medication, but only three patients answered the questions on oral medications.

Twenty-nine patients answered the insulin questions, while twenty-eight patients stated they were on insulin. Fifty-five percent of the patients taking insulin knew the

Table 15.--Number and Percentage of Patients Answering Each Knowledge Question Correctly (N = 50).

Question Number	Number of Patients	Percentage (%) of Patients	Question Number	Number of Patients	Percentage (%) of Patients
1	43	86	25	36	72
2	12	24	26	47	94
3	49	98	27	37	64
4	41	82	28	23	46
5	37	74	29	33	66
6	47	94	30	47	94
7	42	84	31	44	88
8	42	84	32	32	64
9	43	86	33	22	44
10	30	60	34	43	86
11	25	50	35	19	38
12	38	76	36	20	40
13	42	84	*37	2	4
14	48	96	*38	3	6
15	48	96	*39	1	2
16	45	90	*40	1	2
17	40	80	*41	3	6
18	47	94	**42	16	32
19	44	88	**43	29	58
20	45	90	**44	29	58
21	44	88	**45	6	12
22	46	92	**46	22	44
23	41	82			
24	39	78			

*Oral medication questions. **Insulin questions.

peak effect of regular insulin (#42), 68.6 percent of the patients knew what to do when they became ill, and 75 percent of the patients knew the peak effect of intermediate insulin. All of the insulin users knew how to prevent insulin reactions and to rotate administration sites. The low number and percentage of correct responses on questions #37 to #46 because patients on diet only were not asked to answer these questions.

Barriers To Implementing Therapy (Social Support)

The first section of the questionnaire was scored on a Likert-type scale from "Strongly Agree" to "Strongly Disagree" (see Appendix C for Questionnaire). A score of five for each question was desired, and for most questions, "Strongly Agree" was scored as five points. Questions 1, 3, 4, 14, 21 and 23 were transformed and scored in the opposite direction. In other words, a response of "Strongly Disagree" for questions #1, #3, #4, #14, #21 and #23 was scored as five points. Question #2 should have been transformed but was not. Therefore, question #2 was deleted from the score. Without question #2, the alpha reliability of the social support questionnaire is .90760.

The second section was scored on a five point scale from "Never" (scored as one) to "Always" (scored as five). There are five transformed questions requiring negative

responses. Questions #4, #5, #9, #10 and #17 were scored five points for "Never" and one point for "Always."

Table 16 represents the scores on the Barriers To Implementing Therapy Questionnaire (Social Support). The mean is 121.86, and the standard deviation, 35.580. The scores cover a wide range from 41 to 174.

Some of the patients wrote comments on the Barriers To Implementing Therapy Questionnaire. The comments were: "Husband knows but has not done it," "I am a very independent person, but if I needed help, my family would help me," and "Do not need to be reminded." One man wrote, "The reason I circled S.D. (Strongly Disagree) is that I <u>want to control by myself</u> so as not to rely on someone else. (If you have it take care.)"

Table 17 is the percentage of the population responding to each option. Five and six people did not respond to the second section of the social support questionnaire. Two people stated that the questions did not apply to someone living alone even though the directions stated to substitute the word "friend" for "family."

The stated importance of social support, questions #1, #3, #4 and #21 are rated high in the disagreement categories 23, 33, 41 and 27. Patients did not think social support was important. Question #7 indicates that most patients do not have anyone help them with foot hygiene. In general, patients did report not receiving assistance

Table 16.--Scores on Barriers To Implementing Therapy Questionnaire (Social Support) by Number and Percentage of Patients (N = 50).

Score	Number of Patients	Percentage (%) of Patients	Score	Number of Patients	Percentage (%) of Patients
51	1	2	126	2	4
66	1	2	127	1	2
67	1	2	131	1	2
70	1	2	132	1	2
73	1	2	134	1	2
82	1	2	136	1	2
88	1	2	138	1	2
90	2	4	139	2	4
95	1	2	140	1	2
96	1	2	143	1	2
102	1	2	145	1	2
103	1	2	147	2	4
107	2	4	148	1	2
108	1	2	152	1	2
109	1	2	154	1	2
112	1	2	158	2	4
114	2	4	161	1	2
115	1	2	163	1	2
118	1	2	164	1	2
120	1	2	169	1	2
121	1	2	174	1	2
124	1	2	Total	50	100

Table 17.--Points Received for Each Option of the Barriers To Implementing Therapy Questionnaire (Social Support) by Number of Patients (N = 50).

Question Number	No Response	1 Point	2 Points	3 Points	4 Points	5 Points	Total Number of Patients
				Section I			
1	-	8	13	6	16	7	50
2	2	9	17	1	20	1	50
3	-	6	8	3	22	11	50
4	-	2	3	4	26	15	50
5	-	10	16	1	19	4	50
6	4	5	13	3	21	4	50
7	-	19	22	4	3	2	50
8	-	8	11	5	24	2	50
9	-	1	3	2	30	14	50
10	-	9	21	2	15	3	50
11	1	10	23	3	11	2	50
12	2	3	12	3	25	5	50
13	5	7	20	6	10	2	50
14	2	3	12	5	19	9	50
15	1	2	6	3	29	9	50
16	4	4	9	4	24	5	50
17	1	1	13	2	24	9	50
18	2	3	14	7	20	4	50
*19	18	5	10	2	12	3	50
*20	16	8	12	-	12	2	50
*21	16	2	4	1	20	7	50
*22	16	-	4	2	18	10	50
*23	16	2	5	2	20	5	50
*24	16	3	8	2	18	3	50

Table 17.--Continued.

Question Number	No Response	1 Point	2 Points	3 Points	4 Points	5 Points	Total Number of Patients
				Section II			
1	5	8	3	6	10	18	50
2	5	-	-	2	5	38	50
3	6	25	7	7	4	1	50
4	6	-	2	-	1	41	50
5	5	-	-	2	1	42	50
6	5	24	7	7	4	3	50
7	5	30	5	4	3	3	50
8	5	-	-	3	9	33	50
9	7	6	6	16	9	6	50
10	6	3	1	1	9	30	50
11	6	6	2	7	9	20	50
12	6	3	3	3	2	33	50
13	6	7	3	12	6	16	50
14	8	7	4	5	11	15	50
*15	22	-	-	-	-	28	50
*16	22	14	2	3	3	6	50
*17	22	-	-	-	-	28	50
*18	22	15	3	6	1	3	50

*Medication questions.

with care of feet and skin, questions #7, #11 and #13. The responses to questions #9, #15, #17 and #22 shows that patients did not perceive diabetes as interfering with their lives. The remainder of the questions in Section I indicate the patients' subjective appraisal of support from family and friends.

Section II requested responses of "Never" to "Always." Thirty-eight patients stated their families expected them to always comply with the health regimen. Except for diet, patients stated that their families did not tell them to be noncompliant. Fourteen patients indicated that their families said it was all right to eat food that was not on their diet at least occasionally. Three of those fourteen said their families always told them it was all right to eat food not on their diet. All of the patients answering medication questions reported that their families expected them to take their medication and did not suggest missing medications (questions #15 and #17). However, families did not remind patients to take medications or help patients take medications (questions #16 and #18).

The social support score for patients on medication has the same range as for patients without medication, 51 to 174. The mean is higher than for nonmedication users, who had a high score of 137 (see Appendix T).

Self-Management Question (Compliance)

The compliance questionnaire was scored on a Likert scale of "Never" (scored as one point) to "Always" (scored as five points) (see Appendix D for Questionnaire). Fifteen questions were transformed and were scored five points for "Never" and one point for "Always." The transformed questions are: #2, #6, #7, #9, #10, #11, #12, #16, #21, #22, #23, #25, #26, #27 and #28. Table 18 represents the scores on the Self-Management Questionnaire. The range is from 48 to 132. The alpha reliability coefficient is .84272. The mean is 102.82 and the standard deviation is 10.30. The scores for patients on medication range from 95 to 132. The mean is slightly higher at 114.6 (see Appendix U).

One patient wrote comments on the compliance questionnaire which has relevance to this study. The comments are: "I don't see how these answers can help you when I have no income to buy the foods I need or to have the prescriptions filled and your dietitians knew when I left the hospital that I had no way of getting these things." In reference to the compliance question on taking less medication than ordered, the patient stated, "no money to have prescriptions filled."

Table 19 represents the points patients received for each option on the compliance questionnaire. Some of the patients did not answer the question on exercise, questions #1, #2, #3 and #4, stating that exercise was not

Table 18.--Scores on Self-Management Questionnaire (Compliance) by Number and Percentage of Patients (N = 50).

Score	Number of Patients	Percentage (%) of Patients	Score	Number of Patients	Percentage (%) of Patients
48	1	2	104	1	2
63	1	2	108	1	2
66	1	2	109	2	4
68	1	2	110	3	6
69	1	2	111	2	4
74	1	2	112	2	4
83	1	2	113	1	2
84	1	2	116	4	8
85	1	2	117	1	2
86	1	2	118	1	2
88	1	2	120	1	2
90	1	2	123	2	4
91	1	2	125	1	2
93	1	2	126	3	6
94	1	2	127	1	2
95	1	2	129	1	2
98	3	6	132	1	2
102	1	2			
103	1	2	Total	50	100

Table 19.--Points Received for Each Option on the Self-Management Questionnaire (Compliance) by Number of Patients (N = 50).

Question Number	No Response	1 Point	2 Points	3 Points	4 Points	5 Points	Total Number of Patients
1	3	5	9	7	17	9	50
2	2	17	7	9	8	7	50
3	2	1	3	9	8	27	50
4	5	11	8	5	8	13	50
5	4	21	9	5	4	7	50
6	-	-	5	13	14	18	50
7	4	17	5	7	7	10	50
8	-	-	1	5	12	32	50
9	1	-	1	6	28	14	50
10	-	3	4	13	23	7	50
11	1	7	4	4	1	33	50
12	1	-	5	11	13	20	50
13	-	2	3	4	15	26	50
14	5	3	-	2	10	30	50
15	-	9	7	10	13	11	50
16	-	-	-	13	24	13	50
17	-	-	2	5	27	16	50
18	-	-	1	2	9	38	50
19	6	3	2	1	11	27	50
20	1	-	-	2	5	42	50
21	1	2	4	10	11	22	50
22	2	6	4	9	9	20	50
23	-	1	1	5	19	24	50
24	3	13	12	7	7	8	50
*25	19	-	-	-	1	30	50
*26	19	-	-	-	2	29	50
*27	19	-	-	1	1	29	50
*28	20	-	-	-	2	28	50
*29	19	1	1	-	3	26	50

*Medication questions.

prescribed for them. Seventeen patients indicated they treated their own blisters, cuts and corns. The patients reported good compliance with taking medication.

Results of Treatment Questionnaire (Therapeutic Outcome)

The section on therapeutic outcomes is described more completely than the other variables because: (1) the data on therapeutic outcomes are very diverse, and (2) there is little data available on therapeutic outcomes from the reported studies. The Results of Treatment Questionnaire (Therapeutic Outcomes) was scored on a five-point scale with five being the highest level of well-being (see Appendix E for Questionnaire). The range of possible scores for the Results of Treatment Questionnaire was 14 to 70, with 70 indicating good control of diabetes. In addition, a normal blood sugar was given 10 points and normal weight, 5 points. The range of scores for therapeutic outcomes was 16 to 85 points.

Table 20 shows the total range of scores for therapeutic outcomes. The range was from 39 to 83, with a mean of 70.14, a mode of 75, and a standard deviation of 9.1518. The alpha reliability coefficient was .5676.

Table 21 shows the number of reported hypoglycemic and hyperglycemic reactions experienced by patients in the six weeks after the diagnosis was made. One point was given

Table 20.--Therapeutic Outcomes Scores by Number and Percentage of Patients (N = 50).

Score	Number of Patients	Percentage (%) of Patients	Score	Number of Patients	Percentage (%) of Patients
39	1	2	70	4	8
45	1	2	71	3	6
56	1	2	73	4	8
57	2	4	74	3	6
58	1	2	75	5	10
60	1	2	77	2	4
61	1	2	78	3	6
63	1	2	79	2	4
64	3	6	80	1	2
65	1	2	81	3	6
66	2	4	82	1	2
68	1	2	83	1	2
69	2	4	Total	50	100

Table 20.--Therapeutic Outcomes Scores by Number and Percentage of Patients (N = 50).

Score	Number of Patients	Percentage (%) of Patients	Score	Number of Patients	Percentage (%) of Patients
39	1	2	70	4	8
45	1	2	71	3	6
56	1	2	73	4	8
57	2	4	74	3	6
58	1	2	75	5	10
60	1	2	77	2	4
61	1	2	78	3	6
63	1	2	79	2	4
64	3	6	80	1	2
65	1	2	81	3	6
66	2	4	82	1	2
68	1	2	83	1	2
69	2	4	Total	50	100

Table 21.--Number of Hypoglycemic and Hyperglycemic Reactions Reported by Patients (N = 50).

Type of Reactions	Number of Reactions						Total Number of Patients
	0	1-3	4-7	8-12	More than 12	Missing Data	
Hypoglycemic	27	9	7	2	2	3	50
Hyperglycemic	35	7	3	-	1	4	50

for more than twelve reactions up to five points for no reactions.

Scores for weight loss were based on normal height and weight scales. If the patient was overweight, the scores were: five points for eight to thirteen pounds, four points for one to seven pounds, three points for fourteen to twenty pounds, two points for more than twenty pounds and one point for no weight loss. If the patient was underweight or normal weight, the score was: five points for zero, four points for four to seven pounds, three points for eight to thirteen pounds, two points for fourteen to twenty pounds and one point for more than twenty pounds weight gain. Table 22 shows the points patients received for weight loss.

Weight gain was scored: five points for zero, four points for one to seven pounts, three points for eight to thirteen pounds, two points for fourteen to twenty pounds and one point for more than twenty pounds. Thirty-six patients reported no weight gain and twelve patients reported weight gain: nine patients received four points, two patients received three points, and one patient received two points. Two patients did not respond to the question. Even though there appears to be a large number of pounds lost and a minimal amount of weight gain, the majority of patients were overweight six weeks after the diagnosis was

Table 22.--Points for Weight Loss by Number and Percentage of Patients (N = 50).

	5 Points	4 Points	3 Points	2 Points	11 Point	Missing Data	Total Number of Patients
Number of Patients	20	14	5	6	4	1	50
Percentage (%) of Patients	40	28	10	12	8	2	100

made. Table 23 shows the height and weight of the patient population six weeks after the diagnosis was made.

Only one patient reported having any serious cuts or sores since the diagnosis of diabetes was made. Forty-three patients did not experience any short-term illness, five patients had one short-term illness, one patient experienced two short-term illnesses and one patient had more than three short-term illnesses. One patient missed one to two days of work because of illness, four patients did not answer the question, and one patient had missed more than six days of work. That patient wrote on the questionnaire that he was on sick leave. Seventeen patients reported going to work while they were not feeling well.

Table 24 shows the points patients received for calling health care providers. The patients received five points for not calling health care providers. The scale for doctors and nurses differed from dietitians. The scale for doctors and nurses was five points for zero, four points for one to two calls, three points for three to four calls, two points for five to six calls, and one point for more than six calls to health care providers. The scale for calls to dietitians was five points for zero, four points for one, three points for two, two points for three and one point for more than three calls to health care providers.

One patient wrote that the reason he called his physician was to find out the results of his blood sugar.

Table 23.--Heights and Weights of Study Population (N = 50).

Height in Inches	Weight in Pounds	Height in Inches	Weight in Pounds
60	143	66	141
	185		147
	238		161
61	120		195
	124		196
	124		250
	205	67	134
	219		167
62	116		189
	140		210
	148	68	140
	157		155
	170		243
	195	69	148
Missing Data	199		196
63	112		208
	115		220
	228		260
64	120	71	145
	138		197
	140	73	198
	150		198
65	130		201
	137	76	205
	160		225

Table 24.--Calls to Health Care Providers by Number of Patients.

Provider	5 Points	5 Points	3 Points	2 Points	1 Point	Total Number of Patients
Doctor	33	9	6	2	-	50
Nurse	36	12	2	-	-	50
Dietitian	42	4	2	2	-	50

Twenty-two patients did not have sugar in their urine. Four patients did not answer the question. The rest of the responses were: ten patients showed sugar in the urine one to two times, nine patients three to four times, two patients five to six times and three patients had sugar in the urine more than three times.

Table 25 shows the scores patients received for energy level and feeling of well-being. Five points represented a lot more energy and feeling a lot better. One point represented having a lot less energy and feeling a lot worse. The majority of patients felt better and had more energy six weeks after the diagnosis of diabetes was made.

Thirty-two patients had normal blood sugars and received ten points towards the total therapeutic outcome score. One patient each reported blood sugars of 151 to 160, 161 to 170, 171 to 180, 181 to 210 and 211 to 220. Two patients reported blood sugars of 191 to 200 and there was no data for one patient. Ten patients did not have a follow-up blood sugar drawn six weeks after the diagnosis was made. Of the forty patients who had blood sugars drawn, only six were above 150 mg/dl.

Table 26 represents the points patients received for weight. Normal weight added five points to the therapeutic outcome score. Other scores were: four points for ten to twenty-five pounds above normal, three points for

Table 25.--Points for Energy Level and Feeling of Well-Being by Number of Patients (N = 50).

	5 Points	4 Points	3 Points	2 Points	1 Point	Missing Data	Total Number of Patients
Energy	9	20	11	6	3	1	50
Feeling Better	20	20	8	1	-	1	50

Table 26.--Points Added to Therapeutic Outcome Score for Patient Weight.

	5 Points	4 Points	3 Points	2 Point	1 Point	Missing Data	Total
Number of Patients	12	12	6	6	13	1	50

twenty-six to forty pounds above normal, two points for forty-one to fifty-five points above normal and one point for fifty-six or more pounds above normal.

The patient's weight was obtained from the physician's office. The weight was compared to normal height and weight scales and points were assigned based on the number of pounds above normal weight for the reported height. Only twelve patients (24 percent) had a normal weight six weeks after the diagnosis of diabetes was made. A total of thirty-seven patients (14 percent) were overweight. Thirteen patients (26 percent) weighed more than fifty-six pounds above normal weight for their height.

Summary of Descriptive Information

The preceding section presented an overview of the population characteristics. The specific characteristics presented were: age, sex, race, education and occupation level of the patient and spouse, living arrangements, family assistance, number of health prescriptions, symptoms of diabetes, family history of diabetes, previous surgery and hospitalizations, number of present illnesses, visits to physicians, classification of diabetes and if the patient was an inpatient or outpatient. The descriptive information also included the scores on the questionnaires for each of the variables: total Multidimensional Health Locus of

Control, internal health locus of control, chance health locus of control, powerful others health locus of control, Knowledge of Diabetes, Barriers to Implementing Therapy (Social Support), Self-Management Questionnaire (Compliance), and Results of Treatment (Therapeutic Outcomes).

With the description of the study population in mind, the research questions will be presented. The research questions focused on the relationship between the variables and the interrelationship of all the variables. The next section will present the findings from the data analysis in an attempt to answer the research questions of this study. The level of significance used to answer each question was .05.

Relationship of Variables--Statistical Analysis

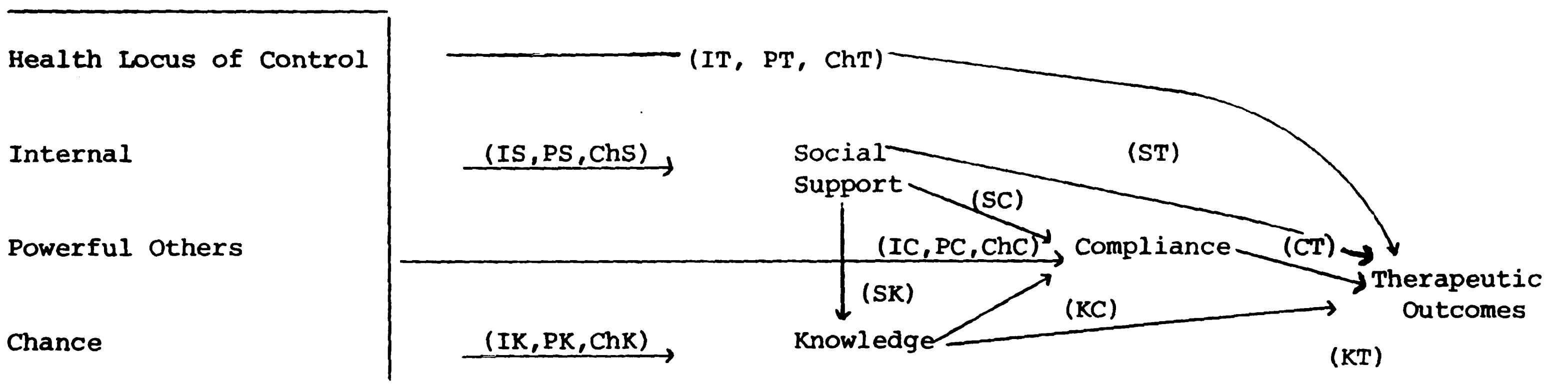
Multiple regression was used to analyze the relationship of all the variables including medications: social support, knowledge, compliance, therapeutic outcomes, social support medication, knowledge of medications, and compliance medication. The medication variables were not significant and were ignored (see Appendix V). A second set of multiple regression equations was computed for the remaining variables, social support, knowledge, compliance and therapeutic outcomes (see Appendix W). The multiple regressions were used in a simultaneous equation that considers systems of linear equations, the path analysis.

Path Analysis

Path analysis describes the linkages between variables and assesses the logical consequences of the causal theory based on an ordering by the investigator. Path analysis is used to test causal relationships and for interpreting and evaluating linear relationships. Multiple regression is used to determine the direct and indirect influence that each variable has on the other variables. Regression technique provides an estimate of the strength of each separate path.

Figure 6 is a schematic conceptualization of the path for the variables health locus of control, social support, knowledge, compliance and therapeutic outcomes. The three dimensions of health locus of control, internal (I), powerful others (P), and chance (Ch), are the driving force for the path analysis. The variables are built into a hierarchy with culmination at therapeutic outcomes. The information from the entire set of data is all contained in the therapeutic outcome score. Path analysis is a method of measuring the direct influence along each separate path and finding the degree to which variation of a given effect is determined by each particular cause. Coefficients derived from data analyses can be inserted into each path as a unit measurement. A unit increase in one variable will have a direct effect on the next variable in the path and an indirect effect on the other variables in the path.

Schematic Conceptualization



I = Internal
P = Powerful Others

Ch = Chance
K = Knowledge

S = Social Support
C = Compliance

T = Therapeutic Outcomes

Mathematical Conceptualization

$$S = B_{SI}I + B_{SCh}Ch + B_{SP}P + U_S$$

$$K = B_{KI}I + B_{KCh}Ch + B_{KP}P + B_{KS}S + U_K$$

$$C = B_{CI}I + B_{CCh}Ch + B_{CP}P + B_{CS}S + B_{CK}K + U_C$$

$$T = B_{TI}I + B_{TCh}Ch + B_{TP}P + B_{TS}S + B_{TK}K + B_{TC}C + U_T$$

Fig. 6.--Conceptualization of Path for Variables Health Locus of Control, Knowledge, Social Support, Compliance and Therapeutic Outcomes.

The combined effects of the variables are additive as illustrated in the equations of the mathematical conceptualization in Figure 6. Social support (S) is affected by the combined effects of internal, powerful others and chance, plus an error factor (Us). As can be seen, therapeutic outcomes contains the effects of all the variables.

Table 27 is the regression coefficient, R^2, standard errors of the regression coefficient, and the computed T-value for the relationships of the variables in this study. It can be noted that the R^2, coefficient of determination, values are very high indicating that the variables explain 91 to 98 percent of the variance. The students t-test was used to determine significance because of the small number of patients. A significance level of .05 with 32 degrees of freedom has a t value of 1.70.

Research Question 1--What is the relationship between health locus of control and the other variables: knowledge, social support, compliance and therapeutic outcomes? Health locus of control was divided into three dimensions, internal (I), powerful others (P), and chance (Ch). The R^2 value for health locus of control with social support is .9242. The largest R^2 change came when internal was entered, .9116.

Internal locus of control is directly related to social support with a t-value of 4.0107, a compliance t-value of 2.9469 and a therapeutic outcomes t-value of

Table 27.--Regression Coefficients, Standard Errors and Computed T Values for Variables in the Study.

Variable	Regression Coefficient		St. Error Reg. Coef.	Computed T Value
		Social Support		
Internal	2.5069094		.62505181	4.0107226*
Powerful Others	1.8582699	R^2=.92429	.70700852	2.6283557*
Chance	.31223662		.73244769	.42629204
		Knowledge		
Social Support	.14919017		.041847106	3.5651253*
Internal	.32363641		.19206286	1.6850546
Powerful Others	.24580042	R^2=.91886	.19789456	1.2420777
Chance	-.28012594		.18897565	-1.4823388
		Compliance		
Social Support	.1725844		.072946608	2.3655444*
Knowledge	1.4995890		.24353401	6.1576163*
Internal	.85501610		.29013680	2.9469413*
Powerful Others	.34606939	R^2=.98531	.29497921	1.1731993
Chance	.32540689		.28556503	1.1395194
		Therapeutic Outcomes		
Social Support	.10081828		.053582209	1.8815626*
Knowledge	1.8011034		.22424387	8.0318959*
Compliance	-.37357135		.11070533	-3.3744658*
Internal	.66038736		.21052732	3.1368249*
Powerful Others	.84790998	R^2=.98784	.19692836	4.3057757*
Chance	.25045046		.19051212	1.3146169

*Significant at the .05 level.

3.1368. Internal locus of control is significantly related to social support, compliance and therapeutic outcomes at the .05 significance level. The t-value for internal health locus of control with knowledge is 1.6850, just below the 1.70 significance level.

Powerful others health locus of control orientation is directly related to social support and therapeutic outcomes at a significant level. The t-value for powerful others and social support is 2.6283, and therapeutic outcomes is 4.3057. Powerful others orientation was related to knowledge at 1.2420 and compliance at 1.1731. The relationship of powerful others orientation to knowledge and compliance was not significant at the .05 level.

Chance health locus of control is not directly related to any of the variables in this study at a significant level. Chance orientation and social support has a t-value of .4262. The chance variable is negatively related to knowledge with a computed t-value of -1.4823. Chance orientation relationship to compliance is 1.1395 and therapeutic outcomes 1.3146.

Regression coefficients are used to show the relationships of each of the dimensions of health locus of control with the variables knowledge, social support, compliance and therapeutic outcomes in Figure 7. Internal orientation is related to social support, 2.5069; knowledge, .3236; compliance, .8550 and therapeutic outcomes, .6603.

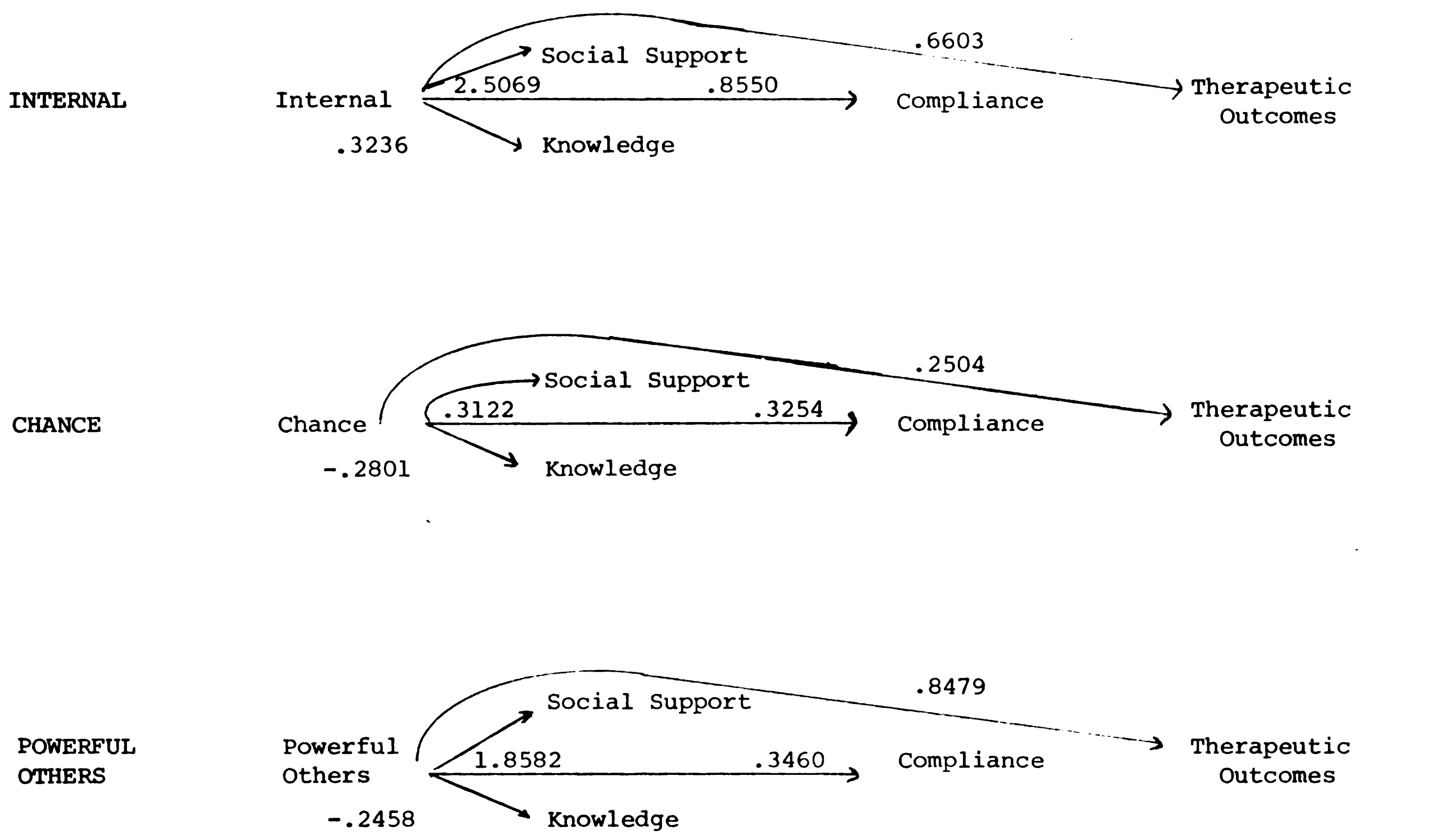


Fig. 7.--Regression Coefficients of Health Locus of Control with: Social Support, Knowledge, Compliance and Therapeutic Outcomes.

Chance orientation relationship to the variables is: social support, .3122; knowledge, -.2801; compliance, .3254; and therapeutic outcomes, .2504. Powerful others orientation relation to the variables is: social support, 1.8582; knowledge, .2458; compliance, .3460; and therapeutic outcomes, .8479.

Research Question 2--What is the relationship between knowledge and the other variables: social support, compliance and therapeutic outcomes? Knowledge is significantly related to social support, compliance and therapeutic outcomes. The relationships are strong with t-values of 3.5651, 6.1576, and 8.0318, respectively. Figure 8 is the path diagram of the regression coefficients for knowledge with social support, .1491, knowledge with compliance, 1.4995, and knowledge and therapeutic outcomes, 1.8011.

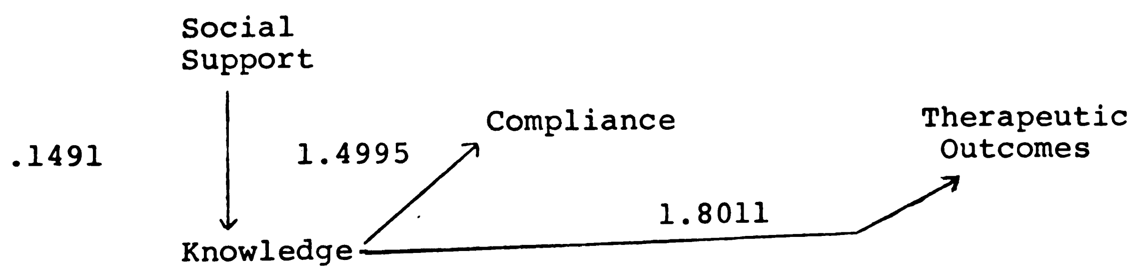


Fig. 8.--Path Diagram with Regression Coefficients of Knowledge with Social Support, Compliance and Therapeutic Outcomes.

Research Question 3--What is the relationship between social support and compliance? Social support and compliance are significantly related with a coefficient of .1725844 and a t-value of 2.365544.

Research Question 4--What is the relationship between compliance and therapeutic outcomes? There is a significant negative relationship between compliance and therapeutic outcomes with a regression coefficient of -.3735 and a t-value of -3.3744.

Figure 9 is the path diagram with coefficients for research questions 3 and 4.

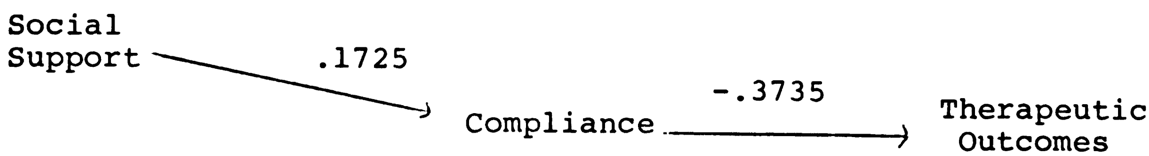


Fig. 9.--Regression Coefficients in Path Diagram for Social Support with Compliance and Compliance with Therapeutic Outcomes.

Summary Research Question--What is the interrelationship between multidimensional health locus of control, knowledge of diabetes, perceived social support, self-reported compliance and therapeutic outcomes six weeks after the adult patient has been diagnosed? Figure 10 is the path diagram with regression coefficients for the summary research question.

The summary path diagram shows the interrelationship between the variables. Each regression coefficient shows the direct relationship between the two variables

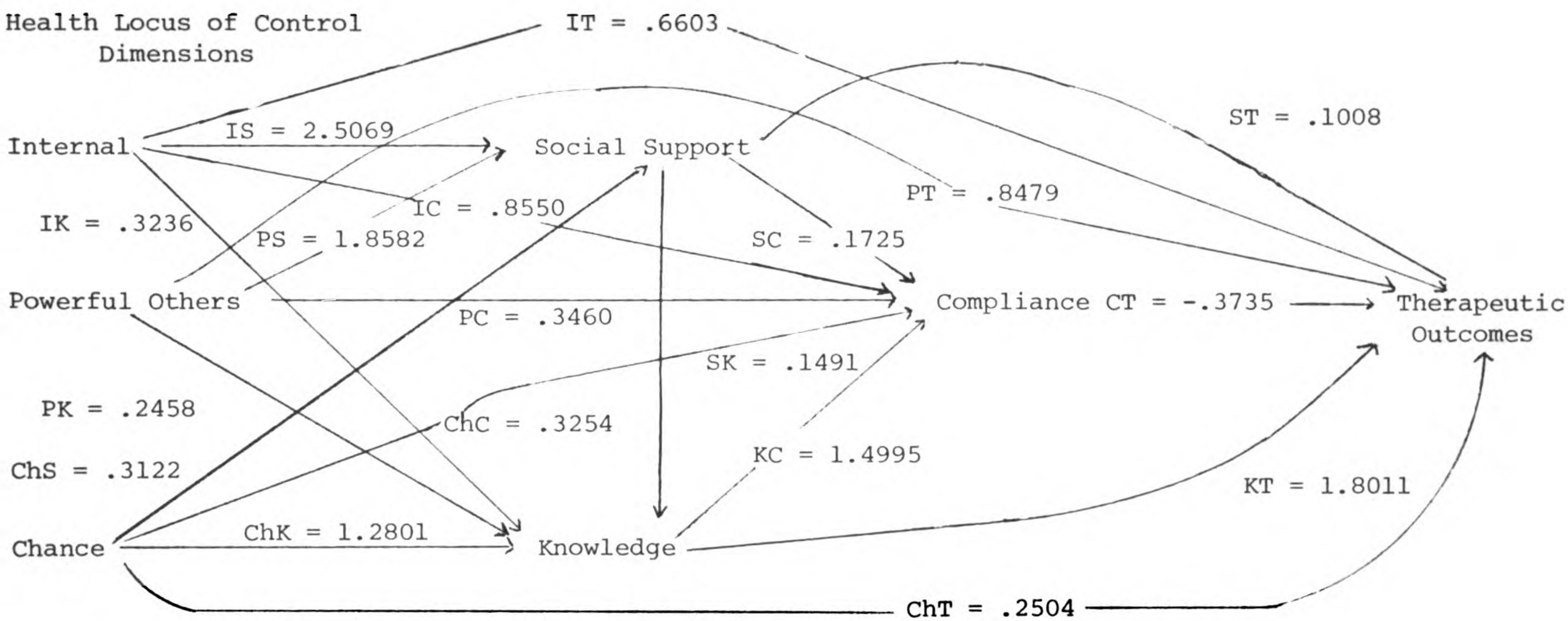


Fig. 10.--Path Diagram with Regression Coefficients for Health Locus of Control, Knowledge, Social Support, Compliance and Therapeutic Outcomes.

considered and an indirect effect on the other variables in the path.

This chapter presented the data to answer the research questions regarding the interrelationships between the variables health locus of control, knowledge, social support, compliance and therapeutic outcomes. The general characteristics of the study population were presented. The relationship between the variables has been determined. Discussion of significant relationships between the variables and the importance of these findings is presented in Chapter VI.

CHAPTER VI

SUMMARY AND IMPLICATIONS FOR FUTURE STUDIES

The purpose of the study was to determine the interrelationship between health locus of control, knowledge of diabetes, social support, compliance and therapeutic outcomes in adult patients six weeks after the diagnosis of Diabetes Mellitus was made.

The theoretical framework for this study is middle range theory which consists of theoretical concepts and their empirical tests or indicators (see Figure 1, page 31). The theoretical concepts are the variables health locus of control, knowledge, social support, compliance and therapeutic outcomes. The empirical tests or indicators are questionnaires developed for the purpose of this study: Sociodemographic Data Questionnaire, Knowledge of Diabetes Test, Barriers To Implementing Therapy (Social Support), Self-Management Questionnaire (Compliance), and Results of Treatment (Therapeutic Outcomes). Questionnaires to measure the variables were developed based on the literature review. The indicator for the health locus of control concept, the Multidimensional Health Locus of Control (MHLC) scale, was developed by Wallston et al. (1978).

Fifty patients with newly diagnosed diabetes completed the questionnaires. The first two questionnaires, Sociodemographic Data Questionnaire and the MHLC scale, were completed by the patients the first week after the diagnosis of diabetes was made and while the patients were attending diabetes education programs. Six to eight weeks later, the patients completed the remaining questionnaires. The methodology, patient criteria and questionnaires were revised following a pilot study with eight patients.

A review of literature indicated some possible relationships between the variables. Locus of control has been related to knowledge and compliance. "Internals" learn more initially and are more compliant to the health regimen than externals. The initial search for knowledge and compliance is an attempt by "internals" to control the disease. Externals believe that fate rules their lives and control is not possible. The effect of powerful others orientation has not been reported. High social support with internality has high reported compliance. However, low social support and "externals" were the second highest compliers. Poor control of diabetes was inversely related to knowledge in one study, and another study reported no correlation between compliance and therapeutic outcomes. The review of literature leaves many questions unanswered about the interrelationships of the variables.

Patients' blood sugar, weight and questionnaire responses supplied the data to answer the research questions. The research questions answered by the study are:

1. What is the relationship between health locus of control and the other variables: knowledge, social support, compliance and therapeutic outcomes?
2. What is the relationship between knowledge and the variables social support, compliance, and therapeutic outcomes?
3. What is the relationship between social support and the variables compliance and therapeutic outcomes?
4. What is the relationship between compliance and therapeutic outcomes?

The summary question is: What is the interrelationship between multidimensional health locus of control, knowledge of diabetes, perceived social support, self-reported compliance and therapeutic outcomes in adult patients six weeks after the diagnosis is made?

The variables of health locus of control, knowledge, social support and compliance have been studied in relation to their effect on therapeutic outcomes. Health care providers have been searching for explanations of health behavior. Health locus of control has been offered as one possible explanation of health behaviors. The expectancy variables could influence the patients' response to health prescriptions and affect the other four variables. Patients who think they have no control over their health may not be concerned about following the prescribed regimen. Patients who have a strong need to control ("internals") learn about their disease and comply to the regimen in an attempt to control the disease.

The diabetes regimen requires many modifications in patients' life style. Knowledge of self-management of the disease is necessary for compliance to the prescribed regimen. Knowledge, alone, is probably not sufficient to obtain compliance, but is one explanation of health behaviors. It is important to determine the quantity and character of diabetes knowledge necessary to permit compliance and the attainment of therapeutic outcomes.

Social support can positively affect knowledge and compliance. Patients with social support have assistance in learning the diabetes regimen, and support to follow the regimen.

Theoretically, if the patient is compliant to the health regimen, control of diabetes should be obtained. However, there is much controversy over how to control blood sugar and if control of blood sugar is really necessary. Not enough is known about diabetes and the progression of the disease to state that compliance affects control or decreases complications. Compliance to the prescribed regimen may not produce sufficient blood sugar control to prevent complications of diabetes. The ultimate goal of the health care provider is control of the disease and prevention of complications. Control is manifested in normal blood sugar values, normal weight, and absence of complications. This study examined some of the possible explanations of health behaviors and the relationship of these variables to therapeutic outcomes.

Summary of Findings

This summary reviews the descriptive information and describes the interrelationship between the variables answered by the research questions. Each research question is presented and discussed.

Descriptive Information

One of the most important descriptive findings is that 42 percent of patients with newly diagnosed diabetes had hypertension, and 10 percent had heart trouble. It is not known if the hypertension is a second chronic illness due to advancing age or if the effects of undiagnosed diabetes were present several years before the disease was diagnosed. Some patients had as many as six present illnesses with their diabetes. Only ten patients were not on any health prescriptions prior to the diagnosis of diabetes. Three patients had six previous health prescriptions.

Forty-eight percent of the patients were over fifty years of age. Ten patients had less than a high school education.

Only one patient reported no symptoms of diabetes in the six month period prior to diabetes being diagnosed. The mean number of symptoms reported was four. Seven patients reported having seven symptoms of diabetes.

Research Question 1

What is the relationship between health locus of control and the variables: knowledge, social support, compliance and therapeutic outcomes? The health locus of control scale was divided into three dimensions, internal, powerful others, and chance. Internal locus of control is directly related to social support, compliance and therapeutic outcomes at the .05 significance level. Internal locus of control orientation was not significantly related to knowledge as reported in other studies, but the relationship did show a strong trend in that direction.

Patients with internal locus of control orientation seek information about the disease as an antecedent to control of the disease. Internally oriented patients seek to control the disease by gaining knowledge about self-management of diabetes and complying with the therapeutic regimen. Internality is directly related to social support. "Internals" receive positive reinforcement and support from family members and friends to gain control over the disease. Internality is also related to therapeutic outcomes although compliance is negatively related to outcomes. Patients may be able to control the disease and attain desired therapeutic outcomes by manipulating their diet, medication and exercise balance without following the prescribed regimen precisely.

Patients were all newly diagnosed diabetics. "Internals" expect knowledge and compliance to lead to control of the disease. The patients were all tested in the initial stage of the disease, six weeks after diagnosis, before the disease had progressed and patients learned that they did not have the control over the disease they expected.

Chance locus of control is not significantly related to any of the variables in the study. Patients who think that the disease is due to fate do not expect to have power over what happens to them and neither knowledge of the disease nor compliance to the regimen will change fate. Without knowledge or compliance, the chance oriented patient does not attain desired therapeutic outcomes. Chance oriented patients apparently do not have assistance or support at home to learn about diabetes or comply with the health regimen.

Powerful others is significantly related to social support, knowledge, therapeutic outcomes, but not compliance. Patients who respond to authority figures are likely to learn about diabetes because their physician told them to attend the educational program and the health care providers conducting the educational program are viewed as authority figures. One would think that knowledge of the disease and the desire to please authority figures would lead to compliance, which is not true in this study. Apparently, patients modify their regimens to maintain desired outcomes. Patients whose desire is to please authority figures do not need to be compliant to the health regimen as long as they can present a picture of compliance. Patients with a powerful others orientation could decrease their food intake the day before a blood sugar test is taken so the blood sugar would be within normal limits. Patients with powerful others orientation report having support at home to assist them with the health regimen.

In general, the relationship of health locus of control dimensions with the other variables supports the theory on locus of control. "Internals" attempt to control the disease by learning about the care, complying to the regimen and attaining therapeutic outcomes. Chance oriented patients have just the opposite response, they did not learn, did not comply and did not attain desired therapeutic outcomes. Chance oriented patients apparently did not have support and assistance in the home to encourage learning about or following the regimen as "internals" and "powerful others" had. Patients with powerful others orientation learned the management of the disease and attained the desired therapeutic outcomes. However, powerful others oriented patients did not comply to the therapeutic regimen.

Research Question 2

What is the relationship between knowledge and the variables social support, compliance and therapeutic outcomes? Knowledge of diabetes is significantly related to social support, compliance and therapeutic outcomes. Knowledge of the disease and its management gives the patient the ability to comply with the regimen. Knowledge of diabetes management also gives the patient the ability to attain desired therapeutic outcomes. Other studies have reported different results for the relationship of knowledge with compliance and therapeutic outcomes, specifically that patients with the poorest control had the greatest knowledge. However, those patients were not newly diagnosed with diabetes. One possible explanation for greater knowledge in patients with poor control is that they have experienced complications, such as reactions, and, therefore, know the management of reactions from experience. The relationships found in this study may vary over time as the disease process progresses. Knowledge of the disease process may decrease over time, but knowledge of self-management may increase as patients modify their life-styles or have experience with unsuccessful self-management. Previous studies have indicated that knowledge levels for "internals" decreased over times while "externals" gained knowledge through experience.

Patients on diet only did not significantly differ from patients on diet and medication. Patients learned and followed the medication regimen. Insulin and oral hypoglycemic agents are medications that patients respect and view as having a substantial effect on their health status. Other studies have validated that antidiabetic agents are subject to fewer than average medication-errors, although accuracy of measuring insulin dosage decreases over time. Following the prescribed medication regimen can be an excuse for noncompliance with the rest of the regimen. Patients could think the medication will cover higher than recommended carbohydrate intake, or use the medication as a substitute for diet therapy. Social support is available for taking medications.

Research Question 3

What is the relationship between social support and the variables compliance and therapeutic outcomes? Social support is significantly related to all the variables except chance locus of control orientation. Patients who have encouragement and support learn diabetes management and comply to the regimen. Over half the patients had someone learn the diabetes regimen with them. Families reinforced the patients' knowledge and compliance to the regimen. Families expected patients to comply to the regimen, but generally did not actively assist with compliance, especially with personal hygiene and foot care. The expectation of compliance, even without direct assistance, increases compliance. Direct assistance from support systems also increases compliance. Following the diabetic diet is easier when the prescribed meal is prepared for the entire family. Patients who had support at home attained desired therapeutic outcomes.

Research Question 4

What is the interrelationship between compliance and therapeutic outcomes? The most surprising result of the study is the significant negative relationship between compliance and therapeutic outcomes. Although other studies have found no correlation between compliance and therapeutic outcomes, a negative correlation was not reported. The negative correlation may mean the diabetic disease process and its management are so poorly understood that therapeutic outcomes are not attainable through compliance to the traditional diabetic regimen. Diabetologists do not agree on the need for blood sugar control or methods to keep blood sugars within normal limits. The traditional prescribed diabetic regimen is not without controversy although it is taught in most diabetes education programs.

Another possible explanation for the negative relationship between compliance and therapeutic outcomes is that both scores were self-reported, there was no check on the scores. Patients may have reported high compliance scores to present a picture of compliance.

The third possible explanation is that the Results of Treatment Questionnaire did not adequately measure therapeutic outcomes. The alpha reliability coefficient was .5676. The Results of Treatment Questionnaire (Therapeutic Outcomes) contained indirect measures of number of reactions, weight change, sick days, calls to providers, energy level and feeling of well being. The score for the questionnaire was combined with a blood sugar score and weight score which are direct measures.

The negative relationship between compliance and therapeutic outcomes could be a result of all three explanations. Other studies have reported no correlation between compliance and therapeutic outcomes. Patients were guaranteed anonymity and had no reason to report high scores on the compliance questionnaire. If patients reported high scores on compliance they could have reported high scores on therapeutic outcomes. Patients were tested six weeks after diagnosis and may not have reached a balance between medication, diet and exercise. The Results of Treatment Questionnaire needs to be retested.

Summary Research Question

What is the interrelationship between multidimensional health locus of control, knowledge of diabetes, perceived social support, self-reported compliance and therapeutic outcomes in adult patients six weeks after the diagnosis of diabetes was made? Each unit increase in one variable has a direct effect on the next variable and an indirect effect on the other variables in the path. Coefficients pertaining to the whole path are the products of the values of the coefficients pertaining to the elementary paths along its course. The data from the entire set of paths is culminated in the therapeutic outcomes scores. The interrelationship between all the variables is represented in Figure 10, page 230.

The R^2 score for therapeutic outcomes indicated that 98.7 percent of the therapeutic outcomes score is accounted for in the variables health locus of control, social support, knowledge and compliance. The R^2 factor is additive in the path analysis. The greatest R^2 change for all the variables is .911 when internal locus of control variable is entered in the equation. The internal variable was entered first in all the equations which may account for the large R^2 change. Since there is a high correlation between all the variables, any variable entered first may cause a large R^2 change. Another possible explanation for the large R^2 change is that the internal variable is so strong that it accounts for the 91 percent of the equation. If this is true, the other variables do not add much to the equation.

Health seeking behaviors are complex and are probably affected by many variables, but, as this study demonstrates, health locus of control, knowledge and social support contribute to health seeking behaviors. Health locus of control, knowledge and social support have a positive significant relationship with therapeutic outcomes. These variables individually and in interaction with one another account for the explained variance in health behaviors.

Generalizing the Results

The patients in this study were from six different diabetes education programs in three different cities in Western Michigan. The patients were all in the health care system and were referred to a diabetes education program by their physician or clinic. The source of referrals and the characteristics of the patient population must be considered before the results can be generalized.

Data were collected and analyzed on one disease condition, Diabetes Mellitus, at one point in time. Diabetes is a poorly understood disease with controversial treatment. Especially, in light of the negative correlation between compliance and therapeutic outcomes, the results of this study may not apply to other chronic illnesses.

Another limitation to generalizing the results is the small number of patients, fifty. The study should be replicated in other settings, with other chronic illnesses, a larger patient population, and at different points in time.

Implications

This section discusses the implications of the study's findings for health care providers, educators and researchers.

Implications for Providers

The high number of patients with hypertension and heart disease when diabetes was diagnosed, indicates that health care providers need to do complete assessments of the patients when they are diagnosed. Pre-existing hypertension and heart disease also indicates that the portion of the diabetic regimen that has to do with preventing or decreasing vascular complication, such as foot exercises and foot care, be stressed.

Newly diagnosed diabetic patients were difficult to find. Many patients had been told they had "diabetic tendencies" or to "watch their weight" long before they were referred to diabetes education programs. Eighty percent of the patient population reported having symptoms of diabetes in the six months before they were diagnosed. Since the symptoms of diabetes, polyuria, polydipsia, polyphagia, fatigue, are insidious, patients may not have been aware that they had the symptoms of diabetes until they were taught the symptoms in the education program. Health care providers can help educate the public to the symptoms of diabetes, and stress early detection. Health care providers must make a concerted effort to diagnose diabetes early.

Providers should be particularly watchful of patients who have a family history of diabetes, or are obese.

Many of the patients already had chronic illnesses with prescribed health regimens when they were diagnosed with diabetes. The addition of the diabetes regimen added to the number of health prescriptions to follow. Research has shown that the greater the number of prescriptions, the less likely the patient is to comply with the regimen. Health care providers should attempt to keep the total number of health prescriptions at a minimum. The health prescriptions should be as similar to the patient's life-style as possible. Health prescriptions should be given in the context of the patient's cultural, economic and social background.

Knowledge is significantly correlated with compliance and therapeutic outcomes. All of the diabetes education programs and the concept of self-care stress patient responsibility and internal beliefs. This type of program would not be appropriate for chance oriented patients, and possibly not for powerful others oriented patients. Health care providers should attempt to discover what is important to their patients and adapt their education program to their needs. The results of this study indicates that educational programs should be tailored to the patient's control orientation.

Educational programs need to make provisions for patients who learn quickly and those who learn slowly. One patient attended classes twice and still was unable to complete the Diabetes Knowledge Test. Other patients were insulted by the simplicity of the instruction. One format is not appropriate for all patients. The results of the Knowledge of Diabetes Test indicated that education programs should place greater emphasis on: (1) short-term illness, including the effect of infection, treatment of foot blisters, and when to call the doctor, (2) when and why to test urine for sugar and acetone, (3) exercise, (4) diet, including eating out and diet for the family, (5) action of insulin and the effect of medication on diabetes, (6) side effects of oral hypoglycemic agents, and (7) peak action of different types of insulin.

The strong relationship of social support with all of the variables except chance orientation suggests that health care providers should attempt to directly involve family members and significant others in the plan of care and educational programs. If classes continue to be the method of choice for diabetes education programs, consideration should be given to a separate class for the support system encouraging them to discuss their feelings and offering specific suggestions on how to support the patient with the diabetes regimen. Patients living alone should be assisted in identifying support systems or support should be provided by health care providers until a system can be developed. A few patients reported that their physician or nurse would help them the most with diabetes. If the health care provider is viewed as the support system, the provider needs to be allowed to continue some support on a regular basis with chronically ill patients, while helping to develop the patient's private support system. A support system could be developed with other diabetic patients.

There is a significant negative correlation between compliance and therapeutic outcomes. The diabetes disease process is poorly understood and there is controversy over what constitutes adequate control of the disease and how to attain control. The measuring instrument for therapeutic outcomes had many indirect measures of control and the patients were measured six weeks after the diagnosis of diabetes was made. Providers should use accurate, objective clinical measures to determine control.

Research studies have shown that there is a higher incidence of vascular complications in patients on oral hypoglycemic agents and insulin than those on diet only. The implications for health care providers is that they stress the importance of maintaining the diabetic diet. Family members occasionally told diabetic patients that it was all right to eat foods not on their diet. Providers need to help patients and families understand the importance of the diabetic diet. The diabetic diet is difficult to understand, and providers should attempt to explain the diet in terms the patient can understand. Evaluation of the patient/family understanding and utilization of the diabetic diet is imperative. Diet information should be given in the context of the patient's cultural, social and financial background.

Implications for Educators

Students in the health fields should have a thorough understanding of each of the variables in this study as explanations of health behavior, and have the opportunity to apply the knowledge.

The health locus of control concept is relatively new and generally has not been incorporated into health care providers education programs. The results of this study indicates that locus of control is an important variable in relation to knowledge, social support, compliance and therapeutic outcomes. The Multidimensional Health Locus of Control (MHLC) scale could easily be adopted as part of the initial assessment. Students in the health care fields should determine the patients locus of control orientation and use the knowledge in developing a plan of care. Internally oriented patients should be allowed and encouraged to make some decisions about their care. Patients with powerful other orientation should have health care providers who are authoritarian. Chance oriented patients will need more direct assistance and positive reinforcement.

The plan of care and educational program should be tailored to the patient's locus of control orientation.

Health education and patient/family teaching are stressed in most disciplines. Students need to know the importance of patient/family teaching, teaching-learning principles, alternative teaching methods, and evaluation of learning. Students need to have a thorough knowledge of the diabetes regimen. Beside the MHLC scale, the initial assessment of the patient should include an understanding of the patient's financial, economic, social background and home patterns of diet, sleep, hygiene and exercise patterns. One of the patients in the study stated that she did not have the money to follow the diabetic diet or buy medication. The diet and medication can be expensive but health care providers can suggest methods of keeping the diet within the food budget or seek financial assistance for the patient.

The results of this study demonstrated that patients did not have a thorough understanding of their medications and their effect, especially side effects of oral hypoglycemic agents. Health care educators need to stress the importance of teaching patients about medications and side effects. Other areas of deficient knowledge included urine testing, sick day rules, diet and exercise. Students in the health field need to evaluate patients' understanding of the diabetic regimen and how the regimen will modify the patient's life style.

Based on the results of this study, educators need to teach students the importance of social support and methods of providing social support for patients who have not developed or who have lost their support system. Social support is positively related to all variables except chance at a significant level. Students need to assess the support system and involve the support system in the plan of care and educational program. Students may have to help patients develop a support system with other diabetic patients, or community resources when a support system is not available.

Although there was a negative correlation between compliance and therapeutic outcomes in this study, this is probably not true in other chronic illnesses. Educators need to help understand the concept of compliance, the factors that decrease or increase compliance, and how to determine compliance. The magnitude of the compliance problem has only been realized in the past one and a half decades. Compliance to the health regimen is especially difficult when there are many health prescriptions and in chronic illness. The diabetic regimen requires many health prescriptions and many of the patients in this study had other chronic illnesses which contributed other requirements for life-style changes. The student needs to know how to help the patient incorporate the health prescriptions into the patient's life-style to increase compliance. The support system is an important aspect of compliance. Compliance to the health regimen should be evaluated and methods of fostering compliance need to be undertaken.

There has not been much emphasis placed on outcome evaluation in the health field. Students need to know how to write outcome measures and evaluate therapeutic outcomes based on objective clinical data.

Long-term illness and chronic illness have been neglected in health education programs. Educators need to include courses on long-term care and the problems of chronic illness in their curriculums. Factors that affect compliance and therapeutic outcomes should be discussed and methods of improving clinical outcomes should be discussed and tested by students.

The findings of this study have many implications for health care providers and educators in regard to all the variables and the descriptive information. The findings will have even more implications for providers and educators when further research is completed.

Recommendations for Future Study

1. There is a need for replication of the study with different populations of patients with diabetes at different periods of time from diagnosis to validate the findings. Although the findings generally support theory

of the variables, other studies have had different results, specifically the relationship between internal locus of control and knowledge, and an inverse relationship between poor control and knowledge. However, the patients in the other studies were not newly diagnosed diabetics. One would think that patients with high powerful others orientation would follow the prescribed regimen given to them by the health care provider. Even though other studies have found no correlation between compliance and therapeutic outcomes, the negative correlation between these two variables needs to be validated. Health care providers prescribe a regimen that they think will help the patient attain therapeutic outcomes of disease control and prevention of complications. Theoretically, compliance should lead to desired therapeutic outcomes.

2. Future studies would need to refine the questionnaires and establish both reliability and validity.

(a) The Multidimensional Health Locus of Control (MHLC) scale had an alpha reliability coefficient of .76957. The MHLC scale is the only scale not developed for the purpose of this study and has been previously tested for reliability and validity. There is ongoing research on the dimensions of the MHLC scale and refinement of the scale is in progress. The results of this study supports the continued need for research on the MHLC scale.

(b) The Barriers To Implementing Therapy Questionnaire (Social Support) had a high alpha reliability coefficient of .90760. However, the questionnaire presented some problems. Because of the high number of transformations, the questionnaire is difficult to score. The questionnaire combined too many variables asking for importance of social support, perception of interruption of life-style, perceived social support in encouragement and direct assistance, and family expectation of compliance. Several patients who did not have spouses living with them did not answer the questions. The questionnaire could be revised to more accurately determine the quality, quantity and source of social support needed for compliance and attainment of desired therapeutic outcomes.

(c) The Knowledge of Diabetes Test had an alpha reliability coefficient of .87202. Revision of the test should include deletion of the controversial item on iodine and inclusion of more application items. Further study of knowledge of diabetes should include some skill performance evaluation, such as urine testing and administration of insulin, and more emphasis on application of knowledge.

(d) The Self-Management Questionnaire (Compliance) had an alpha reliability coefficient of .84272. This questionnaire did not present any problems.

(e) The Results of Treatment Questionnaire (Therapeutic Outcomes) had the lowest alpha reliability coefficient of .5676. The low alpha reliability may partly be due to the many different kinds of outcomes measured, however, this questionnaire should be tested again. The questions on calls to health care providers should not be included in the outcomes score unless the wording of the questions is changed, especially when patients reported they called their physician for the results of their blood sugar tests. Calls to health care providers might be more appropriately included in the social support scale.

The rest of the outcome measures were suggested by the review of literature. However, more direct measures of clinical control should be used to evaluate outcomes. The indirect measures used in this study could be described, but the criteria for control should be blood sugar within normal limits. The Results of Treatment Questionnaire might be appropriate if the patients did not have other chronic illnesses. In light of the large number of patients who reported having hypertension when diagnosed with diabetes (42 percent), questions should be added to elicit if the patient is suffering from the development of vascular complications of diabetic retinopathy, diabetic nephropathy, artherosclerosis and peripheral vascular disease both at baseline with the Sociodemographic Data Questionnaire and as an outcome.

3. The study needs to be replicated with patients who have had diabetes for a longer period of time than six weeks. The variables should be tested on patients who have had diabetes for one year, five years and longer to see if and how the interrelationships of the variables change. Previous studies have indicated that knowledge and compliance change over time, especially as "internals" learn that they cannot control the disease as much as they first anticipated. Longitudinal studies may indicate the amount of change that occurs over time and when intervention would be most helpful to increase or maintain knowledge and compliance.

4. The variables tested in this study with diabetic patients need to be tested with patients who have other chronic illnesses. The diabetes disease process is so poorly understood that there is not total agreement on prescribed regimen and what constitutes good control. Testing the variables with a chronic illness that is better understood may provide additional information about the

interrelationship of the variables. Compliance with the health regimen may accomplish more improvement of function and well-being in other chronic illnesses than appears to be true in diabetes.

5. Before this study is replicated attention should be given to evaluating the methodology and decreasing the problems with this study: (1) source of patient population, (2) initial patient contact and distribution of questionnaires, (3) follow-up of patients who had not returned questionnaires, (4) revision of instruments, and (5) contacting physicians' offices and clinics.

6. Based on the findings of this study, intervention studies need to be conducted.

(a) Knowledge of the effect of the three dimensions of locus of control on the variables knowledge, social support, compliance and therapeutic outcomes suggests different types of educational programs may be appropriate depending on the locus of control orientation. Future research studies should determine if different types of educational programs should be established for people with internal, chance and powerful others orientation. Internality oriented patients may learn more and attain better therapeutic outcomes if they are allowed and encouraged to maintain control in the self-management of the disease. Interventions that would support individual control might be self-paced education programs or having patients regulate insulin dosage based on the amount of sugar and acetone in the urine. Patients with a powerful others orientation may learn more with an authoritative diabetes educator. Studies need to be undertaken to determine what interventions promote learning, compliance and therapeutic outcomes in patients with chance orientation. If adequate methods of interventions cannot be determined for the chance oriented patient, studies may need to determine how to help chance oriented people become more internally oriented.

(b) Interventions to increase knowledge need to be determined. Research should determine if one to one, patient-provider, interaction is more effective than a class presentation or if one type of patient learns better in a particular situation. Educational programs that utilize educational principles and encourage active participation by the patients may be more effective than the traditional class presentation with the patient a passive recipient of information.

(c) The results of this study indicate that social support is important for knowledge, compliance and therapeutic outcomes. However, 22 percent of the patients in the study lived alone, and 28 percent of the patients reported no one would assist them with the diabetes regimen. It is important to determine if other variables can be substituted for the social support component if it is not available or to find means of supplying this component to patients without adequate social support. Self help groups of patients with diabetes or active membership in the American Diabetes Association may provide some social support.

(d) Compliance to the health regimen is a major problem for health care providers. Some intervention methods to increase compliance need to be tested, such as contracting between the patient and provider, mutual goal setting, increasing social support, and teaching patients techniques for better self-management, such as problem solving.

(e) Assuming that compliance is negatively correlated with therapeutic outcomes as this study reports, health prescriptions need to be changed to positively affect therapeutic outcomes. What modifications need to be made in the diabetic regimen to improve therapeutic outcomes needs to be discovered.

(f) The greatest need for future research, supported by this and other research, is the need to determine how to control the disease process and prevent complications of diabetes. If maintaining normal blood sugar is the best means of controlling the disease, methods of decreasing daily fluctuations and maintaining a normal blood sugar range must be discovered. Once it is known how to control the disease process, health care providers can better educate patients in methods of maintaining control. Better methods of determining therapeutic outcomes need to be discovered. Future studies may indicate what direct measures of control.

7. There are other variables that may affect com-compliance and therapeutic outcomes such as patient-provider relationship, the effect of stress and certain aspects of the Health Belief Model, perceived susceptibility, perceived benefit, that require exploration.

8. Studies should be conducted on the effect of intermittent education and support of chronically ill patients by health care providers.

9. Twenty-two patients reported having hypertension and 10 percent of the patients reported having heart trouble. Studies should be conducted to determine if the hypertension and heart problems are related to diabetes in a pre-clinical or undiagnosed state, and how several chronic illnesses affect therapeutic outcomes.

10. Middle range theory provides a way of logically extending the concepts through further research. Further research on the study variable could answer these questions: Does lack of social support reinforce externality? Is it desirable to attempt to change locus of control orientation, if so, in which direction? How can health care providers change locus of control? Could knowledge of locus of control lead to using this information in other areas of care beyond compliance--primary care, hospital admission procedures and so on? Does locus of control for health behaviors differ from locus control of other values? Is locus of control changed by chronic illness, acute illness or health maintenance? Do different teaching methods or programs affect compliance with different dimensions of control? How can health care providers most effectively involve patients and families in the education programs? How can health care providers help patients internalize the wellness process? How much compliance is necessary, especially with chronic illnesses that have progressive deterioration? Does compliance with the regimen vary the long-term outcome? What are the dangers of noncompliance in patient health, family stress, cost to society? Does individual planning or mutual goal setting increase compliance? Is the amount of compliance needed different for chronic illness versus acute illness? Does previous health history effect compliance?

This study provided an opportunity to test concepts that are components of care through middle range theory. The interrelationships of the variables health locus of control, knowledge of diabetes, social support, compliance and therapeutic outcomes were examined. Social support was significantly related to internality, powerful other orientation, knowledge, compliance and therapeutic outcomes. Knowledge was significantly related to therapeutic outcomes and compliance. Internality and powerful other orientation was significantly related to therapeutic outcomes. However, compliance was negatively related to therapeutic outcomes at a significant level. The findings from this study has implications for health care providers, educators and researchers.

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APPENDICES

APPENDIX A

SOCIODEMOGRAPHIC DATA QUESTIONNAIRE

APPENDIX A

SOCIODEMOGRAPHIC DATA QUESTIONNAIRE

1. Name:__________________ Phone:_________________________

   Address:____
   (road and number)

   City:_________________ State:____________ Zip:_________

2. Birthdate:____________ Place of birth:_________________

3. Race:_____________ Religion:______________ Sex:________

4. Marital Status: Married_____ Never Married _____
   Divorced____ Separated _____
   Widow(er)___ Other______________
   (specify)

5. Admitting doctor's name________________________________

6. Name of the doctor that will follow you for Diabetes (if different)____________________________________

7. Education (check the space next to the highest level of education completed).

   ____ Graduate Degree
   ____ College or University Graduate
   ____ Partial College Education (at least one year)
   ____ High School Graduate
   ____ Junior High School (completed ninth grade)
   ____ Less than Seven Years of School

8. Spouse's education (check the space next to the highest level of education completed).

   ____ Graduate Degree
   ____ College or University Graduate
   ____ Partial College Education (at least one year)
   ____ High School Graduate
   ____ Junior High School (completed ninth grade)
   ____ Less than Seven Years of School

9. Your Present Occupation________________________________

10. Spouse's Occupation____________________________________

11. Your Employment Status (check only one on left hand side and complete the line).

____ Employed . . . hours per week ____
____ Sick leave . . . Receiving pay? Yes ____ No ____
____ Retired. Date______ Receiving pension? Yes__No__
____ Unemployed
____ Never employed. Specify__________________________

12. Type of Residence (check appropriate space).

____ Private home Home ownership: Yes ____ No ____
____ Apartment
____ Trailer
____ Hotel
____ Boarding room without meals
____ Boarding room with meals
____ Other, please specify_____________________________

13. Household Composition (check appropriate space).

____ Alone
____ With spouse
____ With children
____ With other relatives
____ With paid unrelated persons
____ With unpaid unrelated persons

14. Who is the person who will help you the most with your diabetes after you leave the hospital: (check appropriate space).

____ No one
____ Spouse
____ Children
____ Other relative, specify how related________________
____ A friend or neighbor
____ An employee of yours or your family
____ A nurse or health service worker
____ Some other person, please specify__________________

15. Will a family member or friend receive instruction in care for diabetes with you? Yes ____ No ____
If yes, please specify who_____________________________

16. Will a family member or friend learn how to give insulin?
Yes ____ No _____. If yes, please specify who_________

17. Will a family member or friend learn the diabetic diet?
Yes ____ No ____. If yes, please specify who_________

18. Prior to this hospitalization:

a. Were you on a special diet? Yes ____ No ____

If yes, please specify diet ____________________

b. Were you on medications ordered by a doctor?

Yes ____ No ____

If yes, please list all medications (or their purpose) and how often taken.

1. ____

2. ____

3. ____

4. ____

5. ____

c. Did your doctor suggest you make other changes for your health such as losing weight or stopping smoking?

Yes ____ No ____. If yes, please specify ________

____

Past Medical History

For each part of question #16 rate the answer as follows:

1 = No Increase
2 = Slight Increase
3 = Moderate Increase
4 = Large Increase

16. In the last six months, have you had an increase in

a.	Urination	1	2	3	4
b.	Thirst	1	2	3	4
c.	Hunger	1	2	3	4
d.	Weight	1	2	3	4
e.	Fatigue	1	2	3	4
f.	Changes in eye sight	1	2	3	4
g.	Problems with teeth or gums	1	2	3	4
h.	Healing time of cuts or sores	1	2	3	4

17. Is there a family history of diabetes? Yes ____ No ___
If yes, please specify relationship ____________________

18. Previous Surgeries Date

a. ______________________________ ____________

b. ______________________________ ____________

c. ______________________________ ____________

19. Reasons for hospitalizations other than surgery or obstetrics Date

a. ______________________________ ____________

b. ______________________________ ____________

c. ______________________________ ____________

20. Present Illness   Circle appropriate answer

Do you have any problems with:

a.	Allergies or asthma	No	Yes
b.	Anemia or bleeding tendencies	No	Yes
c.	Cancer or tumor	No	Yes
d.	Heart trouble	No	Yes
e.	High blood pressure	No	Yes
f.	Kidney or bladder trouble	No	Yes
g.	Lung or respiratory problems	No	Yes
h.	Rheumatism or arthritis	No	Yes
i.	Stomach intestine or ulcers	No	Yes
j.	Other, Specify ____________________	No	Yes

21. Prior to this hospitalization, how frequently did you see a doctor? (check appropriate letter)

a. Every 3 months or more often

b. Every 3-6 months

c. Every 6-12 months

d. Every 12-24 months

e. Only when felt sick

f. Have not seen a doctor for the last two years

APPENDIX B

KNOWLEDGE OF DIABETES TEST

APPENDIX B

Knowledge of Diabetes Test

Circle the one answer choice you think is correct. If you do not know the answer, do not circle any answer.

1. One small apple can be exchanged for:
   a. One half a cup of cucumbers
   b. One medium peach
   c. Two bananas

2. For illness that lasts a short period of time, sick day rules include:
   a. Calling your physician if you are unable to get all your calories.
   b. Drinking lots of fluids, especially fruit juices, tea and carbonated soft drinks.
   c. Cutting down on the amount of sweet foods and carbohydrates taken.

3. Diabetes is a condition that:
   a. Can be controlled
   b. Can be cured
   c. Lasts for a few weeks

4. High blood sugar (acidoses) could be caused by:
   a. Too much insulin and too little food
   b. Too little insulin and too much food
   c. Excessive exercise

5. In order to eat the diabetic diet when dining out,
   a. Reverse the snack and dinner order if a late meal is planned
   b. Order casserole type dishes off the menu
   c. Order cream soup for an appetizer

6. The likelihood of getting diabetes is higher if a person:
   a. Is male
   b. Is underweight
   c. Has a blood relative who has diabetes

7. Which of the following group of symptoms suggest high blood sugar (acidosis)?
   a. Hunger, thirst and headache
   b. Excessive urination, thirst and tiredness
   c. Chest pain, diarrhea and dizziness

8. If an insulin reaction is suspected,
   a. Take black coffee, tea or diet cola to treat the reaction
   b. Eat a quick acting sugar followed by a protein snack
   c. Call your doctor immediately

9. Good foot care is important for people with diabetes because:
    a. A number of years of injecting insulin into the legs may cause swelling of the feet
    b. Flat feet are a common complication of diabetes
    c. Age increases the likelihood of poor blood circulation to the feet

10. The action of insulin in the body is to allow the:
    a. Sugar to enter the cells of the body
    b. Sugar in the cells to come out
    c. Kidneys to lower the blood sugar

11. The diet for people with diabetes is normally:
    a. A guide for planning only the carbohydrate or sugar content of the meal
    b. A diet the whole family can eat
    c. A carefully planned system of special foods

12. A diet higher in polyunsaturated (vegetable) fats than saturated (animal) fats is usually recommended because:
    a. Polyunsaturated fats taste better than saturated fats
    b. Polyunsaturated fats have more nutrients than saturated fats
    c. Saturated fats may increase the incidence of vascular (blood) problems

13. Exercise for people with diabetes:
    a. Increases heart tone and improves circulation
    b. Decreases the need for food
    c. Does not have to be done consistently

14. Diabetes requires:
    a. No treatment
    b. Short-term treatment
    c. Daily treatment

15. In untreated diabetes, the amount of sugar in the blood is:
    a. Increased
    b. Decreased
    c. Not affected

16. Which of the following complications is often associated with diabetes?
    a. Changes in the lungs
    b. Changes in vision
    c. Changes in the liver

17. Which of the following group of symptoms are all indications of too much insulin (insulin reaction)?
    a. Stomach cramps, muscle pain and weakness
    b. Thirst, increased urine and upset stomach
    c. Hunger, sweating and shaking

18. The treatment of diabetes includes:
    a. Weight control
    b. Long and frequent rest periods
    c. Surgery on the pancreas

19. People who have diabetes normally:
    a. Have their food cooked separately from that of their family
    b. Limit the variety of foods that they eat
    c. Eat breakfast, lunch and dinner at approximately the same time every day

20. When a person has diabetes, the amount of sugar in his blood is due to:
    a. Eating too much sugar and other sweet foods
    b. Failure of the pancreas to make enough insulin
    c. Failure of the kidneys to control sugar in the urine

21. Which of the following vegetables are considered "free foods" and can be used as desired?
    a. Turnips
    b. Carrots
    c. Lettuce

22. The goal of diabetes treatment is to:
    a. Increase blood sugar
    b. Decrease the body's ability to use food
    c. Keep the blood sugar close to normal

23. Good foot care for a person with diabetes includes:
    a. Crossing legs
    b. Cutting off corns with a razor blade
    c. Breaking in new shoes slowly

24. When using the Exchange List for Meal Planning, the personal with diabetes knows:
    a. Foods in any one group can be substituted or exchanged with other foods in the same group
    b. Any <u>one</u> of the exchange groups can provide the nutrient needed for a well-balanced diet
    c. The exchange list requires special foods or special preparation

25. The best time to do routine urine tests for sugar is:
    a. Just before meals
    b. One hour after meals
    c. On all urine

26. Symptoms of diabetes include:
    a. Chest pain, hair loss and fatigue
    b. Increased energy, weight gain and skin lesions
    c. Hunger, thirst and excessive urination

27. The presence of sugar and acetone in the urine of a diabetic may indicate:
    a. A need for less insulin
    b. A need for more insulin
    c. A normal need for insulin

28. Exercise
    a. Decreases the body's need for insulin
    b. Increases the body's need for insulin
    c. Does not change the body's need for insulin

29. When people who have diabetes exercise, they should keep in mind that it is important:
    a. To eat extra food for extra exercise
    b. Not to eat anything before the exercise
    c. To eat the same amount of food when exercising or not

30. People with diabetes should keep in mind that exercise should be:
    a. Done right before eating
    b. Done regularly
    c. Limited to one time per week

31. The best way for people with diabetes to take care of their feet is to:
    a. Wash feet every day with hot water, dry feet well, and use a nail file to trim toes
    b. Wash feet every day with warm water, dry feet well, and cut toenails straight across regularly
    c. Wash feet every day with warm water and use a hot water bottle at night to keep them warm

32. Infection is likely to cause:
    a. An increase in blood sugar
    b. A decrease in blood sugar
    c. No change in blood sugar

33. If someone with diabetes begins to get a blister on his/her foot after wearing a new pair of shoes, he/she should:
    a. Put iodine on the blister and tell the doctor
    b. Put iodine on the blister, stop wearing the shoes and tell the doctor
    c. Stop worrying about it and allow the blister to heal normally

34. People with diabetes should
    a. See their dentist regularly for good mouth care
    b. Avoid the use of lotions on their skin
    c. Go barefoot occasionally to increase circulation to the feet

35. People with diabetes should call the doctor if:
    a. There is sugar in the urine for two tests in a row
    b. A fever is present
    c. They are unable to eat the regular prescribed diet for 24-48 hours

36. People with diabetes know that:
    a. Ascorbic acid (Vitamin C) gives a false positive urine test
    b. It is not necessary to check with the doctor when taking new medications
    c. Medications that can be bought without a prescription are all right to take

If you are on oral hypoglycemic pills for diabetes go to page 6, question #37. If you are on insulin go to page 7, question #43.

Oral Medications

37. Side effects of the oral hypoglycemic pills include:
    a. Skin rash, diarrhea, nausea and vomiting
    b. Hair loss, chest pain and fatigue
    c. Ringing in the ears, weakness and sores in the mouth

38. Oral medications for people with diabetes:
    a. Indicates that people taking them are not serious diabetics
    b. Are insulin in tablet form
    c. Are for people who are still able to produce some insulin

39. One of the most frequent side effects from an oral medication is:
    a. High blood sugar
    b. Low blood sugar
    c. Lipo dystrophy

40. When a person who routinely uses oral hypoglycemic pills becomes ill and is unable to eat the prescribed diet, he/she should:
    a. Immediately stop taking his oral medication
    b. Test urine for acetone
    c. Take insulin instead of oral medication

41. People with diabetes know that oral medication:
    a. Can be a substitute for diet control
    b. Should be taken only at bedtime
    c. Is a strong drug that could have side effects

Insulin Users

42. The peak effect of regular insulin in the body usually occurs:
    a. Rapidly within 1 to 3 hours
    b. Moderately, within 8 to 12 hours
    c. Slowly, within 15 to 20 hours

43. To prevent an insulin reaction:
    a. Take more insulin when exercising
    b. Cut down on food eaten before extra exercise
    c. Avoid sudden changes in diet, insulin and exercise

44. People who take insulin know to:
    a. Change or skip the usual daily dosage of insulin depending on how they feel
    b. Store insulin in a warm, light place
    c. Rotate the sites of injection

45. When a person who routinely uses insulin becomes ill and is unable to eat the prescribed diet, he/she should:
    a. Immediately stop taking his insulin
    b. Test urine for acetone
    c. Use the oral diabetic pill instead of the insulin

46. The peak effect of Lente, PZI and NPH insulin in the body usually occurs:
    a. Rapidly, within 1 to 3 hours
    b. Moderately, within 8 to 12 hours
    c. Slowly, within 15 to 20 hours

APPENDIX C

BARRIERS TO IMPLEMENTING THERAPY QUESTIONNAIRE

APPENDIX C

BARRIERS TO IMPLEMENTING THERAPY QUESTIONNAIRE

Everyone can identify some problems that they have trying to follow the doctor's orders for taking medications or sticking to a diet. Below are a list of statements that some people believe keep them from following their doctor's orders. Please indicate your agreement with these statements, regardless of what you think other people want you to say.

There are no right or wrong answers:

All items are rated as follows:

SA = Strongly Agree
A = Agree
U = Undecided
D = Disagree
SD = Strongly Disagree

1. I could exercise regularly if someone were around to exercise with me.

   SA A U D SD

2. I have no one to exercise with me.

   SA A U D SD

3. I could follow my diet if someone were around to help me.

   SA A U D SD

4. I could take better care of my skin and feet if someone were around to help me.

   SA A U D SD

5. I have others around to remind me to eat the right foods.

   SA A U D SD

6. My husband/wife helps me to follow my diet.

   SA A U D SD

7. I can count on my family to remind me to change my socks or stockings daily.

   SA A U D SD

8. I can count on my family when I need help with skin or foot care.

SA A U D SD

9. My personal life does not interfere with taking care of my feet and skin.

SA A U D SD

10. I have others around who remind me to exercise regularly.

SA A U D SD

11. I have others around to remind me to take care of my skin and feet.

SA A U D SD

12. I can count on my family when I need help following my diet.

SA A U D SD

13. My husband/wife helps me to care for my skin and feet.

SA A U D SD

14. I have no one to help me lose weight.

SA A U D SD

15. My personal life does not interfere with my diet.

SA A U D SD

16. My husband/wife helps me to follow my diet.

SA A U D SD

17. My personal life does not interfere with my exercising regularly.

SA A U D SD

18. I can count on my family when I need help exercising.

SA A U D SD

If you are taking medication for diabetes, continue with question #19. If you are not on medication for diabetes, go to page 4, number 1.

19. My husband/wife helps me to take my pills or insulin.

SA A U D SD

20. I have others to remind me to take my pills or insulin.

SA A U D SD

21. I could take my pills or insulin if someone were around to help me.

SA A U D SD

22. My personal life does not interfere with taking my pills or insulin.

SA A U D SD

23. I have no one to help me take my insulin or pills.

SA A U D SD

24. I can count on my family when I need reminding to take my pills or insulin.

SA A U D SD

For the following questions, circle one number. If you do not have any family close by, substitute the word friend for family.

		Never	Occasionally	Sometimes	Frequently	Always
1.	Does your family help you follow the doctor's advice?	1	2	3	4	5
2.	Does your family expect you to follow the doctor's advice?	1	2	3	4	5
3.	During the last six weeks has a family member exercised with you?	1	2	3	4	5
4.	During the past six weeks has a family member told you it's O.K. to treat your own cuts or sores?	1	2	3	4	5
5.	During the last six weeks has a family member told you it's O.K. to miss your exercise?	1	2	3	4	5
6.	Does your family help you to exercise regularly?	1	2	3	4	5
7.	Does your family help you to take care of your skin and feet?	1	2	3	4	5
8.	Does your family expect you to follow your diet?	1	2	3	4	5
9.	Does your family eat a different diet than you do?	1	2	3	4	5
10.	During the past six weeks has a family member told you that it's O.K. to eat food that was not on your diet?	1	2	3	4	5
11.	Does your family help you to follow your diet?	1	2	3	4	5
12.	Does your family expect you to take care of your skin and feet?	1	2	3	4	5

	Never	Occasionally	Sometimes	Frequently	Always
13. Does your family expect you to exercise regularly?	1	2	3	4	5
14. Does your family take care of their skin and feet like you do?	1	2	3	4	5

If you are not taking medications for diabetes go to next questionnaire. If you are on medication for diabetes, complete the last four questions.

	Never	Occasionally	Sometimes	Frequently	Always
15. Does your family expect you to take your medication?	1	2	3	4	5
16. Does your family remind you to take your medication?	1	2	3	4	5
17. During the past six weeks has a family member told you it's O.K. to miss your medication?	1	2	3	4	5
18. Does your family help you take your medication?	1	2	3	4	5

APPENDIX D

SELF-MANAGEMENT QUESTIONNAIRE

APPENDIX D

SELF-MANAGEMENT QUESTIONNAIRE

For each question, circle the answer choice that most closely represents what you do. There is no right answer.

		Never	Occasionally	Sometimes	Frequently	Always
1.	I get the amount of exercise the doctor/ nurse recommended.	1	2	3	4	5
2.	I have a daily exercise program which lasts at least 15 minutes.	1	2	3	4	5
3.	I only exercise on the weekends.	1	2	3	4	5
4.	I do foot and leg exercises every day.	1	2	3	4	5
5.	I eat extra protein before excessive exercise.	1	2	3	4	5
6.	I eat less calories than I am allowed on my diet.	1	2	3	4	5
7.	I treat my own blisters, cuts and corns.	1	2	3	4	5
8.	I wash my feet daily with gentle soap.	1	2	3	4	5
9.	I eat foods that are not included in my diet.	1	2	3	4	5
10.	I modify my diet when I am out with friends.	1	2	3	4	5
11.	I smoke cigarettes.	1	2	3	4	5
12.	I change the number of food exchanges given to me by the dietitian/doctor.	1	2	3	4	5
13.	I eat my meals at approximately the same time every day.	1	2	3	4	5
14.	I watch for symptoms of too much insulin (acidosis).	1	2	3	4	5
15.	I use bath oils or lotions on my skin.	1	2	3	4	5
16.	I eat more calories than I am allowed on my diet.	1	2	3	4	5

		Never	Occasionally	Sometimes	Frequently	Always
17.	I follow my prescribed diet completely.	1	2	3	4	5
18.	I wear clean socks or stockings daily.	1	2	3	4	5
19.	I watch for symptoms of too little insulin (hypoglycemia).	1	2	3	4	5
20.	I wear well-fitted shoes.	1	2	3	4	5
21.	I go barefoot.	1	2	3	4	5
22.	I only exercise two to three times a week.	1	2	3	4	5
23.	I eat between meal snacks that are not on my diet.	1	2	3	4	5
24.	I exercise in addition to my usual physical activity on the job and at home.	1	2	3	4	5

If you take oral hypoglycemic pills or insulin, complete the next 5 questions. If your diabetes is regulated by diet only, go to the next questionnaire.

		Never	Occasionally	Sometimes	Frequently	Always
25.	I take more insulin or oral medication than is ordered.	1	2	3	4	5
26.	I take less insulin or oral medication than is ordered.	1	2	3	4	5
27.	I modify my insulin dose or amount of oral medication depending on how I feel.	1	2	3	4	5
28.	I forget to take my insulin or oral medication.	1	2	3	4	5
29.	I take my insulin or oral medication at the same time every day.	1	2	3	4	5

APPENDIX E

RESULTS OF TREATMENT QUESTIONNAIRE

APPENDIX E

RESULTS OF TREATMENT QUESTIONNAIRE

Circle the Appropriate Answer for Each Question

1. How many hypoglycemic (low blood sugar) reactions have you had since you have been managing your diabetes at home?

   0   1-3   4-7   8-12   more than 12

2. How many hyperglycemic (high blood sugar) reactions have you had since you have been managing your diabetes at home?

   0   1-3   4-7   8-12   more than 12

3. How many pounds of weight have you lost since you were diagnosed with diabetes?

   0   1-7   8-13   14-20   more than 20

4. How many pounds of weight have you gained since you were diagnosed with diabetes?

   0   1-7   8-13   14-20   more than 20

5. How many serious cuts or sores have you had since you were diagnosed with diabetes that needed to be treated by the doctor?

   0   1   2   3   more than 3

6. How many short-term (24-48 hour) illnesses, like a cold or flu, have you had since you were diagnosed with diabetes that required calling the doctor?

   0   1   2   3   more than 3

7. How many days did you miss from work because of sickness since you were diagnosed with diabetes? (If you were hospitalized when you were first diagnosed with diabetes, do not count those sick days.)

   0   1-2   3-4   5-6   more than 6

8. How many days did you to go work not feeling well since you were diagnosed with diabetes?

   0   1-2   3-4   5-6   more than 6

9. How many times have you called your <u>doctor</u> about problems with your diabetes since you were diagnosed with diabetes?

   0   1-2   3-4   5-6   more than 6

10. How many times have you called the <u>nurse</u> (at the hospital or doctor's office) about problems with your diabetes since you were diagnosed with diabetes?

0   1-2   3-4   5-6   more than 6

11. How many times have you called the <u>dietitian</u> about problems with your diabetes since you were diagnosed with diabetes?

0   1   2   3   more than 3

12. How many times have you shown sugar in your urine since you have been managing your diabetes at home?

0   1-2   3-4   5-6   more than 6

13. Compare your present energy level to the amount of energy you had just prior to being diagnosed with diabetes.

A lot less energy	A little less energy	Same amount of energy	A little more energy	A lot more energy

14. Compare the way you feel now to the way you felt just before you were diagnosed with diabetes.

Feel a lot worse	Feel a little worse	Feel the same	Feel a little better	Feel a lot better

15. How many times have you had your blood sugar tested since you were diagnosed with diabetes? (If you were hospitalized when you were first diagnosed with diabetes, do not count the blood sugars done in the hospital.)

0   1   2   3   more than 3

16. What was your last blood sugar (if known)________________.

17. What is your current height_________ weight___________.

18. If on medication for diabetes, give name of the medication(s), amount, and time of day taken.

____

____

APPENDIX F

MULTIDIMENSIONAL HEALTH LOCUS OF CONTROL

(MHLC) SCALE--FORM A

APPENDIX F

MULTIDIMENSIONAL HEALTH LOCUS OF CONTROL (MHLC) SCALE--FORM A

For each item, circle the number that represents the extent to which you disagree or agree with the statement. Circle only one number per item. There are no right or wrong answers.

		Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
1.	If I get sick, it is my own behavior which determines how soon I get well again.	1	2	3	4	5	6
2.	No matter what I do, if I am going to get sick, I will get sick.	1	2	3	4	5	6
3.	Having regular contact with my physician is the best way for me to avoid illness.	1	2	3	4	5	6
4.	Most things that affect my health happen to me by accident.	1	2	3	4	5	6
5.	Whenever I don't feel well, I should consult a medically trained professional.	1	2	3	4	5	6
6.	I am in control of my health.	1	2	3	4	5	6
7.	My family has a lot to do with my becoming sick or staying healthy.	1	2	3	4	5	6
8.	When I get sick I am to blame.	1	2	3	4	5	6
9.	Luck plays a big part in determining how soon I will recover from an illness.	1	2	3	4	5	6
10.	Health professionals control my health.	1	2	3	4	5	6
11.	My good health is largely a matter of good fortune.	1	2	3	4	5	6

		Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
12.	The main thing which affects my health is what I myself do.	1	2	3	4	5	6
13.	If I take care of myself, I can avoid illness.	1	2	3	4	5	6
14.	When I recover from an illness, it's usually because other people (for example, doctors, nurses, family, friends) have been taking good care of me.	1	2	3	4	5	6
15.	No matter what I do, I'm likely to get sick.	1	2	3	4	5	6
16.	If it's meant to be, I will stay healthy.	1	2	3	4	5	6
17.	If I take the right actions, I can stay healthy.	1	2	3	4	5	6
18.	Regarding my health, I can only do what my doctor tells me to do.	1	2	3	4	5	6

APPENDIX G

HOSPITAL A DIABETES COURSE OUTLINE

APPENDIX G

HOSPITAL A DIABETES COURSE OUTLINE

DIABETES EDUCATION AND CONSULTATION SERVICE

PROCEDURE FOR REFERRAL OF OUTPATIENTS TO DIABETES EDUCATION AND CONSULTATION SERVICE

Schedule of Diabetes Education Classes

Teacher	Day	Time		Class
Nurse	Tuesday	2:00-3:00 P.M.	I.	Concepts of Diabetes - The Nature and Care of Diabetes
Dietitian	Tuesday	3:00-4:00 P.M.	II.	Diet - Principles of the Exchange System
Nurse	Wednesday	2:00-3:00 P.M.	III.	Rules of Medication
Nurse	Wednesday	3:00-3:30 P.M.	IV.	Acute Complications
Nurse	Thursday	2:00-3:00 P.M.	V.	Rules of Health - Exercise, Rest and Sleep, Care of Body (with emphasis on Foot Care)
Dietitian	Thursday	3:00-4:00 P.M.	VI.	Meal Planning with Exchange Lists, Dining Out, Sick Day Lists

I. PROCEDURE

A. Physician must request referral by contacting the Diabetes Education and Consultation Service. The telephone number is 487-2792.

B. The following information should be provided at
th the time of the request for either individual consultation or group classes: Name, Age, Date to start classes, Height, Weight, Address, Phone Number, Occupation, Brief Medical History, including time of onset of diabetes, Significant Other, Diet Plan, and Medications Taken.

C. Referring physician is responsible for making arrangements with patients and/or significant other. Encourage family and/or friend to attend classes with patient.

II. ADDITIONAL INFORMATION

A. The Classes are sequential and should be attended as such. It may be necessary to attend one session per week if it is not possible to complete Course in three successive days.

B. Special skills such as, insulin injection technique, urine testing, and individualized meal planning require additional individual appointments. It is not possible to teach skills in group classes. We attempt to teach what diabetes is, how to control it, and to affect attitude so that the patient is an active participant in the management of his own disease.

APPENDIX H

HOSPITAL B DIABETES TEACHING FLOW SHEET

APPENDIX H

HOSPITAL B DIABETES TEACHING FLOW SHEET

DIABETIC TEACHING FLOW SHEET

	SIGNIFICANT OTHER PERSON PRESENT	TEACHING DONE	PATIENT VERBALIZES	COMMENTS
1. UNDERSTANDING DIABETES				
A. DESCRIBE RELATIONSHIPS BETWEEN THE PANCREAS AND PRODUCTION OF INSULIN				
B. LIST THE SYMPTOMS OF DIABETES				
C. NAME THE FIVE FACTORS IN THE CONTROL OF DIABETES				
2. UNDERSTANDS THE ROLE OF MEDICATION IN DIABETIC CONTROL				
INSULIN				
A. EXPLAINS DIFFERENCE BETWEEN 3 MAIN CLASSIFICATIONS OF INSULIN				
B. STATES DOSAGE AND TIME OF INSULIN INJECTIONS				
C. DEMONSTRATES CORRECT STEPS FOR INJECTION AND GIVES SELF INJECTION				
D. EXPLAINS IMPORTANCE OF ROTATING SITES				
E. CHARTS INJECTION				
F. EXPLAINS HOW TO STORE INSULIN (INCLUDE TRIPS ETC.)				
G. LISTS THE SYMPTOMS OF HYPOGLYCEMIA				
H. NAMES THE POSSIBLE CAUSES FOR AN INSULIN REACTION				
I. DESCRIBES WHAT TO DO FOR AN IMMEDIATE TREATMENT				
ORAL HYPOGLYCEMIA				
A. EXPLAINS THE DIFFERENCE BETWEEN INSULIN AND ORAL HYPOGLYCEMICS				
B. STATES DOSAGE AND TIME OF ORAL MEDICATION				
3. URINE TESTING				
A. STATES REASON FOR URINE TESTING				
B. STATES FREQUENCY OF TESTING				
C. DEMONSTRATES PROCEDURE FOR URINE TESTING USING PRESCRIBED METHOD				
D. RECORDS RESULTS OF URINE TESTS EXPLAINS IMPORTANCE OF ACCURATE RECORD—KEEPING				
E. LISTS THE SYMPTOMS OF HYPERGLYCEMIA				
F. NAMES THE POSSIBLE CAUSES OF HYPERGLYCEMIA				
G. EXPLAINS WHAT TO DO IF THIS HAPPENS				
4. MAINTAINING HEALTH				
A. EXPLAINS IMPORTANCE OF BALANCE BETWEEN MEDICATION, DIET, EXERCISE				
B. STATES IMPORTANCE AND EFFECTS OF EXERCISING				
C. STATES EFFECTS OF ILLNESS, INFECTIONS, ETC.				
D. STATES IMPORTANCE OF CARRYING DIABETIC EMERGENCY CARD AT ALL TIMES				
5. PERSONAL HYGIENE				
A. EXPLAINS IMPORTANCE OF PROPER SKIN AND FOOT CARE				
B. LIST WAYS TO PROTECT FEET				
C. REALIZES THAT CHRONIC COMPLICATIONS MAY OCCUR AS A RESULT OF DIABETES				
6. DIET				
A. DIETARY TEACHING				
B. ABLE TO MAKE UP PRACTICE MEAL				

7. EMOTIONAL RESPONSE ____________________

APPENDIX I

HOSPITAL C DIABETES EDUCATION CLASS SCHEDULE

APPENDIX I

HOSPITAL C DIABETES EDUCATION CLASS SCHEDULE

Day	Time	Topics
2nd Monday/month	3:00-5:00	Pre Test Film Basics of Diet Exchange Lists Definition, Anatomy Symptoms of Hyper and Hypoglycemia Oral Hypoglycemics Action of Insulin and Injection
2nd Wednesday/month	3:00-5:00	Review Exchange Lists Write Sample Meal Measuring and Buying Foods Life-Style, Travel Effect on Family and Friends Urine Testing, Health Habits Activity Balance
3rd Monday/month	3:00-5:00	Sample Menu Practice Dietetic Foods, Traveling Eating Out, Combo Dishes, Life-Style Implications, Questions, Illness Care
3rd Wednesday/month	3:00-5:00	Diet During Illness Practice With Restaurant Menu Complications Community Agencies Questions Post Test

APPENDIX J

HOSPITAL D DIABETES CLASS OUTLINE

APPENDIX J

HOSPITAL D DIABETES CLASS OUTLINE

<u>YOU ARE INVITED TO ATTEND</u>

- DIABETES CLASSES -

Classroom - 4E-68
1:30 P.M. - 2:30 P.M.

<u>CLASS 1 - MONDAY</u>

What Is Diabetes, Signs and Symptoms
Blood Sugar Tests

<u>CLASS 2 - TUESDAY</u>

Oral Hypoglycemic Agents, Insulins
Insulin Administration

<u>CLASS 3 - WEDNESDAY</u>

Exchange Diet, Menu Planning
Buying Food, Dining Away From Home

<u>CLASS 4 - THURSDAY</u>

Dr. Vining Lectures
Complications, Foot Care, Excercise
Sick Day Rules

<u>CLASS 5 - FRIDAY</u>

Urine Testing, Hyperglycemia, Hypoglycemia

APPENDIX K

HOSPITAL E DIABETES COURSE OUTLINE

APPENDIX K

HOSPITAL E DIABETES COURSE OUTLINE

There are several professional people who are available to help you with your diabetes.

YOUR DOCTOR

Medically regulates your diabetes

Plans your treatment

Helps you understand what diabetes is

Works closely with other professionals who will be helping you

THE DIABETIC TEACHING COORDINATOR

Assists in coordinating your educational activities with your physican and other staff members.

Helps you with the information and skills you may need to learn, including:

- What diabetes is

- Complications of diabetes

- Action of insulin and oral diabetic medications

- Insulin administration

- Urine testing

- Good health practices

THE DIETITIAN

Talks with you about your diet and diabetes

Assists you with your meal plan

Guides you in weight control, if needed

Assists you with food management, including how to buy and prepare food for your meal plan.

THE PHARMACIST

Helps you to understand the relationship between diabetes and the medicines used in treatment.

Helps you understand about the drugs you are taking for your diabetes.

Explains how other drugs may affect your diabetic control.

Can offer guidance in your equipment and supply purchases.

THE FAMILY COUNSELOR

Will assist you in adjusting to diabetes and provide support in the following areas:

- Counseling

- Referral to other community resources

- Financial assistance

APPENDIX L

HOSPITAL F DIABETES TEACHING PLAN AND RECORD

APPENDIX L

HOSPITAL F DIABETES TEACHING PLAN AND RECORD

LANSING GENERAL HOSPITAL, OSTEOPATHIC

DIABETES TEACHING PLAN AND RECORD

(This Record defines content of total teaching program and the evaluation of patient's progress. Refer to Diabetic Teaching Manual for information needed.)

Patient's Identification ____________

Year Diabetes was diagnosed ____________

Referral to Diabetic Teaching Team ____________ (Date)

Educational background ____________ Urine testing done at home ____________ Frequency ____________	Knowledge Seems Adequate Date/ Initials Yes - No	Instruction or Review Given Date/ Initials	Comments and/or Observable Behavior
I. CONCEPT OF DIABETES			
Does the patient know: A. What diabetes is			
B. The predisposing factors			
C. The classic symptoms			
D. The methods of control			
E. His/Her responsibility for control			
F. The necessity of medical supervision			
G. Any previous instruction			
H. Chronic complications			
I. Handouts given			
II. DIET (To be Completed by Dietitian)			
Does the patient: A. Have a copy of diet			
B. Know how to use the food exchange system			
C. Know that proper spacing of meals and snacks is necessary			
D. Feel that meal plan is realistic for him/her			
E. Know how to adapt meal plan when: 1. Ill			
2. Eating Out			

Signature ____________ Initial ____________ Rev.1/77

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DIABETES TEACHING PLAN AND RECORD - cont'd.
Page Two

	Knowledge Seems Adequate Date/ Initials Yes - No	Instruction or Review Given Date/ Initials	Comments and/or Observable Behavior
III. DIABETES WITHOUT MEDICATION			
Does the patient understand: A. The objectives of control			
B. The hazards of carelessness			
IV. ORAL MEDICATION			
Does the patient know: A. The correct name and dosage of drug			
B. When to take the drug			
C. The action of the drug			
D. Possible side effects			
E. To call physician if unable to eat or take drug			
F. That at times of special stress or illness, insulin may be needed			
V. INSULIN			
Does the patient: A. Know his type, strength and dosage			
B. Know that any change in above should be ordered by physician			
C. Measure exact doses with good technique			
D. Know how to mix two kinds of insulin in one syringe if necessary			
E. Know how to administer injection correctly			
F. Know the safe areas for site rotation			
G. Know how to store insulin: 1. At home			
2. While traveling			
H. Has another person been instructed to administer insulin			

DIABETES TEACHING PLAN AND RECORD - cont'd.
Page Three

	Know-ledge Seems Adequate Date/ Initials Yes - No	Instruc-tion or Review Given Date/ Initials	Comments and/or Observable Behavior
VI. URINE TESTING			
Does the patient:			
A. Know the purpose of urine testing			
B. Know he should use the second voided specimen technique			
C. Use proper technique for: 1. Clinitest			
2. Acetest			
3. Testape			
D. Know how to handle and store equipment			
E. Know he should keep a written record			
F. Know he should test more often and report to doctor if: 1. He feels ill or has an infection			
2. His tests show large amounts of sugar and/or acetone			
'II. ACUTE COMPLICATIONS			
A. HYPOGLYCEMIA - LOW BLOOD SUGAR (Applies to persons taking either insulin or oral hypoglycemic agents). 1. Causes			
2. Symptoms			
3. How to treat			
4. Prevention			
5. That he should carry identification card and some form of quick-acting sugar			
6. Glucagon injection			
B. ACIDOSIS			
Does the patient know: 1. The causes			
2. The symptoms			
3. How to treat			
4. Prevention			

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DIABETES TEACHING PLAN AND RECORD - cont'd.
Page Four

	Knowledge Seems Adequate Date/ Initials Yes - No	Instruction or Review Given Date/ Initials	Comments and/or Observable Behavior
VIII. EXERCISE			
Does the patient: A. Understand the effect of exercise on blood sugar			
B. Know to have extra food for extra exercise			
IX. PERSONAL HYGIENE			
Does the patient know the importance of: A. Prevention of infection			
B. Good foot care			
C. Periodic medical/dental check-up			
D. Treatment of injuries and infections			
E. Good grooming			
X. SOCIAL ASSESSMENT (See: Medical Social Service Progress Report)			

Signature ______________________ Initial __________

Signature ______________________ Initial __________

Signature ______________________ Initial __________

APPENDIX M

LETTER ASKING PHYSICIANS FOR REFERRALS

APPENDIX M

LETTER ASKING PHYSICIANS FOR REFERRALS

Mary Wierenga
6127 Farrington Ct #7
East Lansing, MI 48823
Ph. 351-2430

May 1, 1979

I am conducting a research study entitled, "The Interrelationship of Locus of Control, Knowledge of Diabetes, Social Support, Compliance and Therapeutic Outcomes in Patients with Newly Diagnosed Diabetes." The study is being conducted at all the local hospitals through the diabetes education program. However, many newly diagnosed diabetics do not require hospitalization and are taught how to manage their diabetes in the doctor's office. I need referrals of newly diagnosed diabetics from physician's offices.

Patients, 18-70 years of age who are newly diagnosed with diabetes and can read English are called on the telephone and have the study explained to them. If they agree to participate, they are sent a consent form, Sociodemographic Data Questionnaire and a Multidimensional Health Locus of Control scale. Six weeks later, they are sent a Knowledge of Diabetes Test, Barriers to Implementing Therapy Questionnaire (Social Support), Self-Management Questionnaire (Compliance) and Results of Treatment (Therapeutic Outcomes). The physicians will be called for the patient's six week follow-up blood sugar.

All institutions and physicians' offices that participate will receive a summary of the results which may help with future diabetic patients. I would greatly appreciate if your office would contact me at 351-2430 with the name and phone number of any patients newly diagnosed with diabetes.

APPENDIX N

LETTER TO PHYSICIANS EXPLAINING STUDY

Mary Wierenga
6127 Farrington Ct. #7
East Lansing, Michigan 48823

The Institutional Review Committee at E. W. Sparrow Hospital, Dr. L. Simson, Chairman, the Diabetic Unit Committee, Dr. McCoy, Chairman, and the Michigan State University Committee on Research on Human Subjects, Dr. H. Bredeck, Chairman, have approved my research proposal entitled, "The Interrelationship of Locus of Control, Knowledge, Compliance and Therapeutic Outcomes in Diabetic Patients," to be conducted at E. W. Sparrow Hospital. Dr. Richard Bates is the medical consultant for this project and may be consulted if you have any questions.

The patients to be studied are hospitalized adult diabetic patients who have recently been placed on insulin and who will attend the diabetic classes offered at Sparrow Hospital. Patients will be informed that this is a research project and will be asked to sign an informed consent form. Each person who consents to participate in the study will be asked sociodemographic questions and be given a pre-test on diabetic knowledge. Six weeks after discharge, a series of follow-up tests will be given in the patient's home. These tests are: (1) locus of control scale, (2) compliance questionnaire, and (3) a diabetic knowledge post test. The results of these tests will be compared to therapeutic outcomes of serum glucose, weight change and frequency of hypoglycemic and hyperglycemic reactions. Admission serum glucose and weight will be compared to six week follow-up serum glucose and weight obtained at the physician's office or clinic. Frequency of hypoglycemic and hyperglycemic reactions will be obtained from the "Patient's Record of Daily Medication and Urine Tests" which is kept by the patients at home.

I will be happy to send you a protocol of the research and copies of the questionnaires if you desire. Please contact me with any questions you may have. I will be happy to answer all questions.

Sincerely,

Mary Wierenga, R.N.

APPENDIX N

LETTER TO PHYSICIANS EXPLAINING STUDY

A notation will be made on the charts of patients who meet the criteria listed in the study. If you do not want a particular patient to participate in the study, please indicate this on the notification.

Please contact me with any questions you may have. I will be happy to answer all questions.

Sincerely,

Mary Wierenga, R.N.

APPENDIX O

CONSENT FORM

APPENDIX O

CONSENT FORM

1. I agree to participate in a study concerning factors involved in the self-management of diabetes which will be conducted by Mary Wierenga, a doctoral student at Michigan State University.

2. The study has been explained to me and I understand the explanation that has been given and what my participation will involve.

3. I understand that I am free to discontinue my participation at any time.

4. I understand that the results of the study will be treated in strict confidence and that I will remain anonymous. Within these restrictions, results of the study will be made available to me at my request.

5. I give Mary Wierenga permission to contact my doctor for blood sugar results and weight.

Date______________ Signed______________________________

APPENDIX P

CONSENT FORM FOR HOSPITAL E

APPENDIX P

CONSENT FORM FOR HOSPITAL E

Purpose: The main purpose of this study is to help doctors, nurses and dietitians find better ways to help people learn how to manage their diabetes at home. Participating in this study will not interfere with the diabetes education classes or your physician's care, and you may be helping future patients with diabetes.

Procedure: The study involves filling out a Sociodemographic Data Questionnaire which will provide general information on the study participants as a group. The next part asks some general questions about your health beliefs. Six weeks after the first questionnaire is filled out, you will be sent a Knowledge of Diabetes Test and questionnaires asking how well you think you are doing with self-management of diabetes at home. The results of these tests will be compared to your blood sugar and weight.

Volunteer Statement:

I agree to participate in a study to help determine factors involved in helping patients with diabetes learn to manage their diabetes at home to be conducted by Mary Wierenga from Michigan State University.

I understand that I am free to discontinue my participation at any time.

I understand that the results of the study will be treated in strict confidence and that I will remain anonymous. Within these restrictions, results of the study will be made available to me at my request.

I give Mary Wierenga permission to call my doctor for blood sugar results and weight.

Date_______________ Signed_________________

APPENDIX Q

COVER LETTER FOR SECOND SET OF QUESTIONNAIRES

APPENDIX Q

COVER LETTER FOR SECOND SET OF QUESTIONNAIRES

When you were first diagnosed with diabetes, you filled out a questionnaire for a study on how to help people learn to manage their diabetes at home. Your continued participation is very important. The answers to the following questionnaires will describe how you are getting along at home. The results of this study will assist doctors, nurses and dietitians help other people who have just been diagnosed with diabetes, and may indicate if changes should be made in the teaching program. Everyone has some difficulties when they begin adjusting to diabetes. It is important that we find out what these problems are so we can help other patients.

By completing these last questionnaires, you will help future patients with diabetes, and the diabetes instructors who taught you how to manage your condition at home. Please complete the following questionnaires, put them in the stamped, addressed envelope and mail them to me by ______________________________. If you have any questions, please call me at (517) 351-2430.

Thank you for your assistance and cooperation.

Sincerely,

Mary Wierenga

Enclosure

APPENDIX R

TOTAL MULTIDIMENSIONAL HEALTH LOCUS

OF CONTROL SCORES

APPENDIX R

TOTAL MULTIDIMENSIONAL HEALTH LOCUS OF CONTROL SCORES

Score	Number of Patients	Percentage (%) of Patients
46	1	2
47	1	2
48	1	2
50	1	2
51	1	2
54	2	4
56	4	8
57	1	2
58	3	6
59	1	2
60	1	2
62	4	8
65	2	4
66	2	4
67	2	4
68	4	8
69	3	6
70	2	4
72	4	8
73	2	4
74	2	4
76	1	2
78	2	4
83	1	2
91	1	2
137	1	2

APPENDIX S

KNOWLEDGE OF DIABETES TEST SCORES

FOR MEDICATION USERS

APPENDIX S

KNOWLEDGE OF DIABETES TEST SCORES FOR MEDICATION USERS

Score	Number of Patients	Percentage (%) of Patients
24	1	2
28	1	2
29	4	8
30	2	4
31	2	4
32	5	10
33	2	4
34	3	6
35	2	4
36	1	2
37	4	8
38	3	6
39	1	2

APPENDIX T

BARRIERS TO IMPLEMENTING THERAPY SCORES FOR MEDICATION USERS

APPENDIX T

BARRIERS TO IMPLEMENTING THERAPY SCORES

FOR MEDICATION USERS

Scores	Number of Patients	Percentage% of Patients	Scores	Number of Patients	Percentage% of Patients
51	1	2	137	1	2
67	1	2	138	1	2
73	1	2	139	2	4
82	1	2	140	1	2
90	1	2	143	1	2
108	1	2	145	1	2
114	1	2	147	2	4
120	1	2	152	1	2
121	1	2	154	1	2
124	1	2	158	2	4
126	1	2	163	1	1
131	1	21	164	1	2
132	1	2	169	1	2
134	1	2	174	1	2

APPENDIX U

SELF-MANAGEMENT QUESTIONNAIRE SCORES

FOR MEDICATION USERS

APPENDIX U

SELF-MANAGEMENT QUESTIONNAIRE SCORES

FOR MEDICATION USERS

Scores	Number of Patients	Percentage (%) of Patients
95	9	2
98	2	4
102	1	2
103	1	2
104	1	2
108	1	2
109	2	4
110	3	6
111	1	2
112	2	4
113	1	2
116	4	8
117	1	2
118	1	2
120	1	2
123	2	4
125	1	2
126	3	6
127	1	2
129	1	2
132	1	2

APPENDIX V

MULTIPLE REGRESSION WITH MEDICATION VARIABLES

APPENDIX V

MULTIPLE REGRESSION WITH MEDICATION VARIABLES

Appendix V. Multiple Regression of Social Support Variable with Health Locus of Control Variables - Internal, Chance and Powerful Others

STEP 1

Multiple R	.96240	Analysis of Variance	DF	Sum of Squares	Mean Square	F
R Square	.92429	Refression	3	726412.86037	24213.62012	191.26792
St. Dev.	35.58034	Residual	47	59500.13963	1265.96042	

Variable	Coefficient	T	95 PCT Confidence Interval
Internal	2.5069094	4.0107226	1.249467, 3.7643515
Chance	.31223662	.42629204	-1.1612581, 1.7857313
Powerful Others	1.8582699	2.6283557	.43595220, 3.2805876

Summary Table

Variable Entered	F	Significance	Multiple R	R Squared	R Squared Change	Simple R	Overall F
Internal	16.08590	.000	.95481	.91166	.91166	.95481	191.26792
Chance	.18172	.672	.95560	.91316	.00151	.88166	
Powerful Others	6.90825	.012	.96140	.92429	.01113	.94299	

Appendix V. (Continued) Multiple Regression of Knowledge Variable with Health Locus of Control and Social support Variables (Step 1)

Multiple R	.95858	Analysis of Variance	DF	Sum of Squares	Mean Square	F
R Square	.91887	Regression	5	43569.15312	8713.83062	101.93345
St. Dev.	9.24584	Residual	45	3846.84688	85.48549	

Variable	Coefficient	T	950 PCT Confidence Interval
Internal	.25918122	1.3440715	-.12920421, .64756666
Special Support - Meds	.17815691	.71356188	-.48505090, .52068228
Chance	-.28842459	-1.5124081	-.67252525, .95676070
Powerful	.19701075	.99753496	-.20076982, .59479132
Social Support	.17389794	3.5578609	.75454398, .27234148

Summary Table

Variable Entered	F	Significance	Multiple R	R Squared	R Squared Change	Simple R	Overall F
Internal	1.80653	.186	.92979	.86451	.86451	.92979	101.93345
Social Support - Med.	.00509	.943	.94074	.88499	.02048	.80628	
Chance	2.28738	.137	.94152	.88647	.00148	.83045	
Powerful	.99508	.324	.94660	.89605	.00958	.91969	
Social Support	12.65837	.001	.95858	.91887	.02282	.95369	

Appendix V. (Continued) Multiple Regression of Compliance Variable with Health Locus of Control, Knowledge and Social Support Variables (Step 1)

Multiple R	.99582	Analysis of Variance	DF	Sum of Squares	Mean Square	F
R Squared	.99166	Regression	7	542634.92776	77519.27539	730.34095
St. Dev.	10.30249	Residual	43	4564.07224	106.14121	

Variable	Coefficient	T	95.0 PCT Confidence Interval
Internal	1.0155465	4.6341041	.57359597, 1.4574970
Knowledge-Meds	.66167595	1.6044633	-.17000199, 1.4933539
Chance	.31083792	1.4153918	-.13205317, .75372901
Social Support-Meds	-.73802816	-.71242015	-.21629852, .20153796
Powerful Others	.30540216	1.3454307	-.15237108, .76317540
Knowledge	.80334646	2.1989541	.66585962, 1.5401070
Social Support	.20655113	1.9839571	-.34080772, .41651033

Summary Table

Variable Entered	F	Significance	Multiple R	R Squared	R Squared Change	Simple R	Overall F
Internal	21.47492	.000	.96748	.93601	.93601	.96748	730.34095
Know-meds	2.57430	.116	.98825	.97664	.04063	.85638	
Chance	2.00333	.164	.98878	.97768	.00104	.88600	
Social Support-meds	.00508	.944	.98879	.97771	.00003	.85781	
Powerful	1.81018	.186	.99035	.98079	.00308	.95199	
Knowledge	4.83540	.033	.99544	.99090	.01011	.97488	
Social Support	3.93609	.054	.99582	.99166	.00076	.97985	

Appendix V. (Continued) Multiple Regression of Therapeutic Outcomes Variable with Health Locus of Control, Knowledge, Social Support and Compliance Variables

Multiple R	.99336
R. Squared	.98676
St. Dev.	8.67630

Analysis of Variance	DF	Sum of Squares	Mean Square	F
Regression	6	246772.76094	41128.79349	546.35758
Residual	44	3312.23906	75.27816	

Variable	Coefficient	T	95.0 PCT Confidence Interval
Internal	.41993690	2.1605088	.28211016, .81166278
Chance	.15918146	.85966994	-.21399566, .53235857
Knowledge	1.46360462	7.54090019	1.0522511, 1.8198413
Powerful	.73115722	3.8787937	.35125804, 1.1110564
Social Support	.10026862	2.0052241	-.50721098 .20104445
Compliance	-.16082312	-1.6615977	-.35588701, .34240765

Summary Table

Variable Entered	F	Significance	Multiple R	R Squared	R Squared Change	Simple R	Overall F
Internal	4.66780	.036	.96129	.92409	.92409	.96129	546.35758
Chance	.73903	.395	.96140	.92429	.00021	.87722	
Knowledge	56.86519	.000	.99017	.98043	.05613	.98033	
Powerful Others	15.04504	.000	.99266	.98537	.00494	.95937	
Social Support	4.02092	.051	.99294	.98592	.00055	.97038	
Compliance	2.76091	.104	.99336	.98676	.00083	.97982	

APPENDIX W

MULTIPLE REGRESSION FOR STUDY VARIALBES

APPENDIX W

MULTIPLE REGRESSION FOR STUDY VARIABLES

Appendix W. Multiple Regression of Compliance Variable with Health Locus of Control, Social Support and Knowledge Variables

Multiple R	.99263	Analysis of Variance	DF	Sum of Squares	Mean Square	F
R Squared	.98531	Regression	5	539163.29883	107832.65977	603.86388
St. Dev.	13.36305	Residual	45	8035.70117	178.57114	

Variable	Coefficient	T	95.0 PCT Confidence Interval
Internal	.75306133	2.7135563	.19411092, 1.3120117
Chance	.26000444	.92023188	-.30906498, .82907385
Knowledge	1.3351128	6.1971118	.90119204, 1.7690335
Powerful	.27146520	.94425516	-.30757212, .85050252
Social Support	.25899470	3.8866908	.12478471, .39321470

Summary Table

Variable Entered	F	Significance	Multiple R	R Squared	R Squared Change	Simple R	Overall F
Internal	7.36339	.009	.96748	.93601	.93601	.96748	603.86388
Chance	.84683	.362	.96772	.93649	.00048	.88600	
Knowledge	38.40419	0	.98962	.97934	.04285	.97488	
Powerful	.89162	.350	.99014	.98039	.00105	.95199	
Social Support	15.10637	.000	.99263	.98531	.00493	.97985	

Appendix W. (Continued) Multiple Regression of Knowledge Variable with Health Locus of Control and Social Support Variables

		Analysis of Variance	DF	Sum of Squares	Mean Square	F
Multiple R	.95857	Regression	4	43568.71785	10892.17946	130.23226
R Squared	.91886	Residual	46	3847.28215	83.63657	
St. Dev.	.91357					

Variable	Coefficient	T	95.0 PCT Confidence Interval
Internal	.25617621	1.3763140	-.11848826, .63084069
Chance	-.28852814	-1.5296270	-.66821352, .91157252
Powerful	.19579492	1.0060279	-.19595837, .58754820
Social Support	.17609988	4.6969934	.10063231, .25156745

Summary Table

Variable Entered	F	Significance	Multiple R	R Squared	R Squared Changed	Simple R	Overall F
Internal	1.89424	.175	.92979	.86451	.86451	.92979	130.23226
Chance	2.33976	.133	.93023	.86533	.00082	.83045	
Powerful Others	1.01209	.321	.93805	.87995	.01461	.91969	
Social Support	22.06175	.000	.95857	.91886	.03891	.95369	

Appendix W. (Continued) Multiple Regression of Therapeutic Outcomes Variable with Health Locus of Control, Knowledge, Social Support, and Compliance Variables

Multiple R	.99390	Analysis of Variance	DF	Sum of Squares	Mean Square	F
R Squared	.98784	Regression	9	247044.84441	27449.42716	370.18714
St. Dev.	8.61105	Residual	41	3040.15559	74.15014	

Variable	Coefficient	T	95.0 PCT Confidence Interval
Internal	.33875280	1.4292483	-.13990802, .81741361
Knowledge-meds	.42612690	.94916022	-.48054905, 1.3328028
Chance	.13934725	.18778567	-.23989362, .51858811
Social Support-meds	.57468952	.35764114	-.26704882, .38198672
Powerful	.66265353	3.4181340	.27113699, 1.0541701
Knowledge	1.0024619	2.7488718	.26597326, 1.7389506
Social Support	.36882332	.24810635	-.26333320, .33709786
Compliance	-.25482142	-1.0188209	-.75993690, .25029413
Compliance-meds	.13184507	.59957710	-.31224548, .57593563

Appendix W. (Continued) Multiple Regression of Therapeutic Outcomes Variable with Health Locus of Control, Knowledge, Social Support, and Compliance Variables

Summary Table

Variable Entered	F	Significance	Multiple R	R Squared	R Squared Change	Simple R	Overall F
Internal	2.04275	.161	.96129	.92409	.92409	.96129	370.18714
Knowledge-meds	.90091	.348	.96962	.94017	.01608	.80201	
Chance	.55065	.462	.96985	.94060	.00044	.87722	
Social Support-meds	.12791	.722	.97271	.94616	.00556	.78975	
Powerful	11.68364	.001	.97952	.95946	.01330	.95937	
nowledge	7.55630	.009	.99330	.98665	.02719	.98033	
Social Support	.06156	.805	.99372	.98749	.00084	.97038	
Compliance-meds	1.03800	.314	.99385	.98774	.00025	.80444	
Compliance	.35949	.552	.99390	.98784	.00011	.97982	