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RELATIONSHIP BETWEEN TIMING AND THE LEVEL OF KNOWLEDGE OF A DIABETIC TEACHING PROGRAM

BY

DIANNE M. HANRAHAN

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled RELATIONSHIP BETWEEN TIMING AND THE LEVEL OF KNOWLEDGE OF A DIABETIC TEACHING PROGRAM submitted by DIANNE M. HANRAHAN in partial fulfillment of the requirements for the degree of Master of Nursing.

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This manuscript is dedicated to my parents,
Mary Ellen and John Hugh Cameron for raising
me to believe in my ability to accomplish any goal.

ABSTRACT

The purpose of this study was to examine the relationships between timing, anxiety, and the level of knowledge attained by patients with diabetes at the completion of an indepth diabetic teaching program. Timing of an educational program was defined as the length of waiting time, measured in days, between the patient's being told of the diagnosis of diabetes and entry into the diabetic teaching program. Continuous data were collected from a convenience sample of subjects 18 to 65 years of age. Anxiety was assessed prior to and following the program using the State-Trait Anxiety Inventory (Spielberger, 1983). Knowledge was assessed prior to and following the program using the Diabetes Knowledge Test (Hess & Davis, 1983). Data were analyzed using frequencies and percentage distributions, Pearson product moment correlation, multiple correlation, correlated t-tests, and a Scheffé procedure.

Results revealed that there were no relationships between measures of timing of an educational program, anxiety, and knowledge. The participants' level of education was statistically significant in relation to the level of knowledge attained. Participants with a high education level (grade 11 and above) gained more knowledge than those with a low education (grade 7 to 10). A statistically significant difference between the State Anxiety Inventory pre-test and post-test was evident as was a

statistically significant difference between the Diabetes Knowledge Test pre-test and post-test.

The findings of this study suggest that: (a) there are no relationships between timing, anxiety, and the level of knowledge attained by the patient with diabetes at the completion of an indepth diabetic teaching program; (b) the diabetic patient-education program effectively increased knowledge and decreased anxiety; and, (c) this program was more effective for those patients with a high school education.

Additional research is recommended to determine factors that influence the knowledge level of diabetic patients attending a diabetic patient-education program.

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CHAPTER I

DIMENSIONS OF THE PROBLEM

Introduction and Statement of the Problem

Diabetes, like most chronic diseases, cannot be cured. It must be managed on a 24-hour a day basis, not by the physician, nutritionist, or nurse but by the patient. Control of diabetes is not easily attained and management of the disease requires that patients cooperate closely with health care professionals in a comprehensive system of health care (Etzwiler, 1978). Often included in this system of health care for the diabetic is indepth teaching at diabetic clinics. In order to obtain maximum benefits, patients should learn the necessary self-management skills in the initial learning program. Thus repetition of the program should not be necessary. However, many patients attend indepth education programs for a second time because they have been unable to manage their diabetes. The question arises: are patients initially sent to these programs too soon? Could increased learning occur when the patient has had more time to better adjust to the diagnosis of diabetes?

Since knowledge is a requirement for patients to be self-managers of their diabetes, it is important that nurse

educators be aware of factors that may either enhance or interfere with learning. Learning in and of itself may be anxiety producing. Although anxiety may be useful in motivating people to learn, severe anxiety is incapacitating (Redman, 1984). Since being diagnosed as diabetic is also anxiety producing (Hoover, 1983; Tattersall, 1985), teaching that is begun when patients have just been diagnosed may be ineffective. The objective of this study was to examine the relationships between the timing of an education program, anxiety, and the level of knowledge for the patient with diabetes.

Significance of the Study

A formal teaching program should be based on patient needs. If factors affecting the receptivity to a diabetic teaching program could be identified, then measures for effecting better patient education could be established. Measurement of educational outcomes and correlation of these measurements with anxiety and the timing of diabetes teaching may provide knowledge that would be of value in identifying a patient's readiness to participate in an indepth patient teaching program.

Conceptual Framework

The general objective of this research was to evaluate the

timing of a diabetic teaching program. Therefore, a conceptual framework specific for the evaluation of an educational program was required. Stake (1967) developed a framework which provides the background for the development of an evaluation plan.

Stake describes the two basic acts of evaluation as description and judgement. In order to describe and judge an education program, he states that three bodies of information must be obtained: a) antecedent data; b) transaction data; and c) outcome data. Stake describes an antecedent as any condition existing prior to teaching and learning which may relate to outcomes. For example, the status of a patient, prior to his diabetic education, can be looked at with respect to a number of variables. These variables include: a) gender; b) age; c) family history of diabetes; d) formal education; e) pre-existing knowledge about diabetes; f) timing of the education program; and g) anxiety. Transactions are the engagements that make up the process of education. Examples of transactions include: a) presentation of a lecture; b) class discussions; and c) administration of a test. Stake describes outcomes as the abilities, achievements, attitudes, and aspirations that result from an educational experience. A measurement of the knowledge gained (residual gain score for a pre-test and post-test) during the four days of a diabetic teaching program would exemplify a program outcome.

In using this framework, not all variables need to be addressed at the same time. Instead, the researcher has the freedom to select those characteristics which are most pertinent to the specific study. For the purpose of this study, Stake's framework guided the development of an evaluation plan which was used to study the relationships between timing, anxiety, and the level of learning attained by the patient with diabetes at the completion of an indepth diabetic teaching program.

Definition of Terms

The following operational definitions were used in this study.

Timing of an educational program

The length of waiting time, as measured in days, between the patient's being told of the diagnosis of diabetes and entry into an indepth diabetic teaching program. The independent variable in this study was the timing of an education program.

Anxiety

An unpleasant emotional state or condition, characterized by subjective consciously perceived feelings of tension and apprehension (Speilberger, Gorsuch, Lushene Vagg, & Jacobs, 1983). For this study anxiety is measured by the State-Trait Anxiety Inventory (Spielberger et al., 1983).

Level of knowledge

The status of the patient's knowledge as measured by the Diabetes Knowledge Test (Hess & Davis, 1983) on two different occasions. The unit of measurement for the knowledge gained is the residual gain score for a pre-test and post-test. Knowledge is a score on the Diabetes Knowledge Test. The residual gain score was used to control for the effect of previous knowledge.

Assumptions of the Study

This study is based upon the following assumptions:

1. Patients participating in the diabetic teaching program have been correctly diagnosed by the physician and the diagnosis has been communicated to the patient.
2. The diabetic teaching program is effective and of benefit to the patient in controlling diabetes.
3. Patients in the study will answer questionnaires truthfully and to the best of their ability.

Research Questions

The specific research questions for this study were:

1. What is the relationship between the timing of a patient education program and the patient's anxiety?
2. What is the relationship between the patient's anxiety and the level of knowledge attained at the completion of an indepth diabetic education program?

3. What is the relationship between the timing of an educational program and the level of knowledge attained by the patient at the completion of an indepth diabetic education program?

Hypothesis

The following hypotheses were formulated:

1. There is an inverse relationship between the elapsed time from diagnosis to the beginning of an educational program and the level of anxiety in patients who are attending the diabetic teaching program.
2. There is an inverse relationship between the level of anxiety in patients who are attending the diabetic teaching program and the level of knowledge they attain by the completion of an indepth diabetic education program.
3. There is a positive relationship between the elapsed time from diagnosis to the beginning of an educational program and the level of knowledge attained by the patient on the completion of an indepth diabetic education program.

Ethical Considerations

The administration of the State-Trait Anxiety Inventory (STAI) and the Diabetic Knowledge Test (DKT) to patients attending the diabetic teaching program was a new practice for this

institution. Subsequent to obtaining ethical clearance from the University of Alberta Faculty of Nursing "Ethics Committee", the research proposal was submitted to the University of Alberta Hospitals "Nursing Research and Scholarly Activities Committee" (NRSAC) and the "Special Services and Research Committee" (SSRC). The Canadian Nurses' Association ethical guidelines for nursing research involving human subjects (1983) and the University of Alberta Policy (1985) on ethics in human research were followed throughout this study.

The researcher first contacted potential subjects on the Monday (first) morning of their diabetic teaching program. Potential subjects were told that a study was being done to look at factors that affect the knowledge level of patients attending a diabetic teaching program. Written informed consent (Appendix 1) was obtained from all of the subjects who agreed to participate in the study.

Subjects were informed of their rights to withdraw from the study at any time and to refuse to answer any questions without penalty. There are no known physiologic, psychologic, or social risks to subjects participating in the study.

Subject anonymity was assured by the use of code numbers on the Biographical Data Sheet, the State-Trait Anxiety Inventory and the Diabetes Knowledge Test. Subject confidentiality was maintained by keeping the subject list and subject code numbers in a locked file. The subject list was destroyed upon completion of the final written report for the study. Subjects were given a copy of the consent form.

CHAPTER II

LITERATURE REVIEW

Introduction

In this chapter, the literature related to the relationships between the timing of an education program, anxiety, and the knowledge level of patients attending an diabetic teaching program is presented.

Timing and Learning

The belief that the timing of teaching may be a decisive factor in increasing learning can be found in the literature (Cohen, 1980; Falvo, 1985; Gleit, 1986; Griesbach, 1985; Narrow, 1979; Rankin, 1984; Redman, 1984; Whitman, Graham, Gleit, & Boyd, 1986). Rankin identified poor timing and inattention to the patient's stress level as a problem in patient education. Rankin suggests that patients under stress or in the stage of denial are poor candidates for teaching. In addition, the time prior to or following diagnostic procedures, surgery or painful episodes were identified as poor times for teaching.

Falvo (1985) points out that patients who are unreceptive to information at one time may be much more receptive to the same information at another time.

According to Gleit (1986), the term "readiness to learn" suggests that the learner is likely to engage in positive action to change behavior. Narrow (1979) defined "readiness to learn" as the state or condition of being both willing and able to make use of instruction.

Whitman (1986) indicated that an individual's health status affects "readiness to learn." If one's energy is drastically reduced, little or no learning will take place, or it may take more time. For example, a newly diagnosed patient with diabetes recovering from ketoacidosis must invest all available energy into stabilizing the body processes. In this situation, it is unlikely that much energy will be available for learning. In addition, sensory impairments such as visual deficits due to high levels of blood glucose can limit learning ability. Further, the psychological health status of the newly diagnosed diabetic is influenced by anxiety, fear, or adjustment to the health state. The patient may not be able to learn because psychological energy is being invested in coping with the diagnosis of diabetes.

Carlson (1978) indicated that adaptation to chronic illness varies among individuals. However, Carlson also noted that there is a sequence of adaptation to chronic illness which most individuals follow.

Garrard and Richmond (cited in Whitman et al., 1986) labelled the stages through which an individual progresses when adjusting to a chronic disease. These stages include disorganization, reintegration, and adaptation. The initial stage, the period of disorganization, usually occurs at the time of diagnosis. This period is one of great anxiety and learning effectiveness during this time period is minimal. During the initial stage, nursing care should be directed mainly toward reducing anxiety (Whitman, 1986). During the period of reintegration, the patient's awareness of the reality of the situation gradually increases and energy levels become more stable. At this time, teaching related to the patient's current experiences is pertinent. However, the patient may find it difficult to deal with future-oriented educational content. The last stage, the period of adaptation, may not be reached, or fully achieved by all individuals. At this stage, the patient faces reality and displays information-seeking behavior related to self-care management and implications of the long-term consequences of the disease (Garrard & Richmond, 1986).

There is a dearth of research literature regarding the timing of teaching for the patient with diabetes. It has, however, been addressed with other clinical populations.

Alt (1966) and others (Cohen, 1981; Dyer, Chalfant, Cole, Donahue, Franklin, Hickok, Ishida, Kunishi, Nugent, & Plaisted, 1979; Griesbach, 1985; Guzzetta, 1979) found that timing of

teaching may be a decisive factor in increasing learning. Others however, found that the timing of teaching was not a decisive factor in increasing learning (Brown, 1987; Christopherson & Pfeiffer, 1980). Two of these researchers (Brown, 1987 and Dyer et al., 1978) specifically examined the relationship between diabetic patients' level of knowledge and the timing of teaching.

Dyer et al. (1978) address timing and level of diabetic patient knowledge. The researchers sought to identify conditions facilitating learning for the patient with diabetes. The sample in this study consisted of 114 diabetic patients from five hospitals in Western United States. This study focused on finding correlates of diabetic patients' high knowledge scores, particularly the relationship of these scores to patients' demographic descriptors, and various teaching approaches. The Clients' Knowledge Instrument tool was designed to measure patients' knowledge of diabetes and the relationships of diet, activity level, and insulin. The researchers found that patients who attended diabetic classes after hospitalization rather than during hospitalization had a significant gain in knowledge. Anxiety was not addressed in this study.

Brown (1987) examined the relationship between certain factors thought to influence the diabetic patients' ability to learn (age, educational level, length of time since diagnosis, race, sex, socioeconomic status, and type of clinic attended) and

achievement on the Diabetic Knowledge Test (Collier & Etzwiler, 1971; Etzwiler, 1962). The sample in this study consisted of 30 insulin-dependent patients between the ages of 42 and 65. An exploratory, cross-sectional, correlational design was used. Data was collected through the use of a structured questionnaire, which included the Diabetic Knowledge Test. Brown reported that the educational level of the patient was the only significant predictor of test achievement. Multiple regression was used to show that the difference in diabetic knowledge test scores was related to the educational level of the patients.

Two other researchers who examined aspects of timing are Alt (1966) and Guzzetta (1979). Alt, in a descriptive study using an open-ended interview, examined the knowledge concepts desired by patients and the time which they felt these concepts were best related. During an eight-month period, he interviewed 450 patients at the time of discharge from the hospital. His sample consisted of 130 medical patients, 250 surgical patients, 52 obstetrical patients, and 18 specialty patients. Alt found that a very important aspect of patient education was timing. He reported that the patient is not receptive to information when in pain or under the effects of sedation. Alt did not conduct any tests of significance on his data so it is difficult to eliminate individual differences as a plausible explanation for his findings.

In a study that looked specifically at the timing of an educational program, Guzzetta (1979) examined the relationship

between the timing of a cardiac-rehabilitation teaching program, anxiety and the level of knowledge for the patient with an acute myocardial infarction. Patients were assigned to one of three teaching time periods following discharge from the coronary care unit (CCU). Guzzetta found that the lowest mean level of anxiety was one week following transfer from the CCU (seventh, eighth and ninth days). Patients taught at this time learned considerably more than patients taught earlier (third, fourth and fifth days post CCU transfer) or later (eleventh, twelfth and thirteenth days post CCU transfer). When the relationship between the level of learning and psychological stress was examined, Guzzetta found that patients with a lower level of anxiety achieved a significantly higher level of learning. The findings of Guzzetta's study suggest that the timing of teaching is an important factor in patient learning.

In summary, there is some evidence in the literature that timing is related to learning (Guzzetta, 1979). However, no study addressing the relationship between the timing of a diabetic teaching program, anxiety, and level of knowledge for the patient with diabetes was found.

Anxiety and Learning

Research and descriptive nursing literature indicate high levels of anxiety are inversely related to learning (Fitzgerald,

1980; Guzzetta, 1979; Huckabay, 1980; Leventhal, 1971; Redman, 1984; Webb, 1983; Whitman et al., 1986). Whereas some anxiety may stimulate the learning process, severe anxiety is incapacitating and can, in fact, interfere with learning (Leventhal, 1971; Redman, 1984). Research in education and psychology has supported the belief that high levels of anxiety are inversely related to academic achievement, problem solving, and listening comprehension (Eysenck, 1979; Murphy, 1979). The health professional who blindly proceeds with patient teaching without considering the patient's anxiety levels not only conducts a futile exercise but also runs the risk of losing rapport and trust that could enhance future efforts (Falvo, 1985). However, with the exception of test anxiety, little research of situational stress and its effect on learning has been done outside of the laboratory (Griesbach, 1985).

Learning, itself, may increase anxiety (Redman, 1984). Fitzgerald (1980) addresses the relationship of anxiety and learning for the patient with diabetes. He states that newly diagnosed diabetics may be made so anxious about the new skills they must acquire that it is impossible to concentrate on learning the skills. Further support for this belief is provided by Miller (1982) and Scott, Beaven and Stafford (1984).

Miller (1982), using a qualitative research approach, categorized the self-care needs of 65 ambulatory diabetics. A

participant observation methodology was used to discover self-care needs. Diabetic patients attending a metabolic clinic at a Midwest Medical Center received care from the researcher and a graduate student research assistant. Patients were provided with care one morning a week, during clinic hours, for the duration of 1 year. The age range of the patients was 22-83 years. A tool designed by Miller (1980) was used to measure the patient's self-care agency. All patients in the study had a minimum of three professional nursing contacts. Miller reported that the diagnosis of diabetes, dietary and lifestyle changes, self-injection with insulin, and potential physical losses due to diabetes are all stressful circumstances. When taken together, these circumstances may increase the patient's anxiety to a level that interferes with learning.

Although much attention has been focused on patient education as a means of reducing anxiety, the relationship between learning and heightened anxiety states in diabetic patients remains unclear. Johnson (1972) and others (Myers, 1964; Raleight & Odtohan, 1987; Schmitt & Wooldridge, 1973; Scott et al., 1984; Toth, 1980) found that patient education is effective in reducing patient anxiety. However, Barbarowicz, Nelson, De Busk, and Haskell (1980) and Christopherson and Pfeiffer (1980) found educational programs ineffective in reducing patient anxiety. One of these researchers (Scott et al., 1984) specifically examined

the relationship between diabetic patients' level of knowledge and level of anxiety.

Scott et al. (1984) evaluated the effectiveness of a diabetic education program for non-insulin dependent patients. The patients were allocated at random to treatment (n=32) or non-treatment (n=28) groups. The treatment group commenced the education program on referral, but the other group was excluded from education until four weeks later. The researchers measured the anxiety scores for the control group (without teaching) and the treatment group prior to and at the completion of the four-week education program. The experimental group experienced a significant reduction in anxiety; whereas, the control group had a significant increase in anxiety.

In conclusion, it has been shown that the inverse relationship between anxiety and learning is a widely accepted concept. Further, it has been shown that it is possible to apply this concept to patient teaching (Guzzetta, 1979). The identification of an optimal time for diabetic patient teaching requires further investigation. The literature supports the need for further investigation of conditions that facilitate learning for the patient with diabetes and also that such a study will contribute to nursing knowledge.

CHAPTER III

METHODS AND PROCEDURES

Introduction

The purpose of this chapter is to present the method and procedures used in this study. The discussion focuses on the design of the study, the setting and description of the teaching program, sample population, instruments and data collection procedures. Finally, data analysis procedures are presented.

Design

A one-group pretest-posttest design (Campbell & Stanley, 1963) was used to determine the relationship between timing, anxiety, and the level of knowledge for subjects involved in a diabetic teaching program. Continuous data were collected from a non-probability convenience sample of patients who were attending a diabetic teaching program. Measures of state and trait anxiety and knowledge were obtained on the patients who participated in the study. Patients completed the Diabetes Knowledge Test (Form A) and the State-Trait Anxiety Inventory prior to the commencement of the diabetic teaching program. The Diabetes Knowledge Test

(Form B) and the State Anxiety Inventory were completed immediately following the diabetic teaching program.

Setting and Description of the Teaching Program

The study was conducted at a large urban teaching hospital in Western Canada. This hospital is a 1300 bed, acute care teaching facility. The diabetic patient teaching program is offered at a metabolic centre which is affiliated with the hospital. A comprehensive four-day education program for diabetic patients and their relatives is conducted on a weekly basis. The staff is composed of: a) one attending physician (an endocrinologist), b) two registered nurses, c) two registered dieticians, d) a social worker, e) two secretaries, and f) a dietary technician. The position of director of the metabolic day care centre is held by an endocrinologist. The position of instructor/coordinator of the metabolic day care centre is held by one of the registered nurses. Medical residents, student interns, student nurses, and student dieticians obtain learning experience through the centre.

The objective of the program is to provide patients with an intensive course in the self-management of diabetes. Patients are referred to the centre by their personal physician. The majority of patients attend the centre as out-patients. There is a maximum of 18 patients attending the clinic per week. Approximately 1-2

of the 18 patients are in-hospital patients. The program is held from 0715 hours to 1545 hours on Monday to Thursday of each week. The program is offered throughout the year with the exception of one week in March and one in October. The staff encourage patients to attend the diabetic education program with a relative. Through attending classes, patients are expected to gain the necessary information and skills to carry out their therapeutic regimens as prescribed by the physician. The registered nurses provide group and individualized instruction to patients and their families regarding the pathophysiology, causes, treatment and complications of diabetes. The dieticians provide group and individualized instruction. In addition, the dieticians supervise the patient's planning and selection of food. Lectures are provided by a member from the Canadian Diabetic Association, an exercise specialist and a social worker. The social worker is available for individual and family counselling. Physician visits are scheduled for each day throughout the program. (Appendix 2 gives a detailed outline of the diabetic teaching program.)

Sample Population

The sample population consisted of all diabetic patients admitted to the diabetic teaching program over a three month period (January to March, 1988). From this population, a

non-probability convenience sample was obtained. The following criteria were used in the selection of subjects for the study. They had to: a) be able to read and understand the English language; b) be between the age of 18 and 65 years; c) have no severe documented emotional disturbance; and d) give written consent to participate in the study. Additional data were collected for purposes of describing the sample (Appendix 3). A sample size of 80 patients from the diabetic patient teaching program was obtained. The age of 18 years was chosen to ensure that subjects could give an informed consent. Patients over the age of 65 were not included in the study. It has been reported that the problems commonly encountered in diabetes instruction are exacerbated in the case of elderly patients (Jeffries & McIntosh, 1985).

Instruments

The instruments selected to obtain information about variables that may influence the subjects' level of knowledge regarding diabetes include a biographical data sheet, a diabetes knowledge test developed by Hess and Davis (1983) and the State-Trait Anxiety Inventory (Spielberger et al., 1983). A description of the instruments and the available reliability and validity data are presented in the following discussion.

Biographical Data Sheet

Biographical information about variables that may influence the subjects' level of knowledge regarding diabetes was collected on an information sheet developed by the researcher. This information included patient status, age, sex, occupational status, educational level, previous diabetes education, length of time since diagnosis, management of diabetes, family history of diabetes, the presence of major stressors while attending the diabetic teaching program, and change in therapy since beginning the program. Biographical data were obtained from the participants as well as the participants' medical records. This information was used to develop a profile of subjects who participated in the study.

Diabetes Knowledge Test

The Diabetes Knowledge Test (DKT) is a 38-item patient knowledge test developed at the Michigan Diabetes Research and Training Center (Hess & Davis, 1983). These instruments are the result of assessment activities carried out by Center personnel since 1979 (W.K. Davis, personal communication, March 4, 1987). The patient knowledge test was developed for the purpose of assessing instructional needs among literate adults with diabetes and measuring outcomes of educational programs. There are two parallel forms (Form A and B) which can be used to evaluate subjects' knowledge of diabetes and its management (Appendix 4).

Data obtained from more than 950 administrations of the two parallel forms of the DKT have provided documentation of patient knowledge levels, insight into the effectiveness of diabetes educational programs, and support for program revisions. The psychometric properties of the test instruments that have been studied include factor structure, reliability, and validity.

Content validity of this instrument was established by the process of test construction. In this situation, content validity refers to the relationship between knowledge necessary to manage diabetes and test content. Over 150 test items were developed to match the objectives of diabetic patient teaching programs. The program objectives were compared with two studies that identified cognitive factors related to patient self-management of diabetes. These studies included the Diabetes Education Profile project (Boutaugh, Hull, & Davis, 1982; Davis, Hull & Boutaugh, 1980, 1981) and a Rand Corporation study (Brook, Ware, Davies-Avery, Stewart, Donald, Rogers, Williams & Johnston, 1979). A panel of nationally recognized consultants consisting of a diabetologist, a dietician and a nurse educator reviewed the content included in the final version of the test. This review by the consultants helped confirm the appropriateness of test content and thereby helped establish the test content validity.

Following a pilot use of the test on hospitalized diabetic patients, item analysis was performed and resulting data used to reduce the number of test items from 150 to 38. According to

Dunn, Bryson, Hoskins, Alford, Handelsman & Turtle (1984) a criterion of internal consistency is commonly used in circumstances where test items are to be reduced in number. Hess and Davis (1983) retained test items that had the highest point biserial correlation with the total test scores. The individual items on the two parallel forms of the test have a point biserial correlation that ranges from 0.14 to 0.67. Analysis of variance on the total test score and on each of the five subscores was used to determine equivalence of the two forms of the DKT. None of the resulting F statistics was significant and the hypothesis of test equivalence could not be rejected (Hess and Davis, 1983).

Each form of the test has an overall reliability of 0.89 (Cronbach's alpha). Form A and B are of equal difficulty. The mean percent difficulty level for each of the tests is 65% (G.E. Hess, personal communication, April 13, 1988). Each test consists of five subcomponents (factors) which are labeled: a) carbohydrates; b) blood sugar; c) basics; d) food exchanges; and e) insulin. The first factor, carbohydrates, contains six items related to the identification of foods high in carbohydrate content and to the sick-day management of carbohydrates. The second factor, blood sugar, contains 10 items related to the causes, signs, and management of abnormal glycemic status. The third factor, basics, contains 11 items basic to the treatment goals, control status, and complications of diabetes. The fourth factor, food exchanges, contains six items. The last factor,

administration of insulin, contains five items regarding the management and administration of insulin. The two tests have a factor reliability index (Cronbach's alpha) that ranges from 0.59 for insulin on Form B to 0.86 for blood sugar on Form A (Hess & Davis, 1983). The Diabetes Knowledge Test takes approximately 20 minutes for a patient to complete (W.K. Davis, personal communication, May 13, 1987).

Apothecary and metric equivalents (Curren & Munday, 1986; Scherer, 1982) were included in the instrument to reflect the Canadian metric system. The Canadian Diabetic Association (CDA) food groups and recommended food allowances (CDA, 1983; 1985) were also included in the instrument to reflect the CDA standards and guidelines for diabetes education in Canada. Modification of the instrument was necessary since the CDA standards were used in teaching the patients who participated in this study. Three content experts reviewed the instrument to ensure compatability with Canadian diabetic standards. The content experts included: a) an endocrinologist; b) a diabetes nurse educator; and c) a nutritionist.

In summary, both forms of the DKT provide data upon which educational programs can be based. Further, the tests provide information which is useful in assessing the impact of educational interventions with diabetic patients. Garrard, Joynes, Mullen, McNeil, Mensing, Feste, & Etzwiler (1987) report that the diabetic

patient knowledge test developed by Hess and Davis in 1983 described the minimal kinds of knowledge that a patient with diabetes must be taught.

The State-Trait Anxiety Inventory

The State-Trait Anxiety Inventory (STAI) developed by Spielberger et al. (1983) was used to measure psychological anxiety. The STAI consists of two self-report scales on which subjects rate themselves regarding two anxiety concepts, trait and state anxiety (Appendix 5). Spielberger et al. describe trait anxiety as the relatively stable individual differences in anxiety proneness. Trait anxiety is the amount of anxiety with which one generally faces life and life situations (Lewis, Gadd, & O'Connor, 1987). The trait anxiety scale asks the subjects to describe how they "generally feel." According to Speilberger et al., trait anxiety should not be influenced by situational stress. The items on the trait scale are considered stable over time and unaffected by the stress of a particular situation. State anxiety is described as a transitory emotional state (Spielberger et al., 1983). The anxiety which a person experiences in response to certain specific conditions is referred to as state anxiety (Katkin, 1978). State anxiety is the amount of anxiety that one has at a given moment or in a given situation (Lewis et al., 1987). The state anxiety scale asks people to indicate how they feel at the present moment. The state scale is a sensitive indicator of the level of transitory anxiety and evaluates

qualities of tension, nervousness, worry, and apprehension (Barsevick & Llewellyn, 1982). Although the STAI has been adapted in more than thirty languages for cross-cultural research and clinical practice (Spielberger & Diaz-Guerrero, 1976, 1983), the test was developed and used primarily in North American studies.

Research with the STAI. The STAI has been used in a wide variety of research situations and populations. More than 2000 studies using the STAI to measure anxiety have appeared in the research literature since the test was first published in 1966 (Spielberger et al., 1983). Over a decade ago, an annotated bibliography of research concerned with, or related to, the State-Trait conception of anxiety was published by Smith and Lay (1974). Smith and Lay listed approximately 150 references. These references included journal articles, doctoral dissertations, and technical reports; the STAI was used to measure anxiety in 108 of these studies. Over the past decade, the STAI has been used more extensively in psychological research than any other anxiety measure (Buros, 1978).

Although most studies with the STAI have been conducted by psychologists or medical researchers, the test has also been widely used by investigators from other disciplines: counselling and guidance, criminal justice, education, nursing, physical education and sports psychology, and speech and hearing (Spielberger et al., 1983, p. 20). The STAI has been used in a

number of clinical nursing studies (Barsevick & Llewellyn, 1982; Carnevali, 1966; Christopherson, 1980; Mercer & Ferketich, 1988). The STAI has also been used to investigate the role of anxiety in a number of patient education programs (Barbarowicz et al., 1980; Levesque, Grenier, Kerouac, & Reidy, 1984; Scott et al., 1984). Scott et al. used the STAI in their study of the effectiveness of a diabetic education program for the non-insulin dependent diabetic patient.

The STAI has been used extensively to investigate the role of anxiety in patients suffering from asthma (Alexander, 1972), headaches (Blanchard, Andrasik, Neff, Arena, Ahles, Jurish, Pallmeyer, Saunders, Teders, Barron & Rodichok, 1982), insomnia (Carr-Kaffashan & Woolfolk, 1979), dermatitis (Garrie, Garrie, & Mote, 1974) and hypertension and coronary heart disease (Bloom, 1979).

Reliability. The reliability of the STAI has been examined through measures of stability (test-retest correlation) and internal consistency [The Cronbach modified K-R 20 formula (Cronbach, 1951) and item remainder correlation.] Measures of internal consistency (alpha coefficient) for the revised STAI (Form Y) range from .89 to .96. Test-retest correlations range from .65 to .86 for the trait anxiety scale and from .16 to .62 for the state anxiety scale (Spielberger, 1983). As state anxiety is conceptualized as transitory, low stability (test-retest) reliability coefficients are expected.

Given the transitory nature of anxiety states, the alpha coefficient (Cronbach, 1951) provides a more meaningful index of the reliability of the state anxiety scale than test-retest correlations (Spielberger, 1983). Spielberger et al. (1983) reported that all but one of the state anxiety alphas were above .90 for the samples of working adults, students, and military recruits, with a median coefficient of .93. The measures of internal consistency for the trait anxiety inventory were also uniformly high, with a median coefficient of .90.

Alpha reliability coefficients are typically higher for the state anxiety scale when it is given under conditions of psychological stress. For example, the alpha reliability of the state anxiety scale was .92 when administered to a group of college males immediately after a difficult intelligence test, and .94 when given immediately after a distressing film (Spielbergr et al., 1983, p. 14). For the same subjects, the reliability coefficient (alpha) was .89 when it was given following relaxation training.

Spielberger et al. (1983) provided further evidence of the internal consistency of the STAI by providing item-remainder correlations computed for the normative samples. The median item-remainder correlations for various norm groups ranged from .55 to .63 on the state anxiety scale, and from .52 to .77 on the trait anxiety scale. Speilberger et al. (1983) concluded that:

> Stability, as measured by test-retest coeffiecients, is relatively high for the STAI, T-anxiety scale and low for the S-Anxiety scale, as would be expected for a measure assessing changes in anxiety resulting form situational stress. The internal consistency for both the S-Anxiety and the T-Anxiety scales are quite high as measured by alpha coefficients and item-remainder correlations. The overall median alpha coefficients for the S-Anxiety and T-Anxiety scales for Form Y in the normative samples are .92 and .90 respectively. (p. 14)

Validity. Speilberger et al. (1983) investigated the construct validiy of the state anxiety inventory by administering it to 977 undergraduate students. The investigators used the standard instructions under both normal conditions and exam conditions. Under normal conditions the female students (n=645) scored 39.36 and under exam conditions 60.51; the male students (n=332) scored 40.02 and 54.99, respectively. Under these two conditions the point-biserial correlation between the two measures for females was .73 and .60 for males. Spielberger et al. reported correlations between the state anxiety and trait anxiety inventories ranging from .61 to .75. The researchers used various groups of subjects under a variety of situations to establish the correlations between the state anxiety and trait anxiety scales.

The concurrent validity of the trait anxiety scale was examined by comparing it with several other scales. The following correlation coefficient ranges were reported: 1) .75 to .77 with the Institute for Personality and Ability Testing (IPAT) Anxiety Scale (Cattell and Schier, 1963); 2) .79 to .83 with the Taylor Manifest Scale (TMAS) (Taylor, 1953); and 3) .52 to .58 the Zuckerman Affect Adjective Checklist (Zuckerman, 1960). Dreger (1978) reports that the revised STAI is one of the best standardized of anxiety measures, and consequently further reliablity and validity investigations were not conducted.

Data Collection Procedures

The subjects were chosen from the diabetic teaching program class list. The instruments were administered by the investigator of this study.

Pilot Test

Prior to initiating the study, a small scale trial administration to assess the Diabetes Knowledge Test was conducted. This trial administration provided an opportunity to detect unforeseen problems with the Diabetes Knowledge Test before implementing the full-scale study. The trial administration was done with seven diabetic patients attending a diabetic teaching program at an acute care hospital in Northeastern Nova Scotia.

The mean age of the group was 59.85 years with a range of 32 to 72 years and a median age of 64 years. The participants' education level was determined by the number of years of formal education each had received. This education level included years spent at a recognized vocational institution. The mean education level of the group was 10.3 years of formal education with a range of 8 to 16 years and a median of 8 years of school. The trial administration addressed the following issues: 1) the time required by the participant to complete the instrument; 2) the instructions for the instrument; 3) the language of the instrument; and 4) the ease of administering the instrument. No difficulty with proposed protocols for administering the Diabetes Knowledge Test was identified in the pilot test. Therefore, it was not necessary to adjust the test protocols.

Biographical Data and Pre-Tests

Subsequent to obtaining informed consent on day one of the program (Monday, a.m.), the investigator completed the Biographical Data Sheet for each patient agreeing to participate in the study. The biographical data were obtained from the participant as well as the participant's medical records. The investigator spent approximately 15 minutes with each participant in explaining the study, obtaining the consent, and filling in the Biographical Data Sheet. For the purpose of this study, the "time of diagnosis" was recorded as the time the patient perceived he or

she was diagnosed and not the time of clinical diagnosis (from the chart). That is to say, the time that the patient received a definitive diagnosis from his/her physician. The independent variable "timing" was measured but not manipulated. The Diabetes Knowledge Test (Form A) and the State-Trait Anxiety Inventory were administered following the completion of the Biographical Data Sheet. These questionnaires, designed to be self-administered, were given individually to each participant. Complete instructions for the questionnaires are printed on the test form. The instructions were read aloud to help make sure the participants understood their task. Participants were encouraged to raise questions. Similarly, in an attempt to facilitate objective responses, participants were reassured of the confidentiality of the test results. There was no time limit for the completion of the questionnaries. However, it was necessary for the participants to complete their questionnaires prior to the start of the teaching program at 1300 hours on Monday afternoon. The participants generally required 15-20 minutes in total to complete the questionnaires.

Post-Tests

The Diabetes Knowledge Test (Form B) and the State Anxiety Inventory were administered on Thursday following lunch. The participants completed these questionnaires in approximately 15 minutes.

In responding to the Diabetes Knowledge Test (Form A and B), participants chose the single best answer to each multiple choice question. The answer was inserted in the space provided on the questionnaire. Participants were informed that the questions had only one correct answer. Participants were asked to select the answer they thought may be right if they did not know or were not sure of the correct response. To obtain scores for the Diabetes Knowledge Tests, the number of correct answers for the 38 items of the questionnaire was totalled. The Diabetes Knowledge Tests (Form A and B) were manually scored by the investigator.

In responding to the State-Trait Anxiety Inventory, particpants blackened the number on the standard test form to the right of each item-statement best describing the intensity of their feelings. To obtain scores for the State-Trait Anxiety Inventory, the weighted scores for the 20 items of the individual scales were totalled. A template key was used for scoring the scale manually.

Data Analysis

The Diabetes Knowledge Test (Form A and B) and the State-Trait Anxiety Inventory were hand scored by the investigator following scoring protocols for these instruments. Biographical data and scores for the Diabetes Knowledge Test and the State-Trait Anxiety Inventory were coded on optical scanner coding

sheets. Statistical analysis was done utilizing the Social Sciences Statistical Package-X (SPSSX, 1983).

Descriptive statistics including the mean, standard deviation, minimum and maximum values were computed for the following variables: age, number of days between being diagnosed as having diabetes and entry into an indepth diabetic teaching program, total knowledge (Diabetes Knowledge Test - Form A and B) scores and anxiety (State-Trait Anxiety Inventory) scores. Frequency counts and percentages were calculated for the following variables: gender, age categories, patient status, occupational status, education categories, previous participation in a diabetic teaching program, management of diabetes, requirement of urgent intervention for diabetes, severe hearing or sight defect, lived with someone who had diabetes, a relation not living at home who has had diabetes, a family member who died from diabetes, major stressors while attending the diabetic teaching program, and change in therapy since beginning the diabetic teaching program. Frequency counts and percentages were also calculated for total knowledge (Diabetes Knowledge Test - Form A and B) scores and anxiety (State-Trait Anxiety Inventory) scores. A correlated t-test was used to examine pre-test and post-test differences in anxiety and knowledge levels. A Pearson product moment correlation coefficient was calculated to test the relationship between the participants: 1) timing of their educational program

and level of anxiety; 2) timing of their educational program and level of knowledge; and 3) level of anxiety and level of knowledge. A Scheffé test was done to compare the average knowledge scores of education groups 1 and 2 with groups 3, 4, and 5. Finally, regression models were constructed incorporating the variables relating knowledge to time, anxiety, age, education, and method of treatment for diabetes. The influence of the independent variables on knowledge were determined by comparing the goodness of fit of models composed of different predictor variables (Kerlinger and Pedhazur, 1973).

CHAPTER IV

RESULTS AND DISCUSSION

Introduction

The purpose of this chapter is to present the statistical findings of the study. A description of the sample characteristics and the research hypothesis testing data are presented. Descriptive data are divided into demographic data and supportive data. Hypothesis testing data are based on information obtained from the Biographical Data Sheet, the Diabetes Knowledge Test (Forms A and B), and the State-Trait Anxiety Inventory completed by the study participants. Finally a discussion of the data, addressing each stated research question is presented.

Sample Characteristics

The sample characteristics presented include sample selection and attrition rate, demographic data and supportive data. This is followed by a description of the pre-test and post-test differences of the knowledge and anxiety scores.

Sample Selection and Attrition Rate

During the designated data collection period, 143 diabetic patients attended the four day diabetic patient-education program.

Of these patients, 58 (40.56%) were not eligible for participation in the study for various reasons. These reasons included: a) inability to read and understand the English language; b) under the age of 18 years or over the age of 65 years; and, c) the presence of a severe emotional disturbance (See Table I). Of the 85 patients meeting the specified criteria for participation, no patient refused to participate in the research project. Two patients gave written consent to participate in the study but were unable to complete the pre-tests prior to the start of the teaching program at 1300 hours on Monday afternoon. These two patients had late morning appointments and spent a greater than anticipated amount of time with both the physician and dietician. Three patients failed to complete the four day program due to personal reasons and were unavailable to complete the post-tests. Complete data were obtained for all 80 participants by March 1988.

Demographic Data

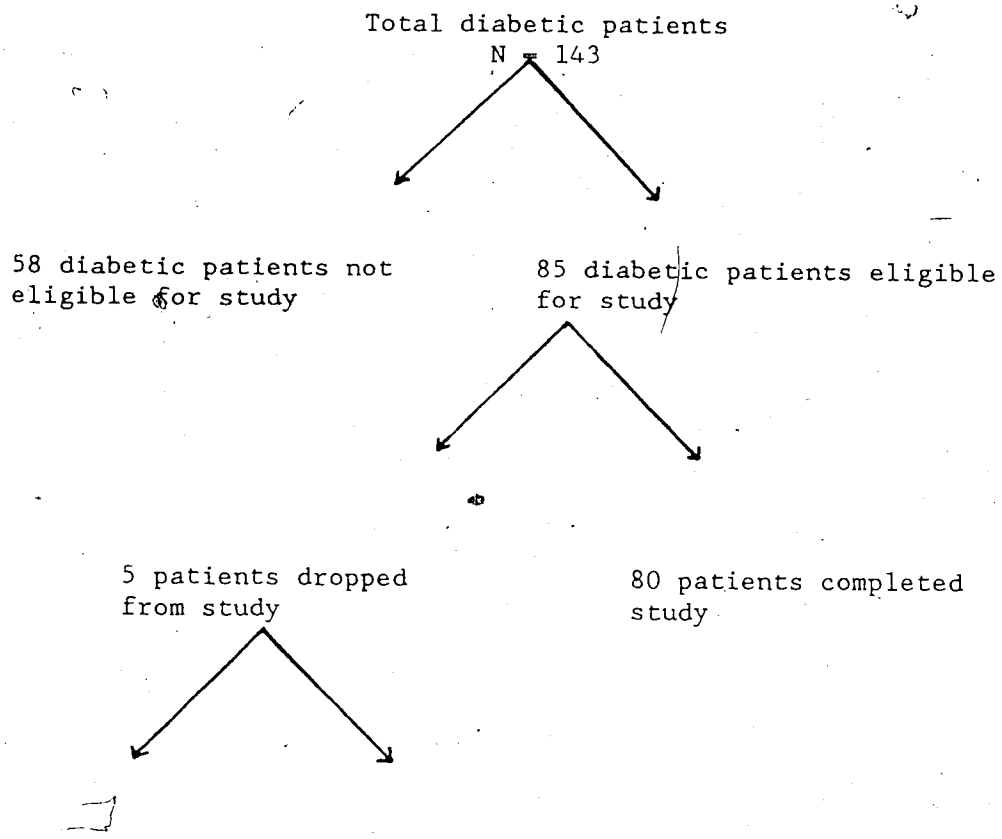
The frequency and percentage distribution of the participants' gender, age, level of education, and employment status are contained in Table II.

Gender. Table II indicates that 45 (56.3%) of the participants were male. This is not a typical finding. Diabetes in Canada is more common in females (60.8%) than males (39.2%) (Statistics Canada, 1985).

Age. The age range of the sample was 18 to 65 years. The mean age of the sample was 46.4 years.

Table I

Sampling Procedure and Attrition Rate



Note. Total number of diabetic patients attending the four day diabetic education program between January 11, 1988 and March 17, 1988.

Table II

Selected Demographic Data of the Study Sample

Data	Frequency	%
Gender		
Male	45	56.3
Female	35	43.8
Age		
18-25 years	6	7.5
26-35 years	13	16.2
36-45 years	12	15.0
46-55 years	28	35.0
56-65 years	21	26.2
Mean age	46.42	
Range	18-65	
Standard deviation	13.07	
Level of Education		
7-8 years	14	17.5
9-10 years	13	16.2
11-12 years	19	23.7
13-16 years	24	30.0
17 years plus	10	12.5
Mean years of education	12.17	
Range	7-20	
Standard deviation	3.18	
Employment Status		
Employed	51	63.7
Homemaker	11	13.7
Retired	8	10.0
Unemployed	6	7.5
Disabled	2	2.5
Student	2	2.5

N=80

Level of education. The participants' education level was determined by the reported number of years of formal education each had received. This education level included years spent at a recognized vocational institution. The participants' level of education ranged from a minimum of 7 years of formal education to a maximum of 20 years. The sample mean for total years of education was 12.17 years and the sample median was 12.0 years. These findings are not atypical for the population of Alberta. The median number of years of formal education of Alberta's adult population is 12.3 (Statistics Canada, 1986).

Employment status. Employment status was determined by participant self-report on day one of the diabetic patient education program. As shown in Table II, the majority of the participants (63.7%) were employed. In decreasing frequency, the other participants were homemakers (13.7%), retired (10.0%), unemployed (7.5%), disabled (2.5%), and students (2.5%). The participants in this study are not atypical of the Alberta population. The employment participation rate for Albertans was 65.9% as of January, 1988 (Alberta Bureau of Statistics, 1988). The participation rate represents the labor force expressed as a percentage of the population 15 years of age and over.

Supportive Data

Selected supportive data were obtained from the participants' self-report and the hospital chart. Table III contains the frequency and percentage distribution that summarize the responses

Table III

Selected Supportive Data of the Study Sample

Data	Frequency	%
Patient status		
Out-patient	70	87.5
In-patient	10	12.5
Length of time since diagnosis		
7-60 days (0-2 months)	25	31.3
61-365 days (3-12 months)	5	6.2
366-3650 days (1-10 years)	25	31.3
3651-9849 days (10-27 ye s)	25	31.2
Previous diabetic patient education program		
Yes	40	50.0
No	40	50.0
Management of diabetes		
Diet and insulin	38	47.5
No prescribed regimen	15	18.8
Diet only	12	15.0
Diet and oral hypoglycemic agent	10	12.5
Oral hypoglycemic agent only	5	6.3
Required urgent intervention for diabetes		
No	48	60.0
Yes	32	40.0
Severe documented hearing or sight defect		
No	71	88.7
Yes	9	11.2
Lived with someone who had diabetes		
No	66	82.5
Yes	14	17.5
Relative not living at home who has etes		
No	5	63.7
Yes	29	36.2

Table III con't.

Data	Frequency	%
Family member died from diabetes		
No	65	81.2
Yes	15	18.8
Major stressors while attending program		
No	53	66.2
Yes	27	33.8
Change in therapy since beginning program		
No	50	62.5
Yes	30	37.5

N=80

to the items. These data were collected so that the relationship between knowledge and the identified variables could be analyzed.

Knowledge Scores

The Diabetes Knowledge Test (DKT), a 38-item multiple choice test (Hess & Davis, 1983), was used to evaluate the participants' knowledge of diabetes and its management. There are two parallel forms (Form A and B) of the test. Form A of the DKT was administered on Monday morning prior to the start of the teaching program. Form B of the DKT was administered on Thursday afternoon following lunch.

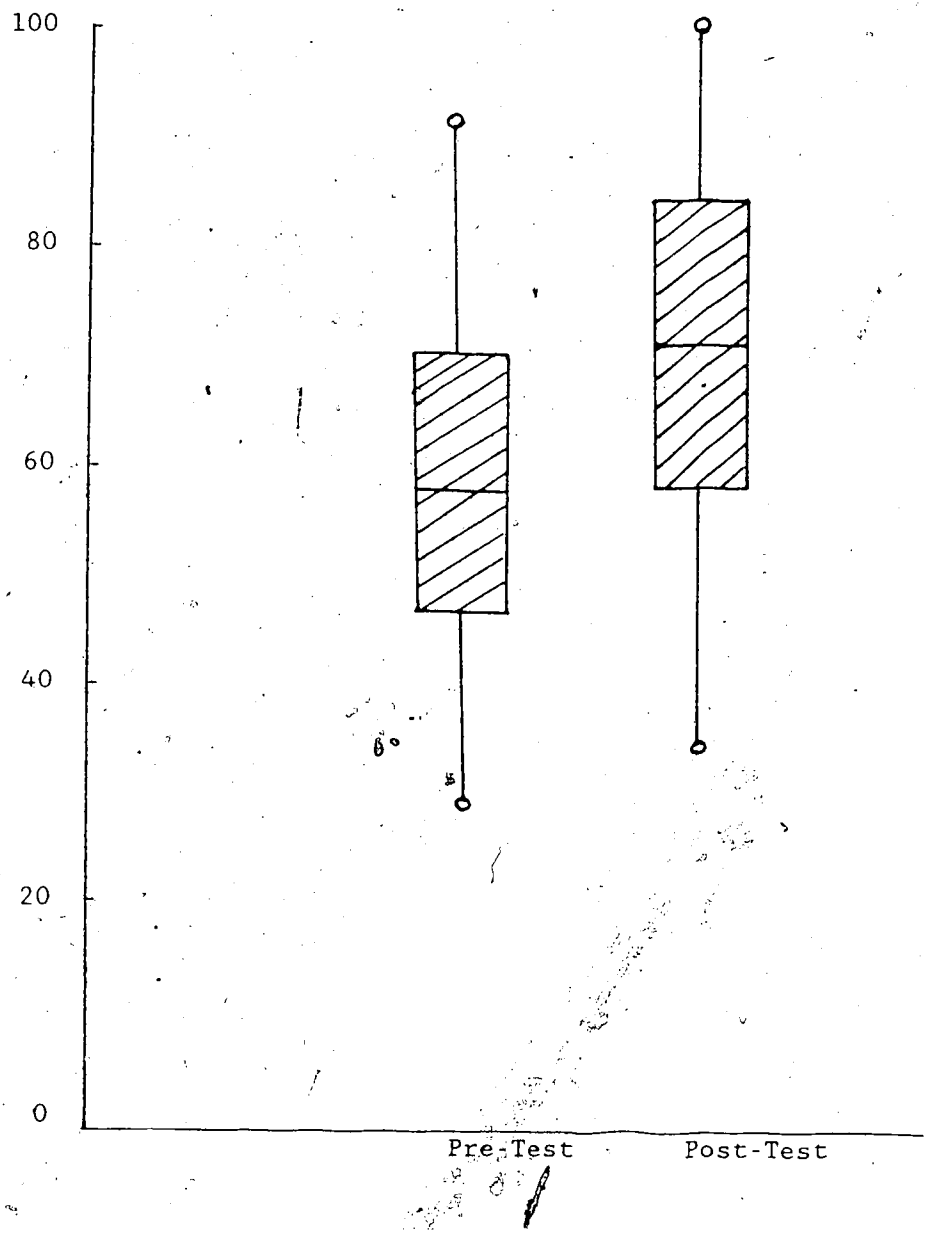
Central tendency and variance. The overall range of the mean percent knowlege scores was from 28.95% to 89.47% for the pre-test and 31.58% to 100.00% for the post-test. The mean percent knowledge scores for the pre-test and post-test were 58.09% and 69.41% respectively. The mean percent difficulty level for the tests is 65% (Hess & Davis, 1983). The data are presented in Figure 1. A box and whisker display, such as Figure 1, is a useful way to illustrate differences between test scores and to identify those participants with extreme scores.

> The two end circles represent the highest and lowest scores. The box is drawn so that its upper and lower boundaries are at the third and first quartiles. A line is drawn across the box at the median. Whiskers are used to join the boxes to the end points. (Maguire, 1986, p. 26).

Scores that fall more than one and a half box lengths beyond the

Figure 1

Box and Whisker Display for Diabetes Knowledge Test: Pre-Test and Post-Test



upper or lower quartiles are marked with asterisks and are called outliers. For example, on the pre-test, the median was 57%, the first quartile (lower border of the box) was at 47% and the third quartile (upper border of the box) was at 68%. The upper whisker marks the top score of 90%, while the lower whisker marks the low score of 30%. There are no outliers. On the post-test example, the median is 71%, the first quartile is 57%, and the third quartile is 83%. The upper score is 100% and the lowest score is 32%.

Of a possible 38 points, the sample achieved a raw score mean of 22.07 on the pre-test with a standard deviation of 5.5 and a range of 11.0 to 34.0 (See Table IV). The post-test raw score mean was 26.37 with a standard deviation of 6.54 and a range of 12.0 to 38.0.

Pearson product moment correlation. A Pearson product moment correlation coefficient was computed using the raw score values for the Diabetic Knowledge Test (pre-test and post-test). There was a statistically significant positive correlation ($r = .67$, $p < .001$).

t-test. A correlated t-test was computed for the purpose of comparing knowledge scores before and after the four day diabetic patient education program. As indicated in Table IV, there was a statistically significant mean difference between the subjects' pre-test and post-test scores. It seems reasonable to suppose

Table IV

Test Results for Diabetes Knowledge Test on Two Occasions

Variable	Mean	Standard Deviation	Correlation	t Value	Degrees of Freedom	2-Tail Probability
Raw Score						
DKT (pre-test)	22.07	5.75				
			.678	-7.80	79	.001
DKT (post-test)	26.37	6.54				

N=80

that this highly significant increase in scores from the pre-test to the post-test is due to the subjects gaining knowledge about diabetes and its management from their four day diabetic patient education program. At the time of the post-test, all the participants had prepared their CDA meal plans and monitored their blood glucose levels for a minimum of 4 days. They had also administered all prescribed medications (insulin injections and oral hypoglycemic agents) for a minimum of 2 days.

Scheffe test. A Scheffe test was done comparing the average residual gain scores of education groups 1 and 2 with groups 3, 4, and 5 because education groups might have differed on the amount of prior knowledge. Results were found to be significant at the 0.05 level (observed value = 12.53, critical value = 4 x 2.5 = 10.0). The education groups were categorized according to the number of years of formal education. These groups include: (a) group 1 (7 to 8 years); (b) group 2 (9 to 10 years); (c) group 3 (11 to 12 years); (d) group 4 (13 to 16 years); and, (e) group 5 (17 years plus).

Anxiety Scores

The State-Trait Anxiety Inventory (STAI) developed by Spielberger et al. (1983) was used to measure psychological anxiety. The STAI consists of two 20-item self-report scales on which subjects rate themselves regarding two anxiety concepts, trait and state anxiety. The possible range of scores for the scale is 20 to 80. The State-Trait Anxiety Inventory was administered on Monday morning prior to the start of the teaching

program. The State-Trait Anxiety Inventory was administered on Thursday following lunch.

Central tendency and variance. The STAI-Trait scale was given as a pre-test. The distribution of the scores is presented in Figure 2. A stem and leaf display, such as shown in Figure 2, is used to "combine both the graphical advantages of a bar graph, with the information of a table. The stem acts as the label for each line and gives the leading values to which the leaves can be attached to recapture the original values" (Maguire, 1986, p. 15). The stem is the value that appears to the left of the colon, the leaves are attached to the right. To obtain the original value, the leaves are attached to the stem. In Figure 2, there are two rows for each stem. Leaves from 20 to 24 are in the first row, and leaves from 25 to 29 are in the second row. Looking across the first row it reads 20:001122333344. This means that two participants obtained a score of 20 (indicated by the "0's"), two participants obtained 21 (indicated by the "1's"), two participants obtained 22 (indicated by the "2's"), four participants obtained 23 (indicated by the "3's"), and two participants obtained 24 (indicated by the "4's"). The mean for working adults as established by Spielberger et al. (1983) is 34.87 and the standard deviation is 9.21. The participants in this current study generally were slightly more anxious than the test sample.

Figure 2

Stem and Leaf Display for STAI-Trait Anxiety Scores

(Stem: tens
Leaves: units)

Possible Range of Scores = 20 to 80

```
20: 001122333344
  : 5566778888899
30: 0112222234
  : 555666667778
40: 002233322
  : 566778999
50: 011113
  : 5
60: 233
  : 6679
70:
  : 7
```

mean = 35.07
SD = 10.94
N = 80

The STAI-State scale was given both as a pre-test and a post-test. The possible range for the STAI-State scale is 20 to 80. The sample population achieved a mean of 38.43 on the pre-test with a standard deviation of 13.32 and a range of 20 to 77. The post-test mean was 35.23 with a standard deviation of 11.13 and a range of 20 to 64.

Pearson product moment correlation. As shown in Table V, there is a significant relationship between STAI-Trait scores and STAI-State pre-test scores ($r = .64$, $p < .001$). The correlation obtained is consistent with those reported by Spielberger et al. (1983, p. 15), which ranged between .59 and .75, depending upon the amount of threat to self-esteem present in the situations used for the state items. The correlation obtained is consistent with the view that high trait anxiety individuals tend to over respond to changing situations, resulting in high state anxiety scores. The correlation between the STAI-Trait scores and STAI-State post-test scores ($r = .55$, $p < .001$) as shown in Table 5, was slightly less than the test sample. Generally it would be expected that the more relaxed conditions of the post-test situation might contribute to the lower correlation of anxiety scores.

A Pearson product moment correlation coefficient was computed for the STAI-State pre-test and post-test. There was a statistically significant positive correlation ($r = .63$, $p < .001$).

Table V

Pearson Correlation Coefficient: STAI-Trait and State (Pre-Test and Post-Test) Scores

	STAI-State Tests	Correlation	Probability
STAI-Trait	STAI-State (Pre-Test)	.64	.001
	STAI-State (Post-Test)	.55	.001

N=80

As shown in Table VI, significant negative relationships were found between STAI-State (pre-test and post-test) scores and Diabetes Knowledge Test (pre-test and post-test) scores. High state anxiety scores on the pre-test and post test were related to low knowledge scores on the pre-test and post test.

t-tests. A correlated t-test was computed for the purpose of comparing anxiety scores before and after the four day diabetic education program. As indicated in Table VII, there was a statistically significant mean difference between the subjects' pre-test and post-test scores. This significant decrease in scores from the pre-test to the post-test may be as a result of the subjects reducing their anxiety about their diabetes and its management from their four day diabetic education program. These findings reinforce the studies conducted by Johnson (1972), Myers (1964), Raleight & Odtohan (1987), Smith & Woodridge (1973), Scott et al. (1984), and Toth (1980). These researchers reported that patient education is effective in reducing patient anxiety. On the box and whisker display (Figure 3) it is readily apparent that anxiety scores decreased with the post-test (over the relatively ious environment of the pre-test). While there was a cons rable range of scores on each occasion (pre-test range 20 to 7 a. post-test range 20 to 64), no outliers were present. It is possi e that the pre-test scores on the STAI would have had a greater ange if the lower limit for the scores was less than 20. The ch ging scores between the two occasions would indicate that the I-State is sensitive enough to detect differences in the p cest and post-test situations.

Table VI

Pearson Correlation Coefficient: STAI-State and Diabetic Knowledge Test

	Knowledge Tests	Correlation	Probability
STAI-State (Pre-Test)	DKT (pre-test)	-.29	.008
	DKT (post-test)	-.24	.027
ate (Post-Test)	DKT (pre-test)	-.27	.013
	DKT (post-test)	-.33	.002

N=80

Table VII

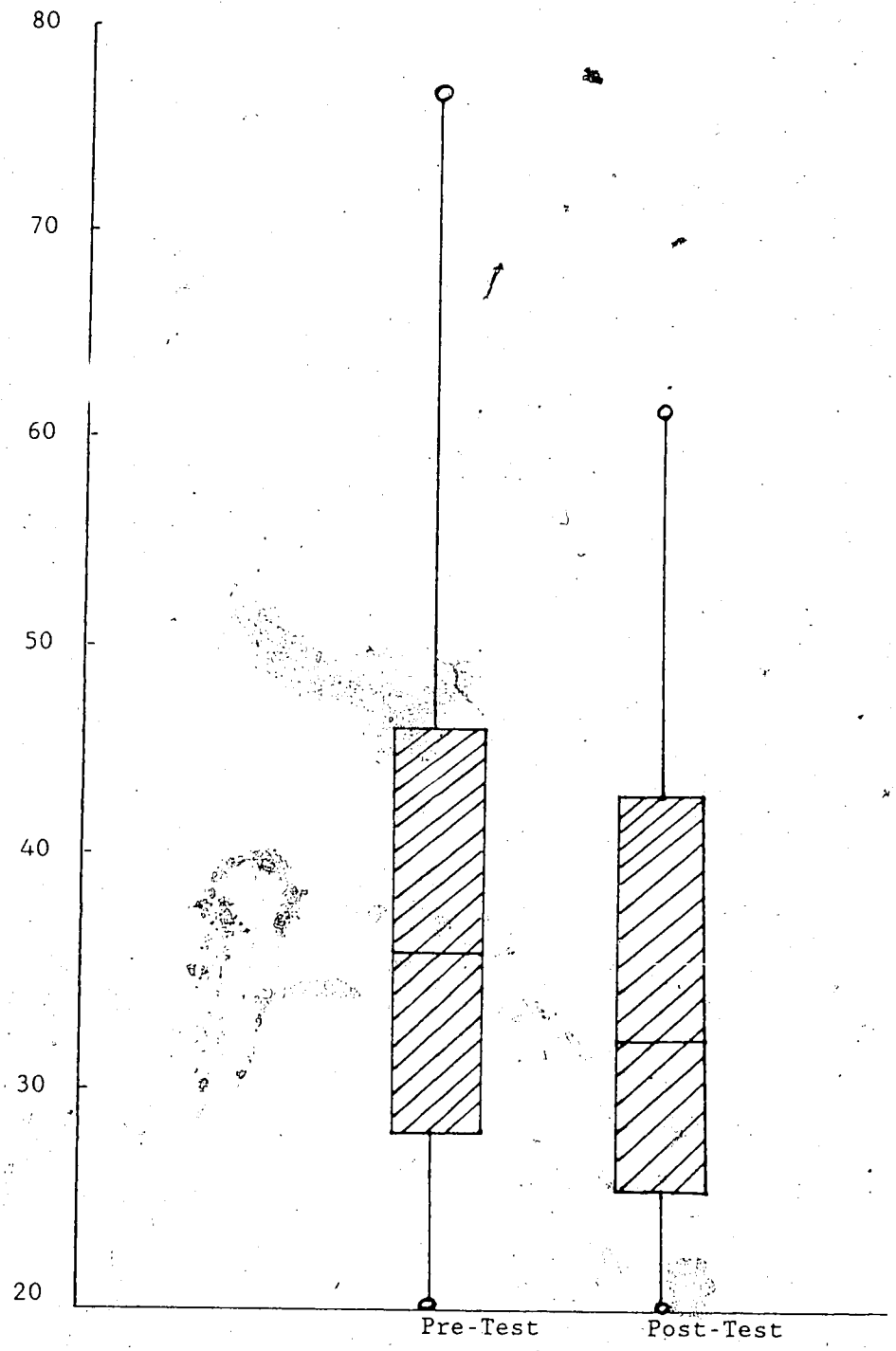
Test Results for STAI-State on Two Occasions

Variable	Mean	Standard Deviation	Correlation	t Value	Degrees of Freedom	2-Tail Probability
Pre-Test	38.43	13.32				
			.63	2.68	79	.009
Post-Test	35.23	11.13				

N=80

Figure 3

Box and Whisker Display for STAI-State Anxiety Scores: Pre-Test and Post-Test



Research Questions

The objective of this study was to examine the relationships between the timing of a diabetic education program, anxiety, and the level of knowledge for the patient with diabetes. The focus of this section of the chapter is a discussion of the data, addressing each of the research questions.

A Pearson product moment correlation coefficient was calculated to test the relationship between the participants: 1) timing of their educational program and level of anxiety; 2) timing of their educational program and level of knowledge; and, 3) level of anxiety and level of knowledge. Regression models were constructed incorporating the variables relating knowledge to time, anxiety, age, education, and method of treatment for diabetes. The influence of the independent variables on knowledge was determined by comparing the goodness of fit of models composed of different predictor variables (Kerlinger & Pedhazur, 1973).

Relationship Between Timing and Anxiety

The first research question asked: What is the relationship between the timing of a patient-education program and the patient's anxiety?

It was hypothesized that there is an inverse relationship between the elapsed time from diagnosis to the beginning of an educational program and the level of anxiety in patients who are attending the diabetic teaching program. As shown in Table VIII,

Table VIII

Pearson Product Moment Correlation Between Timing, Anxiety and Knowledge

	Timing	Anxiety	Knowledge
Timing	-	-.10	.01
Anxiety		-	-.06
Knowledge			-

N=80

the relationship between timing and anxiety was a negative one (r = -.10, p = .37) but not significant. These results indicate that there was no significant correlation between the timing of an educational program and anxiety. These findings are not consistent with those reported by Fitzgerald (1980). Fitzgerald reported that newly diagnosed diabetics may be made so anxious about the skills they must acquire, that it is impossible to concentrate on learning the skills. Fitzgerald did not conduct any tests of significance on his data so it is difficult to eliminate individual differences as a plausible explanation for his findings.

Relationship Between Anxiety and Knowledge

The second research question asked: What is the relationship between the patient's anxiety and the level of knowedge they attain by the completion of an indepth diabetic education program?

It was hypothesized that there is an inverse relationship between the level of anxiety in patients who are attending the diabetic teaching program and the level of knowledge attained by the completion of an indepth diabetic education program. The relationship between anxiety and knowledge was a negative one (r = -.06, p = .56) but not significant. These results indicate that there was no significant correlation between anxiety and the level of knowledge attained at the completion of an indepth diabetic education program. These findings are not consistent with those reported by Fitzgerald (1980), Guzzetta (1979), Huckabay (1980), Leventhal (1980), Redman (1984), Webb (1983) and Whitman et. al.

(1986). These researchers reported that high levels of anxiety are inversely related to learning. Of these researchers, only Fitzgerald specifically studied anxiety and learning in relation to the patient with diabetes. It is therefore difficult to make direct comparisons between this study and those reported in the literature. Further, Fitzgerald did not conduct any tests of significance on his data.

Relationship Between Timing and Knowledge

The third research question asked: What is the relationship between the timing of an educational program and the level of knowledge attained by the patient at the completion of an indepth diabetic education program?

It was hypothesized that there is a positive relationship between the elapsed time from diagnosis to the beginning of an educational program and the level of knowledge attained by the patient on the completion of an indepth diabetic education program. The relationship between timing and knowledge was a postive one (r = .01, p = .89) but not significant. These results indicate that there was no significant correlation between the timing of an educational program and the level of knowledge attained at the completion of an indepth diabetic education program. These findings are consistent with those reported by Brown (1987) and Christopherson and Pfeiffer (1980). These researchers reported that the timing of teaching was not a decisive factor in increasing learning.

Patient characteristics possibly influencing the relationship

between timing and knowledge in this study were anxiety, treatment, education, and age. A multiple-regression analysis was performed to study the effect of these variables on the relationship between timing and knowledge. The dependent variable was residual gain on knowledge. Each variable was inserted into the regression equation sequentially, seeking the best variable or group of variables predictive of the relationship between timing and knowledge. The best single predictor was the patients' educational level (t = 2.68, Sig t = .009). No other variable, singly or additively, was statistically significant. As shown in Table IX, participants with a high education level (grade 11 and above) came to the program earlier and gained more knowledge than those participants with a low education level (grade 7 to 10). The Pearson product moment correlation between knowledge and education was statistically significant (r = .28, $p < .01$). In addition, a Scheffe test which compared the average knowledge scores of education groups 1 and 2 with groups 3, 4, and 5 was statistically significant at the 0.05 level. These results reinforce the study conducted by Brown (1987). This researcher performed multiple-correlation regression to analyze the relationship between certain factors thought to influence the diabetic adult's ability to learn (age, sex, race, socioeconomic status, educational level, length of time since diagnosis, and type of clinic attended) and achievement on a diabetic knowledge test. Brown reported that the educational level of the participant was found to be the only significant predictor of test achievement ($p < .001$).

Table IX

Knowledge (Residual Gain Score) Means Broken Down by Education Group and Time Level

	Timing[a]			
	Mean Count	Low number of days	Medium number of days	High number of days	
Education[b]					
Low Education		-2.98 8	0.75 9	-4.82 10	27
High Education		-.10 22	1.44 16	2.92 15	53
	N =	30	25	25	80

Note. These data were regrouped.

[a] Data regrouped into 3 categories: low number of days (7 through 340 days), medium number of days (403 through 3286 days), and high number of days (3659 through 9849 days [27 years]).

[b] Data regrouped into low education (grades 7 through 10) and high education (grade 11 plus).

Demographic and Supportive Variables

The Pearson product moment correlation between residual knowledge gain and each of the demographic supportive variables was not statistically significant. It was thought that prior experience with diabetes, such as living with a diabetic or having a relative with diabetes, would increase the participants' level of knowledge. However, no signficant relationships were identified.

Further Discussion

Several reasons may be advanced to account for the finding that there are no statistically significant relationships between timing, anxiety, and knowledge. One possible reason is that there are truly no relationships between the variables. Another reason is that this sample is quite different from other samples. However the mean scores in this sample were comparable to those of other investigators, therefore this explanation is not compelling.

With respect to the variables of timing and knowledge, Christopherson & Pfeiffer (1980) reported that the timing of education made little difference in the amount of information recalled. What did make a difference, in relation to the level of knowledge, was whether or not the individual was exposed to the information.' The findings of this study support the findings of Christopherson & Pfeiffer. That is, the timing of the diabetic education program made little difference in the amount of knowledge obtained.

Chapter V

CONCLUSIONS AND IMPLICATIONS

Introduction

In this chapter, the conclusions and implications of the research study are presented.

Research Questions

Relationship Between Timing and Anxiety

The first research question asked: What is the relationship between the timing of a patient-education program and the patient's anxiety?

The findings of this study indicate that the two variables are unrelated. As noted earlier, these findings are not consistent with those reported by Fitzgerald (1980). Fitzgerald reported that newly diagnosed diabetics may be so anxious about the skills they must acquire, that it is impossible for them to concentrate on learning. Fitzgerald did not conduct any tests of significance on his data so it is difficult to eliminate individual differences as a plausible explanation for his findings. The implications of the findings for this study are not clear. Further research is required to assist nurses to

understand the relationship between the timing of a patient-education program and the patients' anxiety. Research which explores the level of anxiety at various stages (for example, pre-test, post-test, two months follow-up) following diagnosis, would be of value to determine changes in anxiety levels. Although the results of this study did not indicate a relationship between timing and anxiety, it would be in the patients' best interest for nurses to follow the suggestions in the literature and attempt to assist the patient in overcoming the adverse effects resulting from high anxiety levels.

Several suggestions regarding the management of the patients' anxiety are proposed. Before beginning the teaching of diabetes management, an opportunity should be provided to allow nurses to complete a thorough nursing assessment for each patient scheduled to attend the diabetes education program. This nursing assessment should include an assessment of the patients' level of anxiety using a tool such as the STAI-State Inventory. If nurses are aware of those patients with high anxiety levels, then measures to help the patient to reduce anxiety can be implemented. For example, nurses can encourage those patients to express their anxiety. Nurses should also attempt to identify the patients' stressors and coping strategies on an ongoing basis.

Facilitating discussion of emotional responses will serve to increase the nurses' sensitivity to "where the patients are at".

An atmosphere of acceptance must exist, where diabetic patients are supported and encouraged in their endeavors, concerning behavior and life style changes.

Nurses should encourage the patient to attend the program with a relative or friend. This person can provide the patient with support, thereby increasing the patient's ability to cope with his disease.

A self-help group (buddy system) may contribute to a reduction in patient anxiety and an increase in patient knowledge. For example, a newly diagnosed patient who is experiencing difficulty in coping with the management of diabetes could be "buddied" with another recently diagnosed patient who has been successful in coping.

Further, the nurse needs to allow the patients every available opportunity to focus on their feelings regarding the disease and their diabetes management skills. In addition, patients attending a diabetic patient-education program should be encouraged to: a) monitor their own blood glucose levels; b) prepare and administer their own medication; c) prepare their own meal plans; and, d) select and measure their own food. These activities should be carried out under the direct supervision of the patient-education program instructors.

In addition, nursing students should be given experience in administering and scoring basic psychological tests such as the

STAI-State Inventory. Students should also be able to discuss the results of these tests with the patient and be aware of the limitations of both the test and the patient's education level.

Relationship Between Anxiety and Knowledge

The second research question asked: What is the relationship between the patient's anxiety and the level of knowledge attained at the completion of an indepth diabetic education program?

The findings of this study indicate that the two variables are not related. As noted earlier, these finding are not consistent with those reported by Fitzgerald (1980), Guzzetta (1979), Huckabay (1980), Leventhal (1980), Redman (1984), Webb (1983), and Whitman et. al. (1986). These researchers reported that high levels of anxiety are inversely related to learning. Of these researchers, only Fitzgerald specifically studied anxiety and learning in relation to the patient with diabetes. It is therefore difficult to make any direct comparisons between this study and those reported in the literature. Further, Fitzgerald did not conduct any tests of significance on his data. The implications of the findings of this study are not clear. Therefore further research is required to assist nurses to understand the relationship between the patients' anxiety and level of knowledge attained in an educational program. Although the results of this study did not indicate a relationship between anxiety and increase in knowledge, it would be in the patients'

best interest for nurses to follow the suggestions in the literature and attempt to assist the patient in overcoming the adverse effects resulting from high anxiety levels. Several suggestions regarding the management of the patients' anxiety were previously proposed.

Relationship Between Timing and Knoweldge

The third research question asked: What is the relationship between the timing of an educational program and the level of knowledge attained by the patient at the completion of an indepth diabetic education program?

The findings of this study indicate that the two variables were unrelated. As noted earlier, these findings are consistent with those reported by Brown (1987) and Christopherson and Pfeiffer (1980). These researchers reported that the timing of teaching was not a decisive factor in increasing learning. It would appear that the significant factor is that the patient receive the education. Further research which explores the level of knowledge of diabetic patients at various stages following diagnosis, would be of value to determine if the participant's level of knowledge was retained.

Level of Education

The findings of the study indicate that a higher level of knowledge is attained by those patients who have a higher level of education. Participants with less than a grade 11 education had a

lower mean knowledge gain than those participants with a higher education level. The program as it is now structured probably is more beneficial to those with high school education than those with less than high school education. In addition, the program would be of more value if the teaching and experiences could be geared to the patients' education level. Further evaluation of our education programs would be of value to make sure that these programs are at an appropriate grade level for the average person in Alberta.

The findings of this study are consistent with those reported by Brown (1987). Brown reported that the educational level of the participant was found to be the only significant predictor of test achievement for the diabetic adult. In light of these findings, nurses must attempt to assist the patient in overcoming the adverse effects resulting from low education levels. For example, nurses must be alert to including the patients' education level as part of the nursing assessment.

Nursing educators must also be alert to including the patients' education level as part of the nursing assessment. In addition, nursing educators should ensure that students have information regarding teaching-learning strategies.

As indicated previously, the findings of the study suggests that the level of education is of significance in terms of knowledge acquired. As the study did not investigate the amount

of teaching time or methods in relation to the amount of knowledge acquired, future investigation of these two variables may prove to be significant. It is probably important for nurses to develop a variety of teaching strategies so that the program can be effective for patients of different educational backgrounds. The need for a variety of teaching strategies is probably particularly important in view of the fact that approximately 40 per cent of the clinic population were excluded from this study because they did not read or understand English, had a severe documented emotional disturbance, or were in an age group where one might expect possible learning difficulties.

Conclusion

This investigation fulfilled the objective of exploring the relationship between the timing of an education program, anxiety, and the level of knowledge for the patient with diabetes. The findings of this study have demonstrated the effectiveness of the diabetic education program. The participants experienced a significant increase in their level of knowledge and a signficant decrease in their level of anxiety following the completion of the diabetic patient education program. The timing of the program and the participants' anxiety level did not directly influence the level of knowledge. These programs should be supported by nurses to ensure patients are adequately educated about diabetes and its management. Further research is required to investigate the

factors that affect the knowledge level of patients with diabetes. Additional research will help determine those patient factors which are reliable predictors of knowledge levels for patients attending a diabetic patient education program. Based upon the results and experience of this researcher, the following recommendation is made: replication of this study, using the same learning objectives and program, with a different diabetic patient population and instructional staff to determine if the results differ significantly from this study. Similar results would increase the confidence that the present outcomes are not particular to this study.

In light of the above recommendation, additional research which further explores factors that influence the knowledge level of diabetic patients would provide valuable groundwork for improving the effectiveness of teaching programs for the diabetic patient.

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APPENDIX 1

Information Sheet and Informed Consent Form

Information Sheet

Project: A STUDY OF PATIENT EDUCATION AND DIABETES MELLITUS

Investigator: DIANNE M. HANRAHAN
FACULTY OF NURSING
UNIVERSITY OF ALBERTA
EDMONTON, ALBERTA, CANADA

When a person is diagnosed as having Diabetes Mellitus, the doctor prescribes treatments and diabetic routines to be carried out at home. The knowledge required to perform the prescribed treatments and routines may be obtained by participating in a diabetic teaching program. The purpose of this study is to examine the factors that affect the knowledge level of patients attending a diabetic teaching program. This study may gain information that may help others in similar circumstances. You are being asked to participate in this study and to sign the attached consent form.

Please answer the questionnaires, which will take about 30 minutes in each of two sessions to complete. The results of the questionnaires are confidential and anonymity is guaranteed.

Informed Consent

PROJECT TITLE: Relationship Between Timing and the Level of Knowledge of a Diabetic Teaching Program

INVESTIGATOR: Dianne M. Hanrahan, R.N., B.Sc.N.
Masters Student
Faculty of Nursing
University of Alberta

The purpose of this research project is to investigate factors that affect the learning of patients attending a diabetic teaching program.

I agree to answer two questionnaires, which will take about 30 minutes at the beginning and end of my diabetes education program, and to allow the investigator to obtain information from my hospital chart pertinent to the study.

The investigation carries no apparent risks to me. All information will be coded so that it cannot be identified with me and my name will not appear in any document or reports.

I may not benefit directly from this investigation, which it is hoped will contribute to a greater understanding of the nursing needs of patients.

I AUTHORIZE DIANNE M. HANRAHAN to use my chart for the above purpose, and agree to complete the two questionnaires.

I UNDERSTAND THAT I can refuse to answer items on the questionnaires that I prefer not to answer.

I FURTHER UNDERSTAND that I am free to withdraw my consent and terminate my participation at any time, without prejudicing my present or future care.

I HAVE BEEN GIVEN THE OPPORTUNITY TO ASK WHATEVER QUESTIONS I DESIRE AND ALL SUCH QUESTIONS HAVE BEEN ANSWERED TO MY SATISFACTION.

_____ _____

Signature of Participant Date

_____ _____

Signature of Witness Occupation of Witness

APPENDIX 2

Four Day Diabetes Mellitus Program

	Day 1	Day 2
07:15-08:00		Blood Testing (all patients
08:00-08:30	Medical, Nursing and Dietary Assessment	Breakfast
08:30-09:15		Causes of Diabetes Methods of Treatment
09:15-10:00	Blood & Urine Test (all patients)	Meal Plan-Basic Concepts -Eating Habits
10:00-10:30	Questionnaire	Blood Testing (patients on diet or diabetic pills only) & Snack
10:30-11:15		Insulin Therapy
11:15-12:00		Methods for Administering Insulin CDA Presentation
12:00-13:00	Blood testing (Insulin-patients only) & LUNCH	LUNCH
13:00-13:45	Overview of Diabetes	Good Health Eating Guide in detail -Commercial Products
13:45-14:30	Introduction to Meal Plan & Food Groups	Individual & Group Teaching, Home Blood glucose testing
14:30-15:00	Blood testing (all patients) & Snack	
15:00-15:45	Monitoring Diabetes	Adapting to Diabetes
15:45-16:00	Urine & Blood Testing	

Four Day Diabetes Mellitus Program

	Day 3	Day 4
07:15-08:00	Blood Testing (all patients	
08:00-08:30	Breakfast	
08:30-09:15	Insulin regimens & Adjustments	Day of Illness -fluid diet
09:15-10:00	Continuation of Good Health Eating Guide -Recipes	Complication & Prevention
10:00-10:30	Blood Testing (patients on diet or diabetic pills only) & Snack	
10:30-11:15	Hypoglycemia & Rebound Hyperglycemia	Foot Care
11:15-12:00	Ketoacidosis Small Group Teaching -glucagon	Diabetes & Alcohol Eating Out Budgeting Follow-up
12:00-13:00	Blood testing (Insulin patients only) & LUNCH	LUNCH
13:00-13:45	Diabetes & Exercise Weight Changes	Safeguards of Driving & Travelling Useful facts for living with Diabetes
13:45-14:30	Group Teaching Insulin Adjustments	Discharge Visit with Physician and Nurse
14:30-15:00	Blood testing (all patients) & Snack	
15:00-15:45 15:45-16:00	Exercise for Fun & Therapy	

APPENDIX 3

Biographical Data Sheet

(For office use only)

1. Patient Number: _____ _____1-3/

2. Date: _____ _____4-9/
(Month) (Day) (Year)

3. Patient Status: a) in-hospital patient _____
b) out-patient _____ _____10/

4. Birthdate: _____ _____11-12/
(Month) (Day) (Year) (Age)

5. Sex: male _____1
female _____2 _____13/

6. Occupational status:
-employed (occupation)_____1
-homemaker_____2
-student_____3
-retired_____4
-unemployed_____5
-disabled_____6
-other (identify)_____7 _____14/

7. Highest grade completed in school:

01 02 03 04 05 06 07 08 09 10 11 12 13 _____15-16/

8. Attended college, trade school or university?
Yes _____ 1-9
No _____ 0 _____17/

If yes to question 7, number of years attended college, trade school or university:_____

9. Attended classes about diabetes?
Yes _____ 1-99
No _____ 00 _____18-19/

If yes to question 9, how many years ago:_____

10. If yes to question 9, where:_____ _____20/
0 - No
1 - U of A
2 - Misericordia
3 - General
4 - Royal Alex
5 - Other in province
6 - Other out of province

10. First diagnosed as having diabetes:

_____ _____21-26/
(Month) (Day) (Year)

12. Present management of diabetes:
    -diet only _____1
    -diet and pills _____2
    -diet and insulin _____3
    -pills only _____4
    -none _____5 _____27/

13. Requires urgent intervention for diabetes (personal physician requested immediate attendance at patient-education program):
    Yes _____1
    No _____2 _____28/

14. Severe documented hearing or sight defect:
    Yes _____1
    No _____2 _____29/

15. Has lived with someone who had diabetes:
    Yes _____1
    No _____2 _____30/

16. Does any relation not living at home have diabetes:
    Yes _____1
    No _____2 _____31/

17. If yes to question 16, identify the relationship:

none - 0	mother - 1	father - 2
aunt - 3	uncle - 4	grandfather - 5
grandmother - 6	brother - 7	sister - 8
many - 9		

_____32/

18. Family member died from diabetes:
    Yes _____1
    No _____2 _____33/

19. Major stressor in life at present time:
    Yes _____1-8
    No _____0 _____34/

    If yes to question 19, identify stressor:

family death ____1	2 major _____6
divorce _____2	3 major _____7
major family illness _____3	pregnancy _____8
severe chronic disease _____4	other (identify) _____9
work _____5	

20. Change in therapy since beginning program:
    Yes _____1-5
    No _____0 _____35/

    If yes to question 19:
    -addition of pills ____1
    -addition of insulin ____2
    -diet ____3
    -diet and pills ____4
    -diet and insulin ____5

21. Pre-test DKT _____36-37/

22. Pre-test S-Anxiety _____38-39/

23. Pre-test T-Anxiety _____40-41/

24. Post Test DKT _____42-43/

25. Post Test S-Anxiety _____44-45/

APPENDIX 4

Diabetes Knowledge Tests

Patient Number _____
Date _____
Location _____

DIABETES KNOWLEDGE TEST

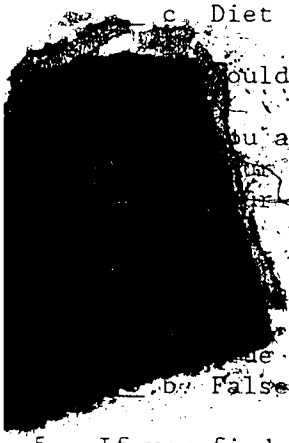
The following questions have only one correct answer. Choose the single best answer to each question. Try to answer every question. If you don't know, or aren't sure, select the answer you think may be right.

1. When people have diabetes, the main food component their bodies cannot use is protein.

   ___ a. True
   ___ b. False

2. In non-insulin-dependent diabetes (maturity-onset diabetes), the best treatment is:

   ___ a. Insulin therapy
   ___ b. Oral hypoglycemic agents
   ___ c. Diet to attain ideal weight



ould be tested more often when:

u are sick or don't feel well
urine shows a trace of sugar
ine tests are often negative

be present in your urine when you are dieting or ill and rbohydrate.

e
b. False

5. If you find "moderate" ketones in your urine, you should:

   ___ a. Drink 6 ounces (180 ml) of orange juice with a teaspoon of sugar
   ___ b. Increase fluids and check urine more often
   ___ c. Skip your next dose of insulin
   ___ d. Skip your next meal

6. Once opened, urine test materials will remain accurate until the expiration date.

   ___ a. True
   ___ b. False

Place an "X" to indicate whether each item is associated with hyperglycemia or hypoglycemia as a sign or symptom, as a cause, or as something you can do to prevent or reduce hyperglycemia or hypoglycemia.

Sign or Symptom	Hyperglycemia (high glucose)	Hypoglycemia (low glucose)
7. Negative urine tests	____	____
8. Dry skin and mouth	____	____
9. Happens slowly	____	____
10. Increased thirst	____	____
Causes		
11. Too much insulin	____	____
12. Too much exercise	____	____
13. Too much food	____	____
14. Illness or infection	____	____
Activities which Prevent or Reduce		
15. Eating food	____	____
16. Taking insulin	____	____

17. Insulin reactions are likely to occur:

___ a. During vigorous exercise
___ b. During the peak action of your insulin
___ c. Just before meals
___ d. During any of the times mentioned above

18. If you take two insulin injections each day and your before-lunch urine test consistently shows higher than usual sugar, but all other tests during the day are not different than usual, you should:

___ a. Increase your morning insulin dose
___ b. Increase your evening insulin dose
___ c. Decrease your evening meal
___ d. Increase your evening meal

19. The reason insulin injection sites should be changed daily is to reduce the likelihood of infection.

___ a. True
___ b. False

20. One cc (ml) of U-100 insulin contains:

___ a. 1 unit
___ b. 40 units
___ c. 80 units
___ d. 100 units

21. If you are on insulin, the spacing of your meals and snacks is planned so that:

___ a. You don't eat too much carbohydrate
___ b. You can exercise occasionally
___ c. Hypoglycemic reactions aren't likely
___ d. The prescribed calories are evenly divided

One food in each pair below contains a higher proportion of carbohydrate than the other. Check the food with the higher carbohydrate content.

22. ___ a. Milk
___ b. Fish

23. ___ a. Eggs
___ b. Carrots

24. ___ Raisins
___ Bacon

25. ___ a. Cheese
___ b. Cereal

26. ___ a. Margarine
___ b. Biscuit

27. Which of the following could you select for a dinner fruit and vegetable choice in a restaurant?

___ a. The canned fruit for dessert
___ b. The large tomato juice for an appetizer
___ c. The peach halves served with the ham
___ d. One half grapefruit broiled with honey for dessert

28. When someone with diabetes is sick, carbohydrate intake should be sharply restricted.

___ a. True
___ b. False

Write the letter of the food group in which each of the following foods is found.

29. ___ Corn
30. ___ Bacon (1 slice, side bacon
31. ___ Cheese (made from skim milk)
32. ___ Egg
33. ___ Peas

A. Fruits and Vegetables
B. Protein
C. Starch
D. Milk
E. Fats and Oils

34. If you made meat loaf and one serving had 4 oz. (100 g) raw meat and 3 soda crackers in it, you would count this as:

___ a. 3 protein choices and 1 starch choice
___ b. 3 protein choices and 1/2 starch choice)
___ c. 4 protein choices and 1 starch choice)
___ d. 4 protein choices and 1/2 starch choice)

35. If you have dialy exercise planned as part of your treatment and you do not exercise one day, you should expect your blood glucose to:

___ a. Go up that day
___ b. Go down that day
___ c. Remain about the same

36. If you have a sore on your foot you should:

___ a. Apply an antiseptic and seek medical advice if no improvement in a week
___ b. Clean it with soap and water, leave it uncovered, seek medical advice if no improvement in a week
___ c. Clean it with soap and water, apply a dressing and seek medical advice if no improvement in 24-36 hours
___ d. Seek medical advice immediately

37. Large blood vessel damage (arteriosclerosis) is:

___ a. A special problem seen only in people with diabetes
___ b. A common problem seen earlier in people with diabetes than in others
___ c. A common problem which is responsible for eye complications
___ d. An uncommon problem in people with diabetes

38. Numbness and tingling may be symptoms of:

___ a. Kidney disease
___ b. Poor diabetes control
___ c. Hypoglycemia
___ d. Heart disease

Patient Number _____
Date _____
Location _____

DIABETES KNOWLEDGE TEST

The following questions have only one correct answer. Choose the single best answer to each question. Try to answer every question. If you don't know, or aren't sure, select the answer you think may be right.

1. When people have diabetes, the main food component their bodies cannot use is:

   ___ a. Protein
   ___ b. Carbohydrate
   ___ c. Fat
   ___ d. Vitamins

2. The goal of diabetes treatment is to:

   ___ a. Attain the most normal blood glucose level possible
   ___ b. Achieve optimum weight
   ___ c. Restore insulin production in the pancreas
   ___ d. Prevent ketoacidosis

3. Urine should be tested for ketones when:

   ___ a. You have eaten acid foods
   ___ b. Your urine tests more sugar than usual
   ___ c. Your urine shows trace amounts of sugar

4. The reason for keeping a diabetes record is to:

   ___ a. Monitor renal threshold
   ___ b. Alert you to problems
   ___ c. Keep weight under control
   ___ d. Remind you to test urine

5. The presence of moderate to large amounts of ketones in your urine means that you are burning carbohydrates for energy.

   ___ a. True
   ___ b. False

6. Urine test materials can easily deteriorate before their expiration date.

   ___ a. True
   ___ b. False

Place an "X" to indicate whether each item is associated with hyperglycemia or hypoglycemia as a sign or symptom, as a cause, or as something you can do to prevent or reduce hyperglycemia or hypoglycemia.

Sign or Symptom	Hyperglycemia (high glucose)	Hypoglycemia (low glucose)
7. Sweating	____	____
8. More sugar in urine	____	____
9. Increased urination	____	____
10. Happens quickly	____	____
Causes		
11. Not enough insulin	____	____
12. Less physical activity	____	____
13. Not enough food	____	____
14. Emotional stress	____	____
Activities which Prevent or Reduce		
15. Eating carbohydrates	____	____
16. Exercising	____	____

17. If you take a morning dose of intermediate acting insulin (lente or NPH) you should particularly watch for hypoglycemic (low blood sugar) reactions before supper.

___ a. True
___ b. False

18. If you are on a mixture of insulin (regular [Toronto] and NPH) in the morning and had an insulin reaction about 11 a.m., you should:

___ a. Decrease Toronto insulin
___ b. Decrease NPH insulin
___ c. Decrease morning snack

19. Insulin injection sites should be changed daily to:

___ a. Provide variety and practice in giving injections
___ b. Reduce the likelihood of infection
___ c. Avoid skin problems and uneven insulin absorption
___ d. Distribute the insulin more evenly in the body

20. 1/2 cc (0.5 ml) of U-100 insulin contains:

___ a. 5 units
___ b. 20 units
___ c. 50 units
___ d. 100 units

21. It is important that _____ be distributed among meals and snacks as prescribed in order to balance insulin levels.

___ a. Fats
___ b. Proteins
___ c. Carbohydrates
___ d. Calories

One food in each pair below contains a higher proportion of carbohydrate than the other. Check the food with the higher carbohydrate content.

22. ___ a. Yogurt
___ b. Pork

23. ___ a. Fish
___ b. Onions

24. ___ a. Banana
___ b. Butter

25. ___ a. Sausage
___ b. Pancake

26. ___ a. Butter
___ b. Potato

27. Your meal plan allows you two fruit and vegatable choices for dinner. You could have:

___ a. 1 cup of peas and onions
___ b. 1/2 cup of broccoli
___ c. 1 cup of corn and lima beans
___ d. 1 cup of cooked carrots

28. When someone with diabetes is sick:

___ a. Carbohydrate intake should be sharply restricted
___ b. Foods other than carbohydrates should be increased
___ c. Carbohydrate intake in some form should be continued
___ d. Extra carbohydrate should be added to the diet

Write the letter of the food group in which each of the following foods is found.

29. ___ Navy beans
30. ___ Potato
31. ___ Cottage cheese
32. ___ Avocado
33. ___ Link sausage

A. Fruits and Vegetable
B. Protein
C. Strach
D. Milk
E. Fats and Oils

34. If you are on insulin and you skip breakfast, you should expect your blood glucose to:

___ a. Become lower
___ b. Become higher
___ c. Be dangerously high
___ d. Remain the same

35. When a person with insulin-dependent diabetes occasionally increases play or work activity, he/she most frequently will take:

___ a. The same amount of insulin with additional food
___ b. More insulin with less food
___ c. Less insulin with less food
___ d. More insulin with more food

36. People who are insulin-dependent often have to change their diet or insulin when on vacation.

___ a. True
___ b. False

37. If your feet are cold at night, warm them with:

___ a. Wool socks
___ b. Hot water bottle
___ c. Heating pad
___ d. Rubbing alcohol

38. Damage to small blood vessels in diabetes most often occurs in the:

___ a. Feet and legs
___ b. Lungs
___ c. Eyes and kidneys
___ d. Heart