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UNIVERSITY OF ALBERTA

OUTCOMES
OF A
DIABETES EDUCATION OUTPATIENT PROGRAM

BY

SHIRLEY A. S. NOROSKY-HURL

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE

MASTER OF EDUCATION

IN

ADULT AND HIGHER EDUCATION

DEPARTMENT OF ADULT CAREER AND TECHNOLOGY EDUCATION

EDMONTON ALBERTA

FALL 1991

ISBN 0-315-70159-5

UNIVERSITY OF ALBERTA

RELEASE FORM

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DEGREE FOR WHICH THESIS WAS PRESENTED: Master of Education

YEAR THIS DEGREE GRANTED: 1991

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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 "Outcomes of a Diabetes Education Outpatient Program" submitted by Shirley A. S. Norosky-Hurl in partial fulfillment of the requirements for the degree of Master of Education in Adult and Higher Education.

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Date October 10, 1991

DEDICATION

I dedicate this manuscript to my dear parents, Joseph and Sophie Norosky, and to my cherished children Kirsten, Paul and Kent. Their presence in my life is of tantamount importance and I will always treasure their unconditional love, continued encouragement and unwaivering support.

ABSTRACT

This study was undertaken to examine the outcomes, following the completion of a Diabetes Education Outpatient Program (DEOP), of a selected sample of physician-referred adult diabetics who were experiencing compromised metabolic control.

A Diabetes Education Outpatient Program was defined as a structured plan of participative, learning activities which aimed to influence the learners to make behavioral and lifestyle changes conducive to the maintenance of optimal health.

Metabolic control implied that the diabetic would modify the manifestations of the diabetic disorder, through medically-guided self-management skills and procedures to maintain optimal health.

Data were gathered and compiled from a sample of 30 adult, English-literate diabetics who attended a Diabetes Education Outpatient Program. A hospital-approved Diabetes Mellitus Knowledge Test (DMKT) was administered to determine knowledge bases in three phases of the study and glycosylated hemoglobin blood tests were performed in two phases of the study to assess metabolic control.

The subjects' knowledge base was assessed in the pretest, posttest and followup posttest phases using a hospital-approved Diabetes Mellitus Knowledge Test to collect the data. Data were gathered and examined to assess metabolic control in the preprogram and in the postprogram followup phases of the study.

The findings of this study indicated that there was an improvement in the knowledge base of the subjects immediately following completion of the Diabetes Education Outpatient Program. There was an improvement in the long-term knowledge base of the participants who completed the Diabetes Education Outpatient Program. There was an improvement in the subjects' degree of metabolic control following the Diabetes Education Outpatient Program.

Following analysis of the data the conclusions and recommendations were summarized. Immediately following completion of the Diabetes Education Outpatient Program the participants demonstrated an adequate diabetes knowledge base level. Eight weeks following program completion the subjects of the study had maintained a knowledge base which compared equally with the postprogram diabetes knowledge base results. The participants in the study demonstrated an increase in the postprogram followup knowledge base with a subsequent decrease in the postprogram followup glycosylated hemoglobin blood values. There was a decrease in the glycosylated hemoglobin levels at postprogram followup.

The findings of the study indicated that the diabetes knowledge base of the participants was limited prior to commencing the diabetes education program. The knowledge base of the subjects increased immediately following completion of the education program. The improved knowledge base was maintained eight weeks following program completion. Preprogram and postprogram followup glycosylated hemoglobin measurements indicated reductions in these blood levels.

It may be concluded that increased diabetes knowledge may account for a decrease in glycosylated hemoglobin blood levels. Further research is recommended to determine factors which influence metabolic control of diabetics.

ACKNOWLEDGEMENTS

My sincerest thanks are extended to Dr. D. A. MacKay for his patient understanding, guidance and support throughout this study.

I have also appreciated the participation and support from the other committee members Dr. A. G. Konrad and Dr. D. M. Richards.

I would like to thank all staff members and outpatients for their willing participation in this study.

I would also like to thank Mrs. C. Prokop for compiling and assisting in the analysis of the data.

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SCOPE OF THE PROBLEM

Introduction and Statement of the Problem

Diabetes Mellitus is an incurable disorder which is treated with a regimen of therapeutic interventions and medically-guided self-management techniques that are individualized to meet the specific needs of diabetics. The principle problem experienced by many diabetics in the self-management of diabetes mellitus is lack of knowledge and understanding of the disorder and its subsequent self-management programs. This, inevitably, leads to a compromise in health status and inadequate metabolic control in individuals who have diabetes.

The prescribed therapeutic regimens for diabetics involve the learning of new behaviors and making lifestyle changes to meet their individual needs. A diabetes education program aims to meet these needs of diabetics.

As lack of knowledge and management (Etzwiler,1973) have been identified as a concern in the successful management of diabetes, it would indeed be prudent to gain information from diabetics about their knowledge base of and understanding about diabetes mellitus and the subsequent self-management that is required to maintain their health status. Such information would also be beneficial to facilitate diabetes educational program planning. A major goal of such education programs would be to communicate information to enhance the learning of new self-management behaviors and facilitate the process of making necessary lifestyle changes to maintain adequate metabolic control.

Before an optimal health status can be achieved in individuals with diabetic disorders, there is a need to examine possible influencing factors that can affect metabolic control. Therefore, the purpose of this study was to examine the outcomes of diabetes education

in a group of adults who were receiving treatment for diabetes, as these outcomes corresponded to long-term metabolic control levels.

Subsequent to beginning the study, a research study proposal was submitted to and approved by the Ethics Review Committee at the hospital where the study was conducted. The research proposal was also approved by the Ethics Review Committee in the Department of Adult, Career and Technology at the University of Alberta.

Over a period of four months the potential subjects were contacted on the first day of their attendance at the Diabetes Education Outpatient Program. They were informed that a study was being undertaken to determine if their participation in the education program would affect their metabolic control. A signed and witnessed, informed consent (Appendix I) was obtained from all of the subjects in the study.

All of the subjects were advised of their right to freely withdraw from the study at anytime following its commencement, without any fear of jeopardy to the continuing health care which they required.

The anonymity and confidentiality of the subjects was ensured by using code numbers on the Biographical Data Sheet and on the three Diabetes Mellitus Knowledge Tests. Subsequent to the completion of the final written report of the study, all of the subject lists were destroyed.

Significance of the Study

A Diabetes Education Outpatient Program should strive to meet the knowledge and self-management needs of diabetics. Etzwiler stated that the major problem in the current management of diabetes is "...lack of patient knowledge and understanding of the disease and its management" (1973, 2). Having an adequate knowledge base should enhance the learning and practicing of self-management skills and techniques and, henceforth, reflect optimal health with adequate metabolic control of the diabetic disorder. Measuring and analyzing educational outcomes and metabolic control levels would be valuable to determine if a formal

diabetes education program had an influence on diabetics achieving and maintaining a more favorable level of metabolic control.

Assumptions, Limitations and Delimitations

Assumptions

Following are the assumptions upon which this study is based:

1. The items in the questionnaire are representative of the knowledge base required for self-managed metabolic control.
2. All of the subjects will have answered the questionnaire test items honestly and to the best of their ability.
3. All of the subjects will have maintained or improved their health status in the eight weeks prior to the postprogram followup tests.

Limitations

The findings of this study have the following limitations:

1. The questionnaire used was a non-validated, hospital-approved instrument for data collection.
2. The findings of the study are limited only to the population under investigation, diabetic adults in attendance at a Diabetes Education Outpatient Program in a selected metabolic unit.

Delimitations

The study was delimited by the following:

1. The subjects of the study were physician-referred adult diabetics who were eighteen years of age or older.
2. All of the subjects were literate in the English language.

3. All of the diabetic outpatients who participated in the Diabetes Education Outpatient Program had experienced a compromised health status in the preceding month prior to beginning the Diabetes Education Outpatient Program.
4. The subjects of the study included only diabetic outpatients who completed the Diabetes Education Outpatient Program.
5. The subjects selected for participation in the study were delimited to those who consented to participate in all three phases of the study.

Research Questions

The research questions for this study were:

1. What is the knowledge base of diabetics immediately upon completion of a Diabetes Education Outpatient Program?
2. What is the long-term knowledge base of diabetics upon completion of a Diabetes Education Outpatient Program?
3. Do diabetics achieve improved metabolic control in the long-term following the completion of a Diabetes Education Outpatient Program?

Hypotheses

The following hypotheses were formulated:

1. There is an increase in the immediate knowledge base of diabetics who have completed a Diabetes Education Outpatient Program.
2. There is an increase in the long-term knowledge base of diabetics who have completed a Diabetes Education Outpatient Program.
3. There is a decrease in the glycosylated hemoglobin blood levels of diabetics who have completed a Diabetes Education Outpatient Program.

Evaluative Framework

This was an evaluative study which was completed to examine the short-term and long-term knowledge base outcomes and metabolic control effects upon completion, by selected diabetics, of a Diabetes Education Outpatient Program. The Countenance Model of Educational Evaluation (Stake, 1967) was used as the conceptual framework to guide the evaluative process.

Stake suggests that a specific rationale guides the design of an educational program. He also indicates that there are two primary concepts in the Countenance Model that distinguish between descriptive and judgmental acts involved during evaluation. He reinforces the importance of the three phases of an educational program, i.e. its antecedent, transaction and outcome phases. These phases are integral components in each of the six cells in the descriptive and in the judgment matrices. The description matrix is divided into two subsections intents and observations, while standards and judgments are the two subsections of the judgment matrix (1967).

Selected components of this conceptual framework were applied to evaluate the identified Diabetes Education Outpatient Program. The following overview summarizes the components of the evaluation model and it provides the *rationale* for the design of the program, illustrates the distinction between the *description* and the *judgment* matrices and provides examples of the *antecedent, transaction* and *outcome* phases of evaluation of the Diabetes Education Outpatient Program. Antecedents refer to conditions that exist prior to instruction which may relate to outcomes. Transactions include the activities that constitute the process of instruction. Outcomes are considered to be the effects of the instructional program. The *intents* and *observation* components of the description matrix identify that which was intended by the former and that which was actually observed in the latter component. The *standards* component refers to the standards used in reaching judgments and *judgment* components of the judgment matrix identify the actual judgments themselves.

The various dimensions of Stake's evaluation model are illustrated in the following description.

Rationale

The primary goal of the Diabetes Education Outpatient Program was to emphasize the importance of understanding the basic pathophysiology underlying the diabetic disorder. This knowledge base is of primary importance to enable the diabetic to understand the importance and necessity of daily routine practices of self-care to achieve and maintain adequate metabolic control.

Description Matrix

Intents

Antecedents - Outpatients know that classes begin on Monday for four consecutive days.

Transactions - The educational coordinator oversees the preparation of audio-visual aids, blood testing procedures, discussions, practice sessions and integration of mealtimes for the duration of the instructional program.

Outcomes - On the last day of instruction, the educational coordinator estimates an achievement level by the outpatients on a written test (for example, 65 percent).

Observations

Antecedents - All outpatients were present for all of the classes.

Transactions - The blood testing procedure and assigned meal times took so long there was little time for discussions. The outpatients appeared tired by lunchtime and were somewhat inattentive and less participative in the afternoons.

Outcomes- The test results at the end of the education program were much lower than expected.

Judgment Matrix

Standards

Antecedents - It is expected the outpatients may not be able to tolerate full days of instruction.

Transactions - The educational coordinator believes the activities during classes are clear enough for 80 percent of the outpatients to understand them.

Outcomes - Fellow educators (i.e. dietitian, physician, social worker, pharmacist) believe three-fourths of the outpatients should do well on this type of test.

Judgments

Antecedents - The educational coordinator retrospectively supposes the length of each day's activities should be shortened.

Transactions - The outpatients told the educational coordinator the instructional activities were helpful but the varied sessions made each day too long.

Outcomes - The staff member assigned to grade the test papers said too many students performed poorly on the test.

The variables in Stake's evaluation model were used as a guide to plan the evaluation of this education program. The study evaluated the outcomes of the knowledge base of the outpatients participating in the education program and the effects of the program on metabolic control.

Definition of Terms

For clarification purposes the following terms used in this study have been defined:

Diabetes Mellitus

Diabetes Mellitus is a chronic, multi-system disorder, characterized by a carbohydrate dysfunction which subsequently influences fat and protein metabolism, and if uncontrolled the disorder causes various acute and long-term complications (Brunner and Suddarth, 1988 and Phipps, Long and Woods, 1987).

Metabolic Control

Metabolic control indicates the degree to which a diabetic disorder is regulated. Specific blood testing i.e. glycosylated hemoglobin blood tests, were performed and the results were analyzed to determine the amount of metabolic control achieved in a given time frame.

Educational Outpatient Program

An educational outpatient program is a structured plan of relevant learning activities (Squyres, 1980) designed to be communicated to a designated population for the purposes of sharing significant information to facilitate the maintainance of optimal health.

Abbreviations

DEOP is the abbreviation used for the Diabetes Education Outpatient Program.

DMKT is the abbreviation used for the Diabetes Mellitus Knowledge Test.

HgbA1C is the abbreviation used for the glycosylated hemoglobin blood test.

Design of the Study

An overview of the design of the study describes the sample of the population, data collection procedures and the methods of data analysis.

Sample

Subjects were selected from the general population of diabetic outpatients attending a Diabetes Education Outpatient Program in a metabolic unit in a selected hospital during a specific four month period of time. All subjects were physician-referred diabetics who were

experiencing unstable metabolic control in the month preceding the Diabetes Education Outpatient Program which they attended.

Methodology

A number-coded Diabetes Mellitus Knowledge Test was given to each subject to assess their knowledge base about diabetes prior to beginning the Diabetes Education Outpatient Program.

A number-coded, glycosylated hemoglobin blood test was performed with each subject prior to beginning the Diabetes Education Outpatient Program.

Upon completion of the Diabetes Education Outpatient Program each of the subjects repeated the same number-coded Diabetes Mellitus Knowledge Test, which was administered before the program commenced, to determine their individual postprogram knowledge bases.

Eight weeks following completion of the Diabetes Education Outpatient Program a second number-coded glycosylated hemoglobin blood test was performed with each subject.

The same Diabetes Mellitus Knowledge Test was administered to the subjects a third time to examine followup knowledge bases eight weeks after program completion.

Analysis of the Data

The scores of the pretest, posttest and followup posttest for each subject were analyzed to determine if similar patterns of responses prevailed among the subjects, and by establishing if the scores of each subject's knowledge test had changed with each subsequent testing . The individual values obtained in the two glycosylated hemoglobin blood tests were examined to determine whether common shifts in the blood values of the subjects had occurred.

CHAPTER II

LITERATURE REVIEW

Introduction

A review of the related literature and research studies is presented in this chapter. This included information related to adult health education, patient knowledge of diabetes mellitus related to self-care, and metabolic control in diabetics as it was assessed by glycosylated hemoglobin measurement.

Health Education for Adults

Adult education is defined as any organized and sustained effort to facilitate learning, especially in a way that enhances the adult's capacity to function as a self-directed learner (Mezirow, 1978; Brundage and Mackeracher, 1980). The philosophical beliefs of adult education imply that it is a lifelong process; it is for the individual's benefit and personal growth; and it contributes to a healthy society. Many adult education programs exist to assist persons with health problems (Barbaro and Noyes, 1984; Leviton and Santa Maria, 1979). Still other programs focus on general health and self-care.

Adult health education is "...a combination of learning opportunities that result in new knowledge and understanding with a positive behavioral change for an optimal state of wellness" (Dudley, 1989, 154). This implies that once an adult's perspective has changed a desired behavior change is likely to occur with a subsequent resolution of a problem. For individuals with diabetes Kinson and Nattrass support the notion "...that education and self-management are essential for survival" (1984, 172). In terms of long-term behavior changes following completion of a diabetes education program, the diabetic may be more self-confident, practice a healthier lifestyle, experience an increased sense of well-being, and have minimal episodes of chronic complications.

Knowles has championed the concept of andragogy since the mid -1960s as opposed to the theory of youth learning known as pedagogy. He indicates there is increasing evidence that the use of andragogical theory is influencing the design of adult education, the preparation of adult educators, and in the way adults are being helped to learn (1973). Knowles (1980, 57-58) subscribes to the following "...principles of teaching..." as being conducive to growth and development of adult learners:

1. Expose the learners to new possibilities for self-fulfillment.
2. Assist the learners to clarify their own aspirations for improved behavior.
3. Facilitate in the diagnosis of the gap between the learners' aspirations and the current state of their affairs.
4. Help to identify life problems they experience due to their personal circumstance.
5. Provide comfortable physical conditions (seating, room temperature, parking) that are conducive to direct interaction (unobstucted views of the instructor and audo-visual aids) between the learner and the instructor.
6. Accept each learner as a person of worth and respect each one's feelings and ideas.
7. Build relationships of mutual trust and helpfulness with the learners by encouraging cooperativeness and minimizing competitiveness and judgmentalness.
8. Practice self-disclosure and contribute as a co-learner in the spirit of mutual inquiry.
9. Involve the learners in a mutual process of formulating learning objectives which consider the needs of the learners, instructor, institution, and society.
10. Support mutual sharing of ideas related to learning experiences, selection of materials and strategies, and encourage joint decision-making.
11. Help the learners to organize learning activities and to share responsibility in the process of mutual inquiry.
12. Assist the learners to exploit their own experiences as resources for learning through a variety of strategies.
13. Gear presentations to the levels of experience of the specific learners.

14. Assist in the integration of new learning with the learners' experiences.

15. Involve the learners in the evaluative process.

16. Promote learner self-evaluation.

Teaching and learning are integral components of adult education. The definition of adult learning "...includes both the process which adults experience as they change or enrich their knowledge, values, skills, strategies and behaviors, and the subsequent resulting knowledge, values, skills, strategies and behaviors possessed by each individual" (Brundage and Mackeracher, 1980, 5). Adults seek learning opportunities that are highly practical and applicable, very meaningful, and relate to their personal and professional growth and development (Moore and Waldron, 1981). The following summary of "... adult learning principles..." (Brundage and Mackeracher, 1980, 97-116) have general implications for planning and facilitating adult education programs:

1. Adult behavior changes in response to internal and external pressures.

2. Adults enter learning activities with a developed self-concept and self-esteem which are based on past experiences.

3. Adult learners have past experience that is stored in memory, is organized according to individualized strategies and is assigned individualized meanings and values.

4. Past experiences are integrated with their self-concept and self-esteem. It is necessary to recognize when this is helpful or a hindrance.

5. Past experience if applied directly to current experience facilitates learning.

6. Past experiences get increasingly more important as the adult grows older.

7. Adult learners with a positive self-concept and a high self-esteem are more responsive to learning and less threatened by the learning environment and the change process.

8. Past experience that is attached to the role of the learner and the resulting meanings, values, skills and strategies is the most essential component of the self-concept relevant to learning.

9. New learning can temporarily destabilize adult learners.

10. Adult learners have immediate and personal needs, problems, feelings, hopes and expectations which must be recognized and respected.
11. Adults are highly motivated to learn in areas relevant to their current developmental tasks, social roles, life crises and transition periods.
12. If adults have problems the solutions must come from their own personal values and expectations, must be implemented through their personal resources and skills, be congruent with their personal meanings, strategies and life-style.
13. Adults must participate in activities that use relevant skills and strategies.
14. Adult learning focuses on transforming the meanings, values, strategies and skills derived from past experiences.
15. The motives or felt needs of adult learners relate to unmet needs and/or to the pursuit of positive change.
16. Volunteer entry into a program in pursuit of positive personal goals reduces adult learner anxiety.
17. Feedback is essential so that the adult learner can modify his behavior in an ongoing way.
18. Experiencing success in meeting needs and reaching established objectives reinforces changes achieved and motivates additional learning.
19. Learning involves arousal of and energy deployment from the adult learner.
20. Various stressors illicit varying overt behaviors in adult learners.
21. Self-paced learning facilitates effective learning.
22. Adult learners often have family and work responsibilities and resent having their "time wasted".
23. Adults learn most effectively when they feel healthy, are well rested and are not stressed.
24. Adults learn best when they have optimal vision and hearing capabilities.

25. The mental ability of adults generally declines slightly after 50 years of age. However, they do well with learning which requires reasoning and past experiences.
26. Adult learners have individualistic learning and cognitive styles.
27. Adults utilize varying components of cognitive development.
28. Cognitive style theorists suggest two successful matches between instructors and adult learners; the teacher and learner using similar styles, and the teacher being one level higher than the adult learner.
29. Adult learners select learning programs which best enhance their individual learning and cognitive styles.
30. Cognitive and learning styles are independent of mental ability.
31. Provide assistance for adult learners to acquire prerequisites or adjust activities to accommodate deficits in education programs.
32. Adults experience developmental changes over their lifetime.
33. Learning activities are cyclical, sequential and unidirectional. Adults prefer to avoid stressful and anxiety-provoking activities.
34. When teachers and adult learners interact their behaviors affect and modify each other.
35. Adult learning focuses on learning for autonomous mastery of one's life and for belonging to and participating in groups.
36. Adult learners may utilize a variety of cognitive strategies.

Such a comprehensive listing of principles of adult learning suggests a profound responsibility for the planners, implementors and evaluators of adult health education opportunities. Such conscientiousness would serve to enhance adult learner achievement.

Unique perspectives of adult learning are important for application in adult health education. The field of adult education focuses on adult developmental tasks and on natural patterns of learning in this group of learners. Bloom (1961) theorized that active learning

involves changes in what one knows and understands (cognitive behaviors), what one wants to do (affective behaviors) and/or what one actually does (psychomotor behaviors).

A basic premise in the field of diabetes education is that education aims to improve clinical control and thereby decrease the risk of serious complications. A clear understanding of the disease process, the importance of consistently performing the necessary daily self-care activities, and practicing health-enhancing lifestyle changes is vital for the optimal well-being of people with diabetes. A lack of adequate management can result in repeated crises, restricted activities, damaging psychological effects and a higher risk of chronic complications and death.

Many teaching-learning strategies exist that strive to facilitate the learning process. To provide optimal diabetes care Sanson-Fisher, Campbell, Redman & Hennrikus (1989, 135-138) summarized the following "...adherence- aiding strategies...":

1. Involve the patient in the negotiation of treatment goals. This promotes a sense of commitment by the patient to the program.

2. Reduce the complexity of the treatment regimen. Implementation of a graduated regimen is less likely to overwhelm the patient. For example, introduce medication and urine monitoring first. Then introduce dietary behavior changes, the wearing of specific identification, smoking cessation, exercise and a routine for visiting medical specialists.

3. Tailor the treatment to the patient's lifestyle. Perhaps only two meals a day are eaten.

4. Utilize reminders. Place stickers, colorful food charts, medication calendars, and all urine testing equipment in appropriate and obvious places.

5. Elicit family support by promoting reinforcement of positive changes such as weight loss and the initiation of active exercise.

6. Inform patients about side-effects related to treatment and subsequent measures to manage them. For instance, there may be evidence of puckered skin at an insulin injection site. Therefore, reinforce the importance of consistently rotating injection sites.

7. Monitor adherence. This should be performed regularly and randomly as is warranted. For example, observe urine testing and injection techniques for accuracy, and /or observe the relationship of food planning and exercise and note subsequent weight loss.

8. Provide feedback to the patient by reinforcing appropriate behavior change. Expect relapses but have strategies to deal with them.

Kensole stated that "...effective management of diabetes requires the active participation of the patient in his own care" (1981). When the well-educated diabetic applies knowledge and understanding of the disorder in everyday self-care, the effects of diabetes can usually be regulated well enough for the individual to lead an active and satisfying life.

Down (1990) identified a year-long study which revealed that the diabetes control of overweight, Type II group participants, using HgbAIC and body weight as two measures, was significantly better four weeks postprogram than it had been prior to diabetes education. It could be concluded that maintaining a high degree of control may delay or prevent problems related to vascular complications.

It is generally accepted that patient education is vitally important in the clinical management of diabetics. Graber, Christman, Alogna and Davidson reinforced the need for diabetics to have a firm understanding of diabetes mellitus. This includes "...knowledge about the pathophysiology of diabetes and a variety of necessary self-care techniques, skills and procedures" (1977, 61-64). This implies that education and diabetic self-care are inseparable. All diabetes education programs provide information to the patients, but the educational systems vary from provision of knowledge only without continuing care to the inclusion of education in conjunction with comprehensive ongoing clinical care.

Etzwiler (1973) and his associates conducted a study at the Diabetes Education Center in Minneapolis, Minnesota which showed that patients' scores on questionnaires improved significantly following a five-day education program in diabetes self-management. A postprogram followup quiz indicated the improvement of knowledge was retained. However, there was no improvement in metabolic control in these patients.

When Dr. Elliott P. Joslin began his work with diabetes in 1897 in Boston, Massachusetts, his medical practice began from his own home with the majority of his teaching centered on dietary management of diabetes. Once insulin was discovered in 1921, he expanded the content of his teaching to include insulin therapy in conjunction with required daily self-care activities which have a bearing on the diabetic's state of wellness. His teachings were the fore-runners of present day education programs for diabetics (Stevens, 1981). It remains, however, that the essential purpose of health education for diabetics is to reinforce those ideas and skills that will help them to cope with their immediate medical problems, maintain optimal health and avoid complications.

Diabetes Mellitus

Diabetes mellitus is defined as a "...complex, chronic disorder characterized by disruption of normal carbohydrate, fat and protein metabolism and with the development of widespread microvascular and macrovascular complications and neuropathies" (Phipps, Long & Woods, 1987, 601). The outcome of this major health problem almost entirely depends on the patient's self-management of the disorder.

Approximately 1 out of 20 Canadians has diabetes (Radak, 1990). Of the two classifications of diabetes mellitus, 10 to 15 percent of the diabetic population have Type I or insulin-dependent diabetes mellitus (IDDM). The remaining 85-90 percent of people with diabetes have Type II or non-insulin-dependent diabetes mellitus (NIDDM) (Canadian Diabetes Association, 1990). An elevated blood sugar is the common trait found in both Type I and Type II diabetics. This factor predisposes the diabetic to potential acute and chronic complications if left untreated.

In order to understand the need for and the nature of treatment, the diabetic "...needs to know about the disease process itself...and how to manage his disease" (Williams, 1981, 4-5). Brown concurred by stating that "...safe and accurate management must be based on ...an understanding of the disease process" (1987, 11). An understanding of the disease process provides answers to questions such as: What is diabetes? What causes diabetes? What are the

chronic aspects of the disease? What does adequate metabolic control mean? What problems may develop and why? What kinds of measures prevent or resolve problems? The diabetic also needs to know about diet, physical activity, medications as required, urine testing, skin and foot care, personal safety measures, the importance of continuing care and how to manage when problems or emergencies arise.

Numerous studies have been carried out in which tests of knowledge about diabetes have been administered to diabetics. Many of the results indicate large gaps in knowledge about

diabetes and its management. Of the adult patients tested in university clinics in three North Carolina settings only 33 percent achieved a passing grade in terms of knowledge acquisition. This study and others have shown similar findings (Etzwiler, D. D., Tyrell, M., Ulrich, M., Wright, J., & Hirsch, A. 1972; Miller et al, 1978).

The second aspect of treatment of diabetes is related to the diabetic's knowledge about self-managing the disorder. Studies have been conducted by observing the diabetic's performance of recommended therapeutic measures to determine adequacy of self-care measures (Williams et al, 1967; Watkins and Moss, 1969). The findings indicated that less than 10 percent of the diabetics carried out a minimally adequate regimen in all aspects of day-to-day management of their diabetes.

In approaching the treatment of diabetes until it can be cured, complications will be the major problem confronting the diabetic. Increasingly it appears that some, or all, of the complications are related to poor metabolic control as previously documented. Therefore, good control may reduce the risk of complications. The diabetic can do much to prevent them from progressing and even if they occur, many of the complications are treatable.

Glycosylated Hemoglobin Measurements

Glycosylated hemoglobin (HgbA1C) blood test values have been used routinely over the last 10 to 12 years as clinical indicators of long-term (four to six weeks) control of diabetes

(Gonen, Rubenstein, Rochman, Tanega & Horwitz, 1977; Gabbey, Hasty, Breslow, Ellison, Bunn & Gallop, 1977; MacDonald and Davis, 1979; Gorman, 1988; Koenig, Peterson, Jones, Saudek, Lehrman & Cerami, 1976). These measurements provide a tool with which to determine the overall degree of metabolic control in a retrospective sense in diabetics. The normal glycosylated hemoglobin range of values is between four and six percent (Gorman, 1988) or in current terminology, 0.039 and 0.074. Gorman states that " the Canadian Diabetes Association in alliance with many other organizations around the world strongly supports the philosophy of the importance of excellent control as a goal in diabetes management" (1988, 28).

In a study conducted by Jackson, Hess and England they suggested that glycosylated hemoglobin blood levels change at a slow rate so that a single measurement is believed to reflect the overall degree of control achieved by a diabetic for about the previous two months. If diabetic control declines glycosylated hemoglobin blood levels progressively increase (1979).

Between 1978 and 1982 a study was conducted to determine the effects of patient and physician education. The study described a diabetes education program and its effects on patient knowledge, skills, self-care behaviors and relevant physiologic outcomes. The sample consisted of 275 predominantly elderly, black women with diabetes of long duration. Despite the requirement that patients demonstrate mastery of educational objectives, the postintervention assessment 11-14 months after instruction showed only rare differences between the experimental and control patients in diabetic knowledge. However, statistically significant group differences in self-care skills and compliance behaviors were evident with significantly greater reductions in glycosylated hemoglobin (-0.43% verus +0.35%, p, >.05) levels as compared with the control subjects (Mazzuca, Moorman, Wheeler, Norton, Fineberg, Vinicor, Cohen & Clark, 1986). In an earlier study conducted by Mazzuca he found that behaviorally oriented patient education was highly influential on self-management of diabetes with effective metabolic control (1982).

Following their study McDonald and Davis concluded that "...the measurement of glycosylated hemoglobins appears to be of value in the assessment of long-term glucose control

in diabetics" (1979, 285). They considered the use of glycosylated hemoglobin to be well established as an aid in monitoring diabetic control. The authors also explored the possible application and potential value of using glycosylated hemoglobin measurement to predict complications of diabetes.

Miller, Goldstein and Nicolaisen completed a study in 1978. It entailed interviews with 84 diabetics. Of the 65 percent who had some formal educational program in diabetic self-care, 49 percent failed to demonstrate adequate self-care knowledge or skills in any of the areas tested; insulin administration, urine testing, diet, foot care, and management of hypoglycemia and hyperglycemia. The percentage passing in each specific area varied from a low of 15 percent (foot care) to a high of 50 percent (urine testing).

Berger reported about the Diabetes Education Study Group that was established in Europe in 1979. He studied 78 patients in Dusseldorf and Vienna to measure an education program in terms of glycosylated hemoglobin values, frequency of hypoglycemic episodes, incidence of complications, hospital admissions and sick days, knowledge questionnaire results and compliance. The results showed a substantial long-term improvement of metabolic control and a subsequent reduction of hospital admissions (1984). Many variables affect the learner outcomes of a health-related education program. In 1989 French, Wittman and Gallagher stated that "...hospital readmission rates are not an accurate measurement or that meaningful a data on the effectiveness of the educational program." (185).

Williams found that while knowledge of diabetes correlated positively with performance related to self-care, there was a negative correlation between degree of control and knowledge (1967).

A study was conducted by Karlander and Kindstedt in 1983, whereby 83 outpatients participated. Diabetes knowledge test scores in the postprogram followup phase one year following program completion had improved. Metabolic control, however, was essentially unchanged at followup.

A longtitudinal study by Pirart was conducted in 1978 in Brussels. Four thousand four hundred diabetic patients were involved in the 25 year study. A significant correlation between the degree of diabetic control and the prevention of degenerative complications was established. He suggests that duration and intensity of glycemic control of diabetes determine the risk of degenerative complications.

A study was conducted in Washington State to evaluate a model program of education on diabetes mellitus for diabetic outpatients. The 16-hours of education included all aspects of self-care, with an emphasis on the prevention of unnecessary morbidity from poor control of the disease or from infection. The sample population consisted of diabetics who averaged 55 years of age, had diabetes for more than seven years and 87 percent of the participants had no formal diabetes education previously. Participants were evaluated just before and three months after the education program. Significant improvements were made in their knowledge of diabetes and in their attitudes towards diabetes and the development of skills in self-management. Their HgbA1C levels were significantly lower at the three-month followup (Paulozzi, Norman, McMahon & Connell, 1984). One can conclude that outpatient education may enhance the performance of self-care skills resulting in a significant improvement in metabolic control.

In summary, the literature revealed that the concentration of glycosylated hemoglobin has been found to be elevated in patients with uncontrolled diabetes, and glycosylated hemoglobin levels change at a slow rate . Thus a single measurement is believed to reflect the overall degree of metabolic control achieved by a patient for about the previous two months (Jackson, Hess and England, 1979). Gorman believes that routine glycosylated hemoglobin examinations should be part of the assessment of diabetes control in patients (1988). It may be concluded that effective medical and self-care therapeutic management of diabetes may result in favorable metabolic control.

CHAPTER III

RESEARCH DESIGN AND METHODOLOGY

Introduction

The research methodolgy used in the study is presented in this chapter. Included are descriptions of the design of the study, the educational program and the sample of the population. The data collection instruments are set forth and the data analysis procedures are also presented.

Design of the Study

One intact group of outpatients were the subjects of this study to determine if metabolic control improved following participation in a Diabetes Education Outpatient Program (DEOP). French, Wittman and Gallagher (1989) stated that "we are ethically bound to provide educational information to all patients, so using control groups to compare educational outcomes is probably not appropriate in the health care setting". The subjects had a glycosylated hemoglobin blood test (HgbA1C) performed before beginning the program. They also completed a Diabetes Mellitus Knowledge Test (DMKT) before commencing the program. The same knowledge test was administered again on the last day of the program. Eight weeks following completion of the program the glycosylated hemoglobin blood tests were performed a second time and the subjects completed the knowledge test a third time.

Setting

The study was conducted in the metabolic unit of a 600 - bed teaching health care facility. Active treatment is provided at the facility for individuals who present with a variety of acute and chronic health care needs.

Description of the Education Program

The diabetes education program is offered on a weekly basis to diabetics who have been referred to the program by their physicians. Significant others are encouraged to accompany the diabetics during their attendance at the program. The program focuses on the presentation of information about the pathophysiology of diabetes mellitus, it identifies the manifestations related to the diabetic disorder, and facilitates the assimilation of self-management skills. Having an adequate knowledge base serves to enhance the learning and practicing of self-management skills to achieve and maintain metabolic control of the diabetic condition. A team of health care workers administers the program and participates in the clinical management of the outpatients. However, regulation of each outpatient's therapeutic regimen is the physician's responsibility. The staff is comprised of a physician who is the director of the metabolic unit and two registered nurses. One nurse coordinates the educational program and participates in instructional activities; the second nurse is a resource person but works primarily with diabetic inpatients. A registered dietitian provides instruction related to nutritional management in the therapeutic regimen. Support services are provided by a laboratory technologist and by the metabolic unit secretary. A pharmacist and a social worker participate as consultants in the educational program.

The outpatients who attend the educational program reside within a 50 mile radius of the health care facility. Due to limited physical space in the metabolic unit a maximum of nine outpatients may attend the weekly sessions. The program is conducted throughout each year, except for a two-week closure in December.

The program is administered Monday to Thursday commencing at 0730 hours and ending at 1500 hours each day. Program activities include attending lectures, participating in discussions, viewing videos, and reviewing graphic charts. Under the supervision of a nurse the outpatients sample blood and urine specimens and administer required medications. They plan snacks and meals with the guidance of the dietitian and are present for two meals and snacks

daily during the program. Appendix 2 includes a comprehensive outline of the Diabetes Education Outpatient Program.

Sample of the Population

The sample selected for this study was comprised of 30 diabetic outpatients who were referred by their physicians to attend a diabetic education program. The subjects participated in the program in February and March of 1989 with subsequent followups at the metabolic unit eight weeks following completion of their education program.

The selection of subjects was limited to the following criteria: Each subject was an English-literate adult (18 years of age or older) who willingly consented to participate in the study. Additional descriptive data of the sample were collected and appear in Appendix 3.

Methods of Data Collection

The instrument which was used to collect data to assess knowledge base acquisition in the short-term and knowledge retention in the long-term was a non-validated hospital-approved questionnaire. The questionnaire was revised and previously used by the metabolic unit staff members for testing knowledge base acquisition of outpatients who had completed the education program.

The Diabetes Mellitus Knowledge Test, which appears in Appendix 4, was developed by the teaching staff who designed the education program in the metabolic unit. The Biographical Data Form identified specific criteria which were common to all of the subjects. The glycosylated hemoglobin blood tests are standard glucose measurement tests conducted at the health care facility.

The Biographical Data Form was compiled to collect information that could influence the subjects' knowledge base about diabetes and the subsequent metabolic control of the diabetic disorder. This criteria included the subjects' gender, age, occupational representation, family history of diabetes, type of diabetes, number of years since being diagnosed as diabetics,

weight, smoking status, exercise status, and previous diabetes education participation. The specific information was used to develop a composite of the participating subjects in the study.

The Diabetes Mellitus Knowledge Test is a 51-item knowledge test, which was developed at the metabolic unit where the program is implemented, to measure knowledge acquisition following completion of the Diabetes Education Outpatient Program. The Diabetes Mellitus Knowledge Test has been administered since 1982 to the outpatients who attend the program. An examination of previous knowledge test answers supplied information related to the patients' short-term knowledge acquisition, provided insights into program effectiveness and was used as a basis for previous program revisions.

The glycosylated hemoglobin blood test is a standard procedure which is used to determine blood glucose values on a long-term basis. The test results reflect the degree of metabolic control over a minimum time frame of two months (Jackson, Hess and England, 1979).

Analysis of the Data

The sample of the population was comprised of 30 subjects. The questionnaire used to collect knowledge base data was a hospital-approved but non-validated instrument. Therefore procedures for statistical analyses were limited because of these two limitations.

The three Diabetes Mellitus Knowledge Tests were number-coded and administered to the subjects. The tests were marked and the scores of the pretest, posttest and followup posttest were analyzed using the Statistical Package for the Social Sciences (SPSS-X) 1983. The test scores were scrutinized for changes between the first, second and third scores.

The glycosylated hemoglobin blood tests were administered in the preprogram and in the postprogram followup phases of the study. The results were analyzed and compared to identify if a change had occurred in the level of metabolic control.

To assess the impact of educational interventions with diabetic individuals, the information obtained from the various data collecting procedures was organized and presented in a comparative manner.

Descriptive statistics included minimum and maximum values, means and standard deviations and were computed for the following variables; age, number of years since being diagnosed a diabetics and weight. These scores were also calculated for knowledge test scores on the pretests, posttests and followup posttests and for the glycosylated hemoglobin blood test results.

Frequency counts and percentage distributions were calculated for the indicated factors; gender, age, occupational representation, family history of diabetes, type of diabetes, number of years since being diagnosed with diabetes, weight status, smoking status, exercise status and previous diabetes education program participation. Frequency counts and percentages were also appraised for the scores of the three knowledge tests.

Summary

A Diabetes Mellitus Knowledge Test, designed in the form of a questionnaire, was distributed to 30 male and female outpatients who actively participated in a diabetes education program. Three procedures were used to collect the data for analysis. Data collection was completed by the investigator. A Biographical Data Form detailed variables that could influence knowledge acquisition and subsequent self-management for adequate metabolic control. All of the outpatients completed the Diabetes Education Outpatient Program. While all of the outpatients completed the preprogram and the postprogram knowledge tests, only 25 outpatients completed the postprogram followup knowledge test.

All of the outpatients had a glycosylated hemoglobin blood test performed in the preprogram phase of the study. However, only the previously referred to 25 outpatients had a postprogram followup glycosylated hemoglobin blood test completed. A variety of descriptive statistical analyses were performed to examine and compare the outcomes of the knowledge tests and the glycosylated hemoglobin blood tests.

CHAPTER IV

RESULTS AND DISCUSSION

Introduction

The findings of the study are reported in Chapter IV. Characteristics of the sample are presented and the data to test the hypotheses are examined. Information gathered from the Biographical Data Form, from the Diabetes Mellitus Knowledge Test administered in phases one, two and three of the study, and the administration of the glycosylated hemoglobin blood tests in phases one and three of the study was used to test the hypotheses. Finally, a discussion of the findings addressed the stated research questions.

Attributes of the Sample

The convenience sample of the population that participated in the study met the delimitation criteria identified in Chapter I. A total of 37 outpatients attended the Diabetes Education Outpatient Program during the period of time when data collection was in progress. Seven of the attendees at the Diabetes Education Outpatient Program were ineligible for participation in the study. Four outpatients dropped out of the program after only one day of attendance. Of these four outpatients three encountered transportation difficulties and could not continue to attend the program and one outpatient had unexpected work-related responsibilities which necessitated out of town travel during his period of program attendance. One outpatient became ill on the third day of the program and was unable to complete it, and two outpatients were under eighteen years of age. Five of the participants in the study were unavailable to complete the postprogram followup knowledge test, and did not have a repeat testing of the glycosylated hemoglobin blood levels. Collection of data was completed in June, 1989. The response rates of the participants in the study, in each of the three phases of the Diabetes Mellitus Knowledge Test are illustrated in Table 1. Table 2 depicts the response rates

of the subjects during the testing of glycosylated hemoglobin blood values in each of the two identified phases.

Table 1

Response Rate of the Study Sample in Each Phase of the Diabetes Mellitus Knowledge Tests

n=30

Phase of the Study	Number of Respondents	Percentage (%)
I Preprogram Pretest	30	100.0
II Postprogram Posttest	30	100.0
III Postprogram Followup Posttest	25	83.3

Table 2

Response Rate of the Study Sample in Each Phase of the Glycosylated Hemoglobin Blood Tests

n=30

Phase of the Study	Number of Respondents	Percentage (%)
I Preprogram Pretest	30	100
II Postprogram Followup	25	83.3

Biographical Data

The characteristics of the respondents, as elicited on the Biographical Data Form are summarized in the following presentation. Table 3 depicts the frequency and percentage distribution of the participants' gender, age, occupational representation, family history of diabetes, type of diabetes, number of years since being diagnosed, weight, smoking status, exercise status and previous diabetes education program participation.

Gender

It was found that 16 (53.3%) of the participants were female and 14 (46.7%) were male. This finding is in keeping with data from Statistics Canada (1985) which indicates that diabetes is more common in females (60.8%) than in males (39.2%).

Age

The age range of the sample population was from 18 to 75 years of age. The mean age of the sample was 50.2 years of age.

Occupational Representation

The current occupational status of the participants was determined from the patient profile data form on the outpatients' charts. Nine (30%) of the participants were employed in the service industry, seven (23.3%) were retired, six (20%) were identified as homemakers, and four (13.3%) were employed in labour-related occupations. Three (10%) were employed in professional occupations and one (3.3%) worked in the health care field.

Family History of Diabetes

Of the total number of participants 21 (70%) indicated a previous family history of diabetes and nine (30%) stated there was no previous history of diabetes in their families.

Type of Diabetes

In the study five (16.7%) of the participants were diagnosed with Type I or Insulin Dependent Diabetes Mellitus. Twenty-five (83.3%) of the outpatients were diagnosed to have Type II or Non-Insulin Dependent Diabetes Mellitus. The incidence of Type II diabetes is more prevelant in individuals who present with a personal profile of being female and are over 45 years of age (Chiasson, Hunt, Hepworth, Ross, Tan & Zinman, 1985) and are at least 10% overweight (Luckman and Sorensen, 1987 and Burke, 1981).

Number of Years Since Diagnosed

Of the 30 participants in the study 13 (43.3%) subjects had received their diagnosis of diabetes within the past year. Six (20%) of the subjects were diabetics between one and four years. Three (10%) participants were diagnosed between five and ten years ago, three (10%) between 11 and 15 years ago, and 2 (6.7%) were diagnosed between 16 and 20 years ago. Three (10%) participants were diagnosed between 21 and 25 years ago. The mean in terms of number of years since being diagnosed as diabetic in the sample was 6.3 years.

Weight Status

The mean weight of the study sample was 85.37 kilograms with a range between 53 and 145 kilograms. Maintaining recommended body weight is related to a number of positive health outcomes (Palmore, 1986).

Table 3

Biographical Data of the Sample

n=30

Data	Frequency	Percentage (%)
Gender		
Female	16	53.3
Male	14	46.7
Age		
18-24 years	1	3.3
25-34 years	4	13.3
35-44 years	7	23.3
45-54 years	5	16.7
55-64 years	6	20.0
65-74 years	6	20.0
75-84 years	1	3.3
Range	57.00	
Mean	50.20	
Standard deviation	14.28	
Occupational Representation		
Professional Status	3	10.00
Service Industry	9	30.00
Health Care Services	1	3.33
Homemaker	6	20.00
Labor Industry	4	13.33
Retired	7	23.33

Table 3 cont'd.

Data	Frequency	Percentage (%)
Family History of Diabetes		
Yes	21	70.00
No	9	30.00
Type of Diabetes		
Type I	5	16.67
Type II	25	83.33
Number of Years Since Diagnosed		
0-1 year	13	43.33
1-4 years	6	20.00
5-10 years	3	10.00
11-15 years	3	10.00
16-20 years	2	6.67
21-25 years	3	10.00
Range	.08-25.00 years	
Mean	6.3 years	
Standard deviation	5.26	
Weight Status (Kg)		
50-64	5	16.67
65-79	7	23.33
80-94	9	30.00
95-109	7	23.33
110-124	0	0.00

Table 3 cont'd.

Data	Frequency	Percentage (%)
125-139	1	3.33
140-154	1	3.33
Range	92.00	
Mean	85.37	
Standard deviation	20.17	
Smoking Status		
Yes	12	40.00
No	18	60.00
Exercise Status		
Yes	9	30.00
No	21	70.00
Previous Diabetes Education Program Participation		
Yes	10	33.33
No	20	66.67

Smoking Status

Of the sample in the study 12 (40%) of the participants were smokers and 18 (60%) were non-smokers. The hazards of smoking may present additional stressors to diabetics who experience a compromised state of health due to the chronicity of the diabetic disorder (Palmore, 1986).

Exercise Status

Nine (30%) of the participants were involved in some form of active daily exercise. However, 21 (70%) did not participate in any exercise activity.

Previous Diabetes Education Program Participation

There were 10 (33.3%) subjects who had previously participated in a formal diabetes education program. However, 20 (66.7%) of the sample had not been involved in any previous diabetes education program.

Glycosylated Hemoglobin Blood Measurement

The glycosylated hemoglobin blood test was performed before the participants began the education program to determine the metabolic control levels of the sample. A second glycosylated hemoglobin blood test was administered to examine the values for any change eight weeks following program completion.

For the 25 subjects who participated in all three phases of the study, the data analysis indicated a mean of .077 and a standard deviation of .0035 for the preprogram glycosylated hemoglobin blood test scores. The mean of the postprogram followup scores was .060 and the standard deviation was .0006. The mean of the difference between the preprogram and postprogram followup glycosylated hemoglobin blood test values was 0.0029. The values of the glycosylated hemoglobin blood tests in the preprogram phase and in the postprogram followup phase of the study with individual score differences are illustrated in Table 4.

Table 4

Values and Differences of the Glycosylated Hemoglobin Blood Tests in the Preprogram and Postprogram Followup Phases of the Study

n=25

Preprogram HgbA1C Values	Postprogram Followup HgbA1C Values	Difference Between the HgbA1C Blood Test Values
.090	.062	.028
.084	.079	.005
.123	.073	.050
.066	.060	.006
.062	.057	.005
.060	.057	.003
.083	.059	.024
.099	.069	.030
.094	.051	.043
.104	.048	.056
.075	.065	.010
.068	.051	.017
.072	.056	.016
.056	.068	-.012
.093	.069	.024
.066	.064	.002
.054	.051	.003
.060	.056	.004
.054	.050	.004
.073	.060	.013
.062	.063	-.001
.068	.058	.010
.078	.060	.018
.114	.071	.043
.055	.050	.005

Table 4 cont'd.

Preprogram HgbA1C	
Mean Score	.077
Standard deviation	.0035
Postprogram Followup	
Mean Score	.060
Standard deviation	.0006
Mean of the Difference	.0029
Effect Size	4.9

Glycosylated hemoglobin blood tests were performed to establish the participants' preprogram glycosylated hemoglobin blood values. These results were used to calculate the above normal values using .074 as the upper limit of the normal values and to determine the percentage above the upper limit of normal. Table 5 illustrates these findings.

The normal range of the glycosylated hemglobin blood test values are .039 - .074. After program completion only one subject continued to have a glycosylated hemoglobin blood value above the upper limit of the normal range of values. Two subjects recorded increases in their glycosylated hemoglobin blood values, however these program followup test results were within the normal range of values. The remaining 22 subjects lowered their glycosylated hemoglobin blood values and continued to maintain test results within the normal range. Table 6 illustrates these findings.

Table 5

Preprogram Glycosylated Hemoglobin Blood Values and Percentage of Normalcy As Related to the Upper Normal Limit of .074

n=25

Preprogram HgbA1C Blood Values	Normal (N) and Above Normal Differences	Percentage (%) Above Upper Normal (N) Limit
.090	.016	17.8
.084	.010	11.9
.123	.049	39.8
.066	-.008 N	N
.062	-.012 N	N
.060	-.014	N
.083	.009	12.2
.099	.025	25.3
.094	.020	21.3
.104	.030	28.8
.075	.001	1.3
.068	-.006 N	N
.072	-.002 N	N
.056	-.018 N	N
.093	.019	20.4
.066	-.008 N	N
.054	-.020 N	N
.060	-.014 N	N
.054	-.020 N	N
.073	-.001 N	N
.062	-.012 N	N
.068	-.006 N	N
.078	.004	5.1

Table 5 cont'd.

Preprogram HgbA1C Blood Values	Normal (N) and Above Normal Differences	Percentage (%) Above Upper Normal (N) Limit
.114	.040	35.1
.055	-.019 N	N
Mean	.077	
Standard Deviation	.0035	

Table 6

Postprogram Followup Glycosylated Hemoglobin Blood Values and Percentage of Normalcy Utilizing the Upper Limit of the Normal Range of .074

n=25

Postprogram Followup HgbA1C Blood Values	Normal(N) and Above Normal Values	Percentage Above Upper Normal (N) Limit
.062	N	
.079	-.005	6.3
.073	N	
.060	N	
.057	N	
.057	N	
.059	N	
.069	N	

Table 6 cont'd.

Postprogram Followup HgbA1C Blood Values	Normal (N) and Above Normal Values	Percentage Above Upper Normal (N) Limit
.051	N	
.048	N	
.065	N	
.051	N	
.056	N	
.068	N	
.069	N	
.064	N	
.051	N	
.056	N	
.050	N	
.060	N	
.063	N	
.058	N	
.060	N	
.071	N	
.050	N	
Mean Score	.060	
Standard Deviation	.0006	

Diabetes Mellitus Knowledge Tests

The Diabetes Mellitus Knowledge Test, developed by the teaching staff of the Diabetes Education Outpatient Program, is a 51 - item test. The test aimed to evaluate the program participants' knowledge base and the subsequent self-management of their diabetic disorder. This Diabetes Mellitus Knowledge Test was completed by the study participants during the morning of the first day of the program before the program commenced. It was completed a second time on the last day of the education program before the scheduled discharge interviews. Eight weeks following completion of the program the study sample completed the knowledge test a third time.

Frequency and Percentage Distributions

The frequency and percentage distributions of the raw scores on the Diabetes Mellitus Knowledge Test on the pretest, posttest and followup posttest are illustrated in Table 7.

Central Tendency and Variance

The mean of the raw scores of the preprogram pretest was 38.97. The means of the raw scores of the postprogram posttest and the postprogram followup posttest were 47.10 and 47.08 respectively. Table 8 provides the Diabetes Mellitus Knowledge Test raw score means, ranges and variance of the scores on three occasions.

Table 7

Frequency and Percentage Distributions of Raw Scores on Diabetes Mellitus Knowledge Test on Three Occasions

DMKT	Frequency	Percentage
Preprogram Pretest (n 30)		
0 - 19	2	6.67
20 - 39	6	20.00
40 - 59	5	16.67
60 - 79	14	46.67
80+	3	10.00
Postprogram Posttest (n 30)		
0 - 19	1	3.33
20 - 39	1	3.33
40 - 59	6	20.00
60 - 79	12	40.00
80+	10	33.33
Followup Posttest (n 25)		
0 - 19	0	0.00
20 - 39	1	4.00
40 - 59	6	32.00
60 - 79	9	36.00
80+	7	28.00

Table 8

Diabetes Mellitus Knowledge Test Raw Score Means, Ranges and Standard Deviations on Three Occasions

n	DMKT	Mean	Range	Standard Deviation
30	Pretest	38.97	6 - 62	14.15
30	Posttest	47.10	0 - 62	10.18
25	Followup Posttest	47.08	31 - 66	11.21

Table 9 provides the percentage scores, ranges and variance of the Diabetes Mellitus Knowledge Tests on three occasions.

Table 9

Diabetes Mellitus Knowledge Test Percentage Scores, Ranges and Standard Deviations on Three Occasions

n	DMKT	Mean (%)	Range (%)	Standard Deviation
30	Pretest	55.76	9 - 89	20.27
30	Posttest	67.23	0 - 89	14.30
25	Followup Posttest	67.24	31 - 94	16.04

Effect Size (Pretest to Posttest) = 0.57

Effect Size (Pretest to Followup) = 0.57

Discussion

The findings of the study have been presented in this chapter. This section focuses on a discussion of the data as it is related to the research questions.

The participants of the study presented with a diverse range of characteristics. Sixteen of the subjects were female and 14 were male. They ranged in age between 18 and 75 years of age with a mean of 50.2 years. Their occupational representation varied with nine subjects

employed in the service industry, seven were retired and six individuals were classified as homemakers. Four participants were employed in labor-related occupations, three worked in a professional occupation and one was employed in the health care field.

Of the participants in the study 21 indicated they had a previous family history of diabetes, while nine reported there was no previous history of diabetes in their families. Five participants were diagnosed with Type I diabetes and 25 were diagnosed with Type II diabetes.

The number of years since the subjects were diagnosed with diabetes varied. Thirteen subjects were newly diagnosed for less than one year, six were diabetics between one and four years, three diabetics were diagnosed with the disorder between five and ten years ago and three were diagnosed between 11 and 15 years ago. Two participants were diabetics between16 and 20 years and three were diagnosed between 21 and 25 years ago.

The weight of the subjects ranged from 53 kilograms to 145 kilograms with a mean weight of 85.37 kilograms. Of the participants 12 smoked various tobacco mixtures while 18 were non-smokers.

Nine subjects of the sample were involved in daily exercise activity and 21 did not participate in any active exercise. Ten subjects had attended a previous diabetes education program and 20 had not been involved in a formal diabetes education program.

The attributes of the participants of the study indicated a diverse group of diabetic adults with respect to their demographic and lifestyle profiles and diabetes-related status.

The Diabetes Mellitus Knowledge Test was utilized on three occasions to determine the participants' preprogram knowledge base, and to assess short-term knowledge acquisition and long-term knowledge retention of the subjects of the study. In phase I of the study a pretest was completed by the participants prior to beginning the education program. The same test was repeated in phase II of the study immediately upon program completion. The final knowledge

test was completed by the participants in phase III of the study eight weeks after the subjects completed the program.

The first research question asked: What is the knowledge base of diabetics immediately upon completion of a Diabetes Education Outpatient Program? The first hypothesis stated: There is an increase in the immediate knowledge base of diabetics who have completed a Diabetes Education Outpatient Program. Tables 9 and and 10 indicate an increase in the results of the postprogram Diabetes Mellitus Knowledge Test from the results of the preprogram knowledge test. In the preprogram phase the scores ranged from 9 percent to 89 percent with a mean of 55.76 percent. In the postprogram phase the scores ranged from 0 percent to 89 percent with a mean of 67.23 percent. These findings indicate the subjects may have gained diabetes knowledge following the completion of the Diabetes Education Outpatient Program. These results are consistent with those reported by Etzwiler, 1973 and Paulozzi, 1984. These researchers determined that the knowledge base of diabetics who have completed a diabetes education program improves immediately following program completion.

The second research question asked: What is the long-term knowledge base of diabetics upon completion of a Diabetes Education Outpatient Program? The second hypothesis stated: There is an increase in the long-term knowledge base of diabetics who have completed a Diabetes Education Outpatient Program. These results are depicted in Tables 9 and 10 and indicate an increase in the results of the postprogram followup Diabetes Mellitus Knowledge Test from the results of the preprogram knowledge test. The postprogram knowledge test results ranged from 0 percent to 89 percent with a mean percent of 67.23 percent. The postprogram followup knowledge test results ranged from 31 percent to 94 percent with a mean of 67.24 percent. These results are in keeping with the results of studies conducted by Berger, 1979; Etzwiler, 1973; Paulozzi, 1984 and Karlander and Kindstedt, 1983. These researchers

concluded that the long-term knowledge base of diabetics, who attended a diabetes education program, improved from the preprogram phase and was maintained when measured eight weeks or longer following program completion.

The third research question asked: Do diabetics achieve improved metabolic control in the long-term following the completion of a Diabetes Education Outpatient Program? The third hypthesis stated: There is a decrease in the glycosylated hemoglobin blood levels of diabetics who have completed a Diabetes Education Outpatient Program. These results are shown in Tables 4, 5 and 6. These findings are not consistent with those reported by Etzwiler, 1973. However, results that are consistent with the findings of this study have been cited by Mazzuca, Moorman, Wheeler, Norton, Fineberg, Vinicor, Cohen and Clark,1986; Mazzuca, 1982 and Berger, 1979. These researchers reported that subsequent to participating in a diabetes education program long-term improvement of metabolic control resulted.

The increase in the Diabetes Mellitus Knowledge Test results should be viewed with caution for several reasons. The study participants were not a randomly selected sample. The Diabetes Mellitus Knowledge Test was a hospital-approved, non-validated knowledge test which has been used previously at the metabolic unit. The knowledge test should be validated to ensure it is a reliable and valid tool for collecting diabetes knowledge data. The subjects wrote the same Diabetes Mellitus Knowledge Test in all three phases of the study. Recall of correct answers may have occurred during phases II and III of the study when the same test was written a second and third time, and subsequently may have influenced the test scores. A second Diabetes Mellitus Knowledge Test with parallel test items should be constructed and used in knowledge testing to determine postprogram and postprogram followup knowledge retention. However, exposure to diabetes information may have influenced a change in knowledge levels in the subjects in phases II and III. Teaching/learning strategies were not considered in this study, but these may have facilitated knowledge gain by the subjects.

Exposure to diabetes information may have contributed to a decrease in glycosylated hemoglobin concentration levels between phases I and III of the study. The outcome measures of the mean glycosylated hemoglobin values should have been less affected by retesting error. It cannot be concluded from this evaluation that the improvements in knowledge test scores caused improvements in glycosylated hemoglobin levels at followup. Further study and analyses are required to determine any significant changes.

The findings of the study for a specific sample have been examined. The demographic information revealed a diverse variation of characteristics of the participants. The Diabetes Mellitus Knowledge Test scores in the preprogram phase of the study revealed varying degrees of diabetes knowledge among the sample. Postprogram knowledge test scores indicated a possible increase in knowledge base with an increase in test scores and a similar range of variance in the results in the second phase of the study. The postprogram knowledge test scores revealed similar scores to the postprogram test results. The glycosylated hemoglobin blood concentrations had decreased in the postprogram followup phase of the study.

CHAPTER V

CONCLUSIONS IMPLICATIONS AND SUGGESTIONS

Introduction

The conclusions and implications of the study are included in this chapter. Suggestions for further study have been presented.

Research Question 1

The first research question asked: What is the knowledge base of diabetics immediately upon completion of a Diabetes Education Outpatient Program?

The study indicated that knowledge acquisition improved following attendance at and participation in the Diabetes Education Outpatient Program. The knowledge which was tested was comprised of the pathophysiology of diabetes and the disease process. The knowledge component also incorporated skills, procedures and techniques related to effective self-care management, reinforced the importance of consistently performing the necessary daily self-care activities and the promotion of the practice of health-enhancing lifestyle changes. The application of effective everyday self-care minimizes repeated crises, enhances psychological health and reduces the potential of chronic complications.

Certain considerations should be made related to learner-readiness before commencing a diabetes education program with diabetics. A thorough assessment of the diabetic's needs should be completed. This should include assurance that each diabetic outpatient received all pertinent program-related information and has been provided an opportunity to have all questions answered well in advance of program commencement. Basic logistics such as transportation enquiries and parking arrangements, location of the education program, room temperature, and adequate lighting and seating arrangements during educational sessions need consideration. An atmosphere of acceptance serves to be supportive and encouraging to the diabetic concerning health-related behaviors and possible lifestyle changes. Attendance at the

education program with a family member provides the diabetic with support to facilitate improving his coping abilities. Adults can change health-related behaviors if they have the knowledge to do so and if their learning environment enhances their ability to acquire that knowledge.

Adult learners' needs must be met by program planners and teachers so that participation in the education program promotes and facilitates learner success. Principles of teaching and learning for adults are documented in the literature recognizing that learning needs for adults are uniquely different from the learning needs of youths (Knowles, 1984, and Brundage and Mackeracher, 1980).

Research Question 2

The second research question asked: What is the long-term knowledge base of diabetics upon completion of a Diabetes Education Outpatient Program?

The study indicated that the long-term knowledge base of diabetics had improved eight weeks following program completion in comparison to their preprogram knowledge base and was maintained in the postprogram followup phase eight weeks after the Diabetes Education Outpatient Program was completed. A variety of supervised self-care activities, which must be performed daily to maintain optimal health, were integrated into the four-day education program. These activities involved the outpatients in testing their own urine samples for glucose content, monitoring their own blood glucose levels, preparing and administering their own medications and planning their own meals and selecting and measuring their own food. The outpatient diabetics may have assimilated an increased level of diabetes and self-care knowledge and applied their newly acquired knowledge in their home setting for the eight weeks following program completion. The improved knowledge test scores may be a reflection of this internalized knowledge.

Research Question 3

The third research question asked: Do diabetics achieve improved metabolic control in the long-term following the completion of a Diabetes Education Outpatient Program?

The study indicated that, overall, the study participants did achieve improved metabolic control in the long-term eight weeks following the completion of a Diabetes Education Outpatient Program. Only one diabetic experienced a glycosylated hemoglobin concentration above the upper limit of the normal glycosylated hemoglobin value range. This postprogram followup value, however, was reduced from the recorded preprogram test value. Two other participants in the study recorded increased glycosylated hemoglobin values when compared to their preprogram test values. Their postprogram followup glycosylated hemoglobin values, however, remained within the range of normal glycosylated hemoglobin values. This study did not investigate instructor-preparedness or the various teaching/learning strategies utilized in the education program. Planning and implementing strategies that address the needs of adult learners would probably be an important consideration . Knowledge acquisition and subsequent retention of newly-acquired knowledge may be influenced by many internal and external factors related to the diabetes education program and to each individual's circumstance.

Conclusion

This investigation attempted to fulfill the goal of determining whether there was an increase in the immediate and long-term knowledge bases of outpatient diabetics who had completed a Diabetes Education Outpatient Program. The study also determined whether there was a decrease, in the long-term, of the glycosylated hemoglobin blood values of outpatient diabetics following completion of a Diabetes Education Outpatient Program. It may be concluded that the Diabetes Education Outpatient Program was effective from the perspective that, overall, the glycosylated hemoglobin blood values of the study participants decreased following completion of the education program. "Strong evidence is still lacking that diabetes

mellitus education alone, without attendant improvement in clinical care, is effective" (Paulozzi, 1984). Support for such programs should be recognized and promoted to ensure diabetics continue to receive adequate diabetes and self-care management education.

The findings of this study may be of interest to those concerned with the problem of metabolic control in diabetics and to those interested in the education of adult diabetics. The following conclusions are relative to the sample in this study:

1. Human and material resources at this time are adequate to support the Diabetes Education Outpatient Program.
2. Participants in the education program present with a wide variety of diabetes-related characteristics.
3. The Diabetes Education Outpatient Program provides information so that the participants experience an attitude conducive to a changed lifestyle, and can increase their diabetes knowledge base, self-care skills and their coping abilities.
4. Improvements in the postprogram and postprogram followup Diabetes Mellitus Knowledge Test scores may be due to recall of some correct answers to test questions as the same knowledge test was used in all three phases of the study.

Recommendations

Based upon the results following completion of this study suggested recommendations include that:

1. A "contract" approach be considered as proposed by Etzwiler and others (1973), whether this is a verbal or a written agreement between the health care instructors and the diabetic, about the responsibilities each is undertaking to accomplish the educational goals.
2. An ongoing educational program be developed as a part of a continuing relationship with the diabetic and the family. Adherence to therapeutic plans correlate

significantly with diabetes education in a continuing relationship (Williams et al, 1967).

3. The Diabetes Education Outpatient Program be expanded to be conducted in the evenings and on weekends to accommodate those diabetics who are unable to attend weekday education sessions.

In order to have optimal health the diabetic must take charge and change certain risk behaviors. One strategy which is available to achieve this goal is to learn effective self-care measures through diabetes education. However, Squyres (1980) states that "...although knowledge may be a requisite for skill acquisition, knowledge on its own will not necessarily lead to behavior change." Knowing what to do doesn't ensure that individuals will actually take the necessary steps. Understanding human behavior, the pathophysiology of diabetes and potential complications, and practicing effective self-management strategies in conjunction with participitative health team assistance, guidance and support bodes well for continued optimal health for diabetics.

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APPENDICES

APPENDIX 1

Information Sheet and Informed Consent Form

APPENDIX 1

Information Sheet

Project Title A STUDY OF PATIENT EDUCATION AND DIABETES MELLITUS

Investigator SHIRLEY A. NOROSKY-HURL
GRADUATE STUDENT - FACULTY OF EDUCATION - UNIVERSITY OF ALBERTA
NURSE EDUCATOR - MISERICORDIA SCHOOL OF NURSING
EDMONTON, ALBERTA - CANADA
TELEPHONE NUMBER - 486-8786 or 459-7500

When a person is diagnosed as having Diabetes Mellitus, the doctor prescribes treatments and certain routines to be carried out at home. The knowledge required to perform these treatments and routines may be learned by participating in a diabetic outpatient education program. The purpose of this study is to examine the learning retention that occurs in persons with diabetes who attend a diabetic education program. It is hoped this study will yield information which may help others in similar circumstances. It is also hoped this study will provide useful information that will be of benefit in future planning by the metabolic unit personnel.

To obtain the desired information, you are asked to please answer the hospital-approved questionnaires, which will take about 20 minutes in each of three sessions to complete. You are also asked to have standard, hospital-approved, glycosylated hemoglobin (HgbA1C) blood tests taken at two different intervals. The results of the questionnaires and the blood tests are confidential and anonymity is guaranteed.

Informed Consent

PROJECT TITLE Diabetic Education Outpatient Program for the Promotion of Knowledge and the Enhancement of General Health Status.

INVESTIGATOR Shirley A. Norosky-Hurl R.N., B.Sc.N.

Graduate Student - Faculty of Education - University of Alberta

Nurse Educator - Misericordia School of Nursing, Edmonton Alberta

Telephone Number - 486-8786 or 459-7500

The purpose of this research study is to examine the learning retention that occurs with persons with diabetes who attend a diabetic education outpatient program.

I agree to answer three questionnaires which will take about 20 minutes to complete at the beginning and at the end of the diabetic outpatient education program, and about eight weeks following the end of the education program, to have two HgbA1C blood tests performed and to allow the investigator to obtain information from my hospital chart relevant to the study.

All information will be number-coded so that it cannot be identified with me and my name will not appear in any documents or reports without my permission.

I understand that I am free to decline to enter or may withdraw my participation, AT ANY TIME without any consequences to continuing medical care.

I have been given the opportunity to ask whatever questions I desire and all such questions have been answered to my satisfaction.

I have reviewed a copy of the informed consent form before participating in this study.

_____ _____

Signature of Participant Date

_____ _____

Signature of Witness Occupation of Witness

APPENDIX 2

Diabetes Education Outpatient Program

APPENDIX 2

Diabetes Education Outpatient Program

Day 1

0730 - 0800	Introductions: Record therapeutic regimens of all outpatients: Weigh-in: Blood testing
0800 - 0815	Administration or supervision of all medication requirements
0815 - 0900	Breakfast for all outpatients in cafeteria
0900 - 0915	Orientation to Diabetes Education Outpatient Program
0915 - 1015	Individual medical, nursing and dietary assessments
1015 - 1030	Preprogram Diabetes Mellitus Knowledge Test - Questionnaire
1030 - 1040	Snack for all outpatients
1040 - 1100	Preprogram Glycosylated Hemoglobin Blood Test and Glucose Blood Tests
1100 - 1145	Overview of Diabetes Mellitus - lecture and film tape presentations
1145 - 1300	Lunch for all outpatients
1300 - 1430	Nutrition and Diabetes - lecture presentation
1430 - 1445	Blood and urine testing for Type II diabetics
1445 - 1500	Snacks for all outpatients
1500 - 1515	Blood and urine testing for Type I diabetics

Day 2

0730 - 0800	Blood glucose and urine testing: Additional blood testing as required
0800 - 0815	Administration or supervision of all required medications
0815 - 0900	Breakfast for all outpatients in cafeteria
0900 - 1015	Nutrition and Diabetes - lecture presentation
1015 - 1030	Snacks for all outpatients
1030 - 1040	Blood testing for Type II diabetics
1040 - 1100	Blood testing for Type I diabetics
1100 - 1145	Supervised menu planning and food group selections
1145 - 1300	Lunch for all outpatients in cafeteria
1300 - 1430	Blood Glucose Monitoring - slide tape presentation and discussion
1430 - 1445	Blood testing for Type II diabetics
1445 - 1500	Snacks for all outpatients
1500 - 1515	Blood testing for Type I diabetics: Additional blood testing as required

Day 3

0730 - 0745	Blood glucose and urine testing for all outpatients
0745 - 0800	Fasting blood testing and medical assessment
0800 - 0815	Administration or supervision of all required medications
0815 - 0900	Breakfast for all outpatients in cafeteria
0900 - 1030	Medications and Diabetes - lecture presentation
1030 - 1040	Snacks for all outpatients
1040 - 1100	Blood glucose testing
1100 - 1145	Menu planning and food group selections
1145 - 1300	Lunch for all outpatients in cafeteria
1300 - 1400	Exercise Nutrition and Diabetes - discussion
1400 - 1430	Long-Term Complications of Diabetes - discussion Hypoglycemia and Hyperglycemia Reactions - slide tape presentation
1430 - 1445	Blood testing for Type II diabetics
1445 - 1500	Snacks for all outpatients
1500 - 1515	Blood testing for Type I diabetics

Day 4

0730 - 0745	Blood glucose testing: Weigh-in
0745 - 0800	Medical assessments
0800 - 0815	Administration or supervision of all required medications
0815 - 0900	Breakfast for all outpatients in cafeteria
0900 - 1030	Diabetic Counselling - discussion
1030 - 1040	Blood testing for Type II diabetics
1040 - 1100	Diabetic Kit - discussion
1100 - 1130	Aids To Daily Living - demonstration and discussion
1145 - 1300	Lunch for all outpatients in cafeteria
1300 - 1400	Individual Discharge Medical Interviews - with all outpatients
1400 - 1415	Postprogram Diabetes Mellitus Knowledge Test - Questionnaire

APPENDIX 3

Biographical Data Form

APPENDIX 3

Biographical Data Form

1. Outpatient Number ____.

2. Patient Status: a. Outpatient ____.
   b. Inpatient ____.

3. Birth Date : Day ____ Month ____ Year ____.

4. Gender : Male ____.
   Female ____.

5. Age : 18 - 24 Years ____.
   25 - 34 Years ____.
   35 - 44 Years ____.
   45 - 54 Years ____.
   55 - 64 Years ____.
   65 - 74 Years ____.
   75 - 84 Years ____.

6. Occupational Representation :
   Professional Status ____.
   Service Industry ____.
   Health Care Services ____.
   Homemaker ____.
   Labor Industry ____.
   Retired ____.

7. Family history of diabetes: a. ____ Yes
   b. ____ No

8. Does your present management regimen of diabetes include insulin? a. ____ Yes
   b. ____ No

9. Number of years since diagnosed with diabetes : 0 - 1 Year ____.
1 - 4 Years ____.
5 - 10 Years ____.
11 - 15 Years ____.
16 - 20 Years ____.
21 - 25 Years ____.
26 - 30 Years ____.

10. Weight Status : 50 - 64 Kilograms ____.
65 - 79 Kilograms ____.
80 - 94 Kilograms ____.
95 - 109 Kilograms ____.
110 -124 Kilograms ____.
125 - 139 Kilograms ____.
140 - 154 Kilograms ____.

11. Do you smoke at the present time? a. ____ Yes
b. ____ No

12. Do you do exercise activities at least once a week? a. ____ Yes
b. ____ No

13. Have you attended a diabetes education program before this session? a. ____ Yes
b. ____ No

APPENDIX 4

Diabetes Mellitus Knowledge Test

APPENDIX 4

Diabetes Mellitus Knowledge Test

Outpatient Number ____

Preprogram DMKT ____ Postprogram DMKT ____ Postprogram Followup DMKT ____

Diabetes Mellitus Knowledge Test

Provide the best answer(s) for each question. Try to answer every question.

Check the four correct answers.

1. Diabetes is generally thought to be caused by:
   a. __ eating too many sweets.
   b. __ inheritance.
   c. __ obesity.
   d. __ taking too many pills.
   e. __ a virus.
   f. __ stress.

Check the one correct answer.

2. Diabetes is a/an:
   a. __ lack of glucose in the blood stream.
   b. __ deficiency of insulin.
   c. __ inflammation of the pancreas.
   d. __ rare disease.

Fill in the blanks in the following.

3. The pancreas secretes hormones called _____ and _____.
4. Sugars, starches, proteins and fats taken at meal times tend to _____ blood glucose levels.
5. Insulin will _____ blood glucose levels.
6. The classic symptoms of diabetes include _____ and _____.
7. Ketones that appear in the urine are a danger sign that the body is not producing enough _____ and is forced to burn _____ for energy.

Check the following as True or False.

8. The diet is a means of controlling diabetes.
   a. ___ True
   b. ___ False

9. The amount of carbohydrate, protein and fat eaten should be the same from day to day.
   a. ___ True
   b. ___ False

10. Mealtimes do not have to be regular.
    a. ___ True
    b. ___ False

11. Large increases in activity will mean the need for more insulin.
    a. ___ True
    b. ___ False

12. A cheese slice can be exchanged for 1/2 cup apple juice in the diet.
    a. ___ True
    b. ___ False

13. The diabetic diet can only be eaten by diabetics.
    a. ___ True
    b. ___ False

14. I can better control my diabetes by balancing my diet, exercise and insulin.

a. ___ True

b. ___ False

15. If you are not hungry your regularly planned snack is not necessary.

a. ___ True

b. ___ False

Choose the one correct answer.

16. The diabetic diet is "special" because it is a :

a. ___ reducing diet.

b. ___ measured diet.

c. ___ low salt diet.

17. My diabetic "meal plan" depends on my:

a. ___ medication.

b. ___ appetite.

c. ___ weight, work, exercise and age.

18. If my urine test shows "2%", my blood glucose is most likely:

a. ___ below 7.7 MMol/L.

b. ___ between 7.7 MMol/L and 10.0 MMol/L.

c. ___ above 11.1 MMol/L.

19. The most common way for testing for control of diabetes is to do a :

a. ___ urine test and glucose tolerance test.

b. ___ blood test and glucose tolerance test.

c. ___ blood test and urine test.

Check the three correct answers in each of the next two questions.

20. If my urine tests show "negative" results my blood glucose is most likely:

a. ___ below 7.7 MMol/L.

b. ___ between 7.7 MMol/L and 10.0 MMol/L.

c. ___ above 11.1 MMol/L.

d. ___ none of the above.

21. Ketones may be found in the urine when:

a. ___ there is too much insulin.

b. ___ there is starvation (not enough food).

c. ___ there is not enough insulin.

d. ___ there is an infection.

Check the following as True or False.

22. If my blood glucose was high I would test my urine for ketones.

a. ___ True

b. ___ False

23. "Chemstrips" measure the amount of sugar in my urine.

a. ___ True

b. ___ False

24. When there is glucose in my urine it means that my blood glucose has exceeded my kidney threshold.

a. ___ True

b. ___ False

25. Hyperglycemia means low blood glucose.

a. ___ True

b. ___ False

Choose the one correct answer.

26. Everyone with diabetes:

a. ___ must take insulin.

b. ___ must take oral hypoglycemic agents.

c. ___ must be controlled by diet.

27. If taken by mouth insulin:

a. ___ works well.

b. ___ is destroyed by digestive juices.

c. ___ causes an upset stomach.

28. Oral hypoglycemic agents:

a. ___ act as a substitute for insulin.

b. ___ are really insulin pills.

c. ___ help your body make insulin.

29. Insulin should be taken:

a. ___ at the same time each day.

b. ___ once a day at any time.

c. ___ before meals.

30. To get the best results when I inject insulin I should use:

a. ___ the same spot each day.

b. ___ a different spot each time.

c. ___ either the same or a different spot.

31. If you recognized the early symptoms of hypoglycemia you could stop it if you immediately:

a. ___ took an extra shot of short-acting insulin.

b. ___ drank a regular coke.

c. ___ started exercising.

d. ___ ate two pieces of cheese.

32. For my protection I should always carry:

a. ___ insulin or pills each day.

b. ___ a diabetic identification card and a roll of candies.

c. ___ the good health eating guide and two lumps of sugar.

33. Regular exercise will:

a. ___ make the body need more insulin.

b. ___ burn more glucose.

c. ___ reduce the body's need for insulin and increase the body's ability to use glucose.

34. Before planning to weed my garden I should:

a. ___ omit my daily insulin dose.

b. ___ take an extra snack before I start.

c. ___ eat a light lunch when I'm done.

35. More strenuous activity such as window-washing, tennis and lawn-mowing should be done:

a. ___ one hour before meals.

b. ___ one hour after meals.

c. ___ anytime.

36. Infection disturbs the control and balance of diabetes because:

a. ___ you have a high temperature.

b. ___ you burn more glucose.

c. ___ it interferes with the effects of insulin in your body, therefore, requiring more insulin.

37. When I am ill and nauseated with the "flu" I should:

a. ___ omit my usual insulin dose.

b. ___ follow a fluid diet.

c. ___ phone the dietitian.

38. If my blood tests show 18.8 MMol/L or 23.5 MMol/L and especially if acetone is found in "moderate" or "large" amounts I need to:

a. ___ call my doctor immediately.

b. ___ rest in bed for 24 hours.

c. ___ wait for four hours to see how I'll feel.

39. In caring for my feet I should:

a. ___ wash my feet in hot water every day.

b. ___ trim my corns and calluses every day.

c. ___ soak my feet in warm water and inspect them every day.

Choose the four correct answers in the next two questions.

40. Which are the four parts of your body in which insulin can be injected?

a. ___ neck

b. ___ shoulder

c. ___ upper arms

d. ___ lower arms

e. ___ calves (lower legs)

f. ___ thighs (upper legs)

g. ___ buttocks

h. ___ sides of abdomen

41. Which of the following four symptoms might occur with a low blood glucose?

a. ___ increased urination

b. ___ headache

c. ___ a nervous, "shaky feeling"

d. ___ dry tongue and mouth

e. ___ hunger

f. ___ fast heartbeat

Are the following statements True or False ?

42. If my diabetes is uncontrolled my blood insulin will be low.

a. ___ True

b. ___ False

43. With uncontrolled diabetes blood sugar will be normal.

a. ___ True

b. ___ False

44. If my diabetes is not under control the urine ketones will be high.

a. ___ True

b. ___ False

45. In uncontrolled diabetes the blood glucose will be high.

a. ___ True

b. ___ False

46. There will be a lot of glucose being converted to and stored as fat if my diabetes is uncontrolled.

a. ___ True

b. ___ False

47. If my diabetes is not under control the urine glucose will be low.

a. ___ True

b. ___ False

48. In uncontrolled diabetes the cells of the body will be starving.

a. ___ True

b. ___ False

49. Acetone may be in the urine if diabetes is not controlled.

a. ___ True

b. ___ False

50. In uncontrolled diabetes the amount of urine (volume) will be increased.

a. ___ True

b. ___ False

51. Regular exercise allows your muscles to draw on any excess glucose in the blood when the diabetes is uncontrolled.

a. ___ True

b. ___ False