



National Library
of Canada

Acquisitions and
Bibliographic Services Branch

395 Wellington Street
Ottawa, Ontario
K1A 0N4

Bibliothèque nationale
du Canada

Direction des acquisitions et
des services bibliographiques

395, rue Wellington
Ottawa (Ontario)
K1A 0N4

Your file Votre référence

Our file Notre référence

NOTICE

The quality of this microform is heavily dependent upon the quality of the original thesis submitted for microfilming. Every effort has been made to ensure the highest quality of reproduction possible.

If pages are missing, contact the university which granted the degree.

Some pages may have indistinct print especially if the original pages were typed with a poor typewriter ribbon or if the university sent us an inferior photocopy.

Reproduction in full or in part of this microform is governed by the Canadian Copyright Act, R.S.C. 1970, c. C-30, and subsequent amendments.

AVIS

La qualité de cette microforme dépend grandement de la qualité de la thèse soumise au microfilmage. Nous avons tout fait pour assurer une qualité supérieure de reproduction.

S'il manque des pages, veuillez communiquer avec l'université qui a conféré le grade.

La qualité d'impression de certaines pages peut laisser à désirer, surtout si les pages originales ont été dactylographiées à l'aide d'un ruban usé ou si l'université nous a fait parvenir une photocopie de qualité inférieure.

La reproduction, même partielle, de cette microforme est soumise à la Loi canadienne sur le droit d'auteur, SRC 1970, c. C-30, et ses amendements subséquents.

UNIVERSITY OF ALBERTA

**FOLLOW-UP: PATIENT PERCEPTION OF THE NEED TO
REINFORCE LEARNING AFTER A DIABETES EDUCATION
PROGRAM**

BY



MARCIA LEAH SHAW

A THESIS

**SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND
RESEARCH IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR
THE DEGREE OF MASTERS OF EDUCATION**

IN

**ADULT AND HIGHER EDUCATION
DEPARTMENT OF ADULT, CAREER AND TECHNOLOGY EDUCATION**

EDMONTON, ALBERTA

FALL, 1992



National Library
of Canada

Bibliothèque nationale
du Canada

Canadian Theses Service Service des thèses canadiennes

Ottawa, Canada
K1A 0N4

The author has granted an irrevocable non-exclusive licence allowing the National Library of Canada to reproduce, loan, distribute or sell copies of his/her thesis by any means and in any form or format, making this thesis available to interested persons.

The author retains ownership of the copyright in his/her thesis. Neither the thesis nor substantial extracts from it may be printed or otherwise reproduced without his/her permission.

L'auteur a accordé une licence irrévocable et non exclusive permettant à la Bibliothèque nationale du Canada de reproduire, prêter, distribuer ou vendre des copies de sa thèse de quelque manière et sous quelque forme que ce soit pour mettre des exemplaires de cette thèse à la disposition des personnes intéressées.

L'auteur conserve la propriété du droit d'auteur qui protège sa thèse. Ni la thèse ni des extraits substantiels de celle-ci ne doivent être imprimés ou autrement reproduits sans son autorisation.

ISBN 0-315-77178-X

Canada

UNIVERSITY OF ALBERTA

RELEASE FORM

NAME OF AUTHOR: Marcia Leah Shaw

TITLE OF THESIS: FOLLOW-UP: PATIENT PERCEPTION OF THE
NEED TO REINFORCE LEARNING AFTER A
DIABETES EDUCATION PROGRAM

DEGREE: Master of Education

YEAR THIS DEGREE GRANTED: FALL, 1992

Permission is hereby granted to the University of Alberta Library to reproduce single copies of this thesis and to lend or sell such copies for private, scholarly or scientific research purposes only.

The author reserves all other publication and other rights in association with the copyright in the thesis, and except as hereinbefore provided neither the thesis nor any substantial portion thereof may be printed or otherwise reproduced in any material form whatever without the author's prior written permission.

Marcia L. Shaw
.....
Student's Signature

10776-31 Avenue
.....
Student's Permanent Address

Edmonton Alberta
.....

Date: 92.09.24

T6J3S5
.....

UNIVERSITY OF ALBERTA


FACULTY OF GRADUATE STUDIES AND RESEARCH

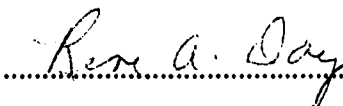
The undersigned certify that they have read, and
recommend to the Faculty of Graduate Studies and
Research for acceptance, a thesis entitled


**FOLLOW-UP: PATIENT PERCEPTION OF THE NEED
TO REINFORCE LEARNING AFTER A DIABETES
EDUCATION PROGRAM**

submitted by **Marcia Leah Shaw**

in partial fulfillment of the requirements for the
degree of **MASTER OF EDUCATION.**


.....
DR. J. F. D. ILOTT


.....
DR. RENE A. DAY


.....
DR. J. M. SMALL

Date: 92 09 24

DEDICATION

**THIS THESIS IS DEDICATED TO THE MEMORY OF MY PARENTS, ELLEN
ELIZABETH (BUNTY) AND RICHARD WILLIAM (DICK) MITCHELL.**

"The joys of parents are secret, and so are their griefs and fears".

'Of Parents and Children'

Francis Bacon

Abstract

Many individuals with diabetes mellitus have difficulty adhering to and maintaining the prescribed treatment which can be complex, long-term and requires behavioral change. At an intensive, short-term educational program, they acquire self-care behaviors to manage diabetes and to control the blood sugar. These behaviors must then be integrated into their life-style. Medical treatment is available after the diabetes education but often systematic follow-up of learning is absent.

Studies have shown that knowledge and skills tend to decline within two to four weeks after the program. The purpose of this study was to find out the clients' perception of the need for follow-up support and reinforcement of information and their knowledge of available resources four to ten weeks following a four-day diabetes education program.

To accomplish this, the researcher interviewed insulin and non-insulin dependent subjects four to ten weeks after they had completed a Diabetes Education Program. Knowledge of diabetes was tested by administering a short quiz. Two self-care skills were assessed: blood glucose monitoring and meal planning. Using a structured question format, each subject was interviewed to determine the need they have for support and reinforcement of knowledge and self-care skills. The subjects were asked how they were managing in the following areas: blood sugar monitoring, meal planning, exercise, medication, foot care, and the complications of high and low blood sugar.

A convenience sample of 36 individuals with diabetes, who complete the four day Diabetes Education Program, were assessed. Results of the study indicated that approximately 2/3 of the subjects perceived they would derive benefit from follow-up education. Most subjects were knowledgeable about available resources, although some did not have access to the resources they preferred.

A well-designed program using built-in strategies to enhance self-care behavior will help to maintain the diabetes treatment regimen. To sustain this learned behavior, the client and the diabetes educator should use a combination of interventions based on the five principles of learning.

ACKNOWLEDGMENTS

I would like to express my appreciation and gratitude to the many individuals who assisted in making this study possible.

Thank you to Dr. F. Ilott, advisor, for your patience, encouragement and direction, during the research process. To Dr. R. Day and Dr. J. Small for your valuable insight and contributions as members of the committee.

To the Staff of the Metabolic Day Care Center whose cooperation, humor and encouragement were constant. To those of my friends who have 'gone this way' before me and to those who have not, but understood. Thank you, all!

Above all, thanks to my partner, Jim, who sacrificed, tolerated and met the challenges with patience, and good humor. Jim, whose support and belief in me never failed, even when mine did. Thank you!

TABLE OF CONTENTS

CHAPTER 1 - THE PROBLEM.....	1
Statement of the Problem.....	3
Research Questions.....	3
Definition of Terms.....	3
Assumptions.....	4
Limitations.....	5
Delimitations.....	5
Significance of the Study.....	5
Organization of Thesis.....	6
 CHAPTER 2 - REVIEW OF LITERATURE.....	 7
Diabetes Education.....	7
Diabetes Education Programs.....	8
Goals of Diabetes Education Programs.....	9
Factors Affecting Goal Attainment.....	10
Evaluating Diabetes Education Programs.....	10
Theoretical Model.....	12
Predisposing Factors.....	13
Enabling Factors.....	14
Reinforcing Factors.....	15
Diabetes Knowledge, Skills and Self-Care Management.....	16
Follow-up Studies.....	21
Follow-up after Diabetes Education.....	21
Early Studies	22
New Approaches.....	23
Recent Studies.....	24
Follow-up Intervention.....	26
 CHAPTER 3 - METHODOLOGY.....	 31
Design of the Study.....	31
Setting.....	31
Sample.....	32
Instrumentation.....	33
Demographic Information.....	33
Diabetes-Related Knowledge Quiz.....	33
Self-Care Skills.....	34
Home Visit Questions.....	34
Access to Sample.....	35
Data Collection.....	36

(Chapter 3 continued)

During the Program.....	36
During the Telephone Call.....	36
During the Home Visit.....	37
Data Analysis.....	37
Summary.....	37

CHAPTER 4 - RESULTS AND ANALYSIS.....	38
Statement of the Problem.....	38
Sample Characteristics.....	38
Sample Selection.....	38
Demographic Information.....	39
Supporting Data.....	42
Diabetes-Related Knowledge and Self-Care Skill Results.....	45
Knowledge Scores.....	45
Self-Care Skills Results.....	47
Home Visit Questions.....	48
Blood Sugar Monitoring (BSM).....	50
Difficulty.....	50
Accuracy.....	51
Use of Information.....	53
Confidence.....	53
Meal Planning.....	54
Difficulty.....	54
Measuring and Selecting Food.....	56
Confidence in Measuring and Selecting Food.....	57
Confidence in Food Selection When Eating Out.....	58
Confidence in Food Selection When Ill.....	59
Exercise.....	59
Difficulty.....	59
Effects of Exercise on Blood Sugar.....	60
Use of Information.....	60
Confidence.....	61
IDDM Concerns.....	62
NIDDM Concerns.....	62
Medication.....	62
Insulin.....	62
Difficulty.....	62
Confidence in Measuring Accurately.....	63
Use of Information.....	63
Confidence in Using Insulin Safely.....	64

(Chapter 4 continued)

Oral Medication.....	64
Difficulty.....	64
Confidence in Taking Medication Safely.....	64
Foot Care.....	64
Difficulty.....	64
Confidence in Providing Foot Care.....	65
High Blood Sugar (HBS).....	65
Difficulty with HBS - Group A.....	65
Use of Information to Treat HBS - Group A.....	65
Use of Information to Treat and Prevent HBS	
Group B.....	66
Confidence in Preventing and Treating HBS	
Group A.....	66
Confidence in Preventing and Treating HBS	
Group B.....	67
Low Blood Sugar (LBS).....	67
Difficulty with LBS - Group C.....	67
Use of Information to Treat LBS - Group C.....	68
Use of Information to Treat LBS - Group D.....	68
Confidence in the Prevention and Treatment of LBS	
Group C.....	68
Confidence in the Prevention and Treatment of LBS	
Group D.....	68
Knowledge and Preference of Resources.....	69
Blood Sugar Monitoring.....	69
Meal Planning.....	70
Exercise.....	70
Medication.....	71
Insulin.....	71
Oral Medication.....	71
Foot care.....	71
Uncontrolled Blood Sugar.....	71
Need for Follow-Up.....	72
Summary.....	74

CHAPTER 5 - CONCLUSION, DISCUSSION AND	
RECOMMENDATIONS.....	75
Summary of Thesis.....	75
Purpose.....	75

(Chapter 5 continued)

Methodology.....	75
Design of the Study.....	75
Sample.....	76
Data Collection.....	76
Instrumentation.....	77
Data Analysis.....	77
Summary of Findings.....	77
Conclusions.....	83
Knowledge and Skills Results.....	83
Discussion.....	83
Blood Sugar Monitoring.....	84
Discussion.....	85
Meal Planning.....	86
Discussion.....	86
Exercise.....	87
Discussion.....	87
Medication.....	88
Discussion.....	88
Foot Care.....	89
Discussion.....	89
Uncontrolled Blood Sugar.....	89
High Blood Sugar.....	89
Discussion.....	90
Low Blood Sugar.....	90
Discussion.....	91
Need for Follow-Up.....	91
Discussion.....	91
Recommendations.....	92
Further Discussion.....	93
REFERENCES.....	95
APPENDIX 1.....	114
APPENDIX 2.....	116
APPENDIX 3.....	119
APPENDIX 4.....	122
APPENDIX 5.....	125
APPENDIX 6.....	128
APPENDIX 7.....	133
APPENDIX 8.....	138

LIST OF TABLES

Table 1.	Supporting Data.....	43
Table 2a.	Stem and Leaf Display Blood Sugar Monitoring.....	47
Table 2b.	Stem and Leaf Display Food Diary.....	48
Table 3.	Difficulty with Blood Sugar Monitoring....	50
Table 4.	Monitoring Blood Sugar Accurately.....	52
Table 5.	Difficulty Following a Prescribed Meal Plan.....	55
Table 6.	Confidence in Measuring and Selecting Food for the Prescribed Meal Plan.....	57
Table 7a.	Food Selection on Sick Days.....	59
Table 7b.	Food Selection on Sick Days by Gender.....	59
Table 8	Difficulty Adhering to a Regular Exercise Schedule.....	60
Table 9.	Effects of Exercise on the Blood Sugar.....	60
Table 10.	Subjects Experiencing High Blood Sugar since Beginning Treatment.....	65
Table 11.	Subjects Who have Experienced Low Blood Sugar	67
Table 12.	Knowledge of Resources for Blood Sugar Monitoring.....	69
Table 13.	Knowledge of Resources for Exercise.....	70
Table 14.	Exercise Preference.....	71
Table 15a.	Resources to Contact for Uncontrolled Blood Sugar	72
Table 15b.	Preferred Contact for Uncontrolled Blood Sugar.....	72
Table 16.	Subjects Perceived Need for Follow-Up.....	73

LIST OF FIGURES

Figure 1.	Gender of Subjects.....	40
Figure 2.	Age of Subjects.....	40
Figure 3.	Occupational Classifications of Subjects.....	41
Figure 4.	Educational Attainment of Subjects.....	41
Figure 5.	Diabetes-Related Knowledge Quiz Scores.....	46
Figure 6.	Nutrition Quiz and Food Diary Scores.....	49

FOLLOW-UP: PATIENT PERCEPTION OF THE NEED TO REINFORCE LEARNING AFTER A DIABETES EDUCATION PROGRAM

CHAPTER 1

THE PROBLEM

Like other chronic conditions, diabetes cannot be cured but may be controlled. Diabetes Education Programs (DEP) provide knowledge and skills that enable those with this condition to control their diabetes. Individuals treat their condition by learning to practice self-care behaviors related to meal planning, physical activity and often medication. Many find this treatment difficult to manage and to incorporate into their existing life-style because it is complex, long term and requires behavioral changes (Anderson, Donnelly & Dedrick, 1990; Haynes & Sackett, 1976).

Traditionally, diabetes education has been delivered in short, intensive programs, focusing primarily on improving the patient's metabolic control. It was thought that education would increase knowledge and skills and enhance self-care behavior. Subsequently, blood glucose control would be improved, complications and hospitalization would be reduced. Ultimately the goal of an improved quality of life for those with diabetes would be achieved. This narrow view of education is ineffective since diabetes affects the psychosocial aspects of a person's life which must also be addressed by the education program (Anderson, Nowacek & Richards, 1988).

Many studies indicate that a minimum level of knowledge and skill is needed for diabetes management (Anderson et al., 1990; Bloomgarden et al., 1987; Etzwiler, 1986; Greene, Beaudin & Bryan, 1991; Rettig, Schrauger, Recker, Gallagher, Wiltse, 1986; Whitehouse, Whitehouse, Smith & Hohl, 1979). Some studies suggest that the knowledge and skills begin to diminish two weeks to four weeks following attendance at a diabetes program (Estey, Tan & Mann, 1990; Hulka, Kupper, Cassel, & Mayo, 1975; Scott, Beaven & Stafford, 1984; Weinsier, Seeman, Herrera, Simmons & Colloins, 1974). Knowledge and skills alone do not sustain the behavioral changes required

by individuals to adhere to the daily treatment regimen and to maintain metabolic control.

In fact, many components contribute to health and health-related behaviors. Programs which provide health information must attend to these elements, such as community (enabling) resources and reinforcing factors, if they are to have any effect on health behavior (Green, Kreuter, Deeds & Partridge, 1980). Short intensive educational programs by themselves may not ensure the behavioral changes necessary for adherence to the treatment. Diabetes educators should use a variety of educational techniques to ensure all domains of learning are addressed and that the behavioral changes started in the program are maintained. Follow-up is one way to assist in sustaining self-care management.

Reinforcement is an important condition of learning (Van Hoozer, et al., 1987). It is reported in the literature that systematic reinforcement supports adherence to treatment regimen in a person with chronic illness (Bloomgarden et al., 1987; Hramiak, 1986; Kerr, 1985; Mazzuca, et al., 1986; Rosenstock, 1985). In the few studies on the long-term effects of follow-up diabetes care, similar results are suggested (Estey et al., 1990; Lawrence & Cheely, 1980; Rettig et al., 1986; Whitehouse et al., 1979).

Education programs for clients with diabetes provide knowledge and self-care skills. Follow-up support for learning is seldom a systematic part of diabetes education programs, nor has it been studied extensively as a reinforcement technique (Etzwiler, 1986; Lawrence & Cheely, 1980). Programs which distribute health information are likely to fail if they do not recognize that enabling and reinforcing factors are required simultaneously to promote health care behaviors (Green et al., 1980).

During the time I was employed as a nurse educator at the Metabolic Day Care Center (MDCC) in the University of Alberta Hospitals, clients participated in an intensive four-day Diabetes Education Program (DEP). Upon completion of the program, clients were advised to obtain medical follow-up. However, there was no systematic educational follow-up that included regular contact with the same health care professional. I was curious to find out if these clients required educational intervention to meet their needs after the program.

Statement of the Problem

What are the perceptions of subjects with diabetes regarding the need for follow-up support and reinforcement of information four to ten weeks after completing a four-day diabetes education program?

Research Questions

1. What knowledge and self-care skills do these subjects retain four to ten weeks following the four-day diabetes education program?
2. What do subjects perceive their needs to be for knowledge and self-care skills four to ten weeks following the four-day diabetes education program?
3. What knowledge of existing support services do the subjects have?
4. What type of support services do the subjects prefer?

Definition of Terms

Insulin: A hormone produced by the pancreas. Insulin must be present before the blood sugar can move into the body cells where it is used to produce heat and energy. Insulin is needed for management and control of the body's energy system.

Type I insulin-dependent diabetes mellitus (IDDM): Individuals with this type of diabetes are unable to manufacture the hormone insulin and must depend on insulin injections to control blood sugar levels and maintain life. This condition tends to develop in the young but it is not unknown in older people. The onset is rapid with severe symptoms developing in a few weeks. Characteristic symptoms are usually extreme thirst, frequent urination and rapid weight loss. The consequences of uncontrolled blood sugar may result in complications such as kidney disease, nerve damage, blindness, and hardening of the arteries (poor circulation) at an earlier age than is expected.

Type II non-insulin dependent diabetes (NIDDM): NIDDM subjects generally produce sufficient insulin but the body does not use it properly. This type of diabetes is most frequently found in older people but may rarely occur in the young. Individuals with this type of diabetes are usually overweight and inactive but not always. Development of this

condition is slow, often continuing for years. Mild symptoms such as thirst, fatigue and extra urination, are often blamed on aging. Diagnosis may be made during examination for an unrelated medical problem. Blood sugar is controlled by dietary management, exercise and weight loss. Pills may be prescribed to enhance insulin production. NIDDM do not depend on insulin injections to maintain life but insulin may be required for acceptable blood sugar control. The same complications may develop as in IDDM but they are less severe and less frequent.

Clients with diabetes: Persons who have completed a four-day diabetes education program at the University of Alberta Hospitals who are either insulin dependent (IDDM) or non-insulin dependent (NIDDM).

Adherence (Compliance): The extent to which the individual follows a prescribed treatment regimen.

Self-Care Management: Includes both performance skills and adherence to the treatment regimen.

Follow-up Service: Includes continuing reassessment of the client's treatment plan, knowledge and skills; necessary re-education to correct misunderstandings and to reinforce information; to provide appropriate referral to other resources.

Perception: To 'see' by means of the senses, a reality, which creates an impression in the mind, some knowledge, an insight or an intuition that becomes the basis for concept formation.

Metabolic control: A broad term which indicates the degree to which the blood sugar level falls in the normal range. Synonyms are "blood sugar control" and "blood glucose control".

Assumptions

This study is based on the following assumptions:

1. Upon completion of the diabetes education program, the subjects, to the best of their ability, will follow the prescribed treatment plan recommended by the health team at the Metabolic Day Care Center (MDCC).
2. The questions asked during the home visit are valid and reliable.

Limitations

1. It is not recommended that the results be generalized to other populations.

Delimitations

The study will include the following delimitations:

1. The findings are limited to a convenience sample being investigated.
2. Outcomes of diabetes education programs frequently focus on biological outcomes, such as weights and blood sugar tests etc. (Lorenz, 1986). This study is limited to assessing educational outcomes of knowledge and the performance of selected skills.

Significance of the Study

A formal education program is based on client needs. Education suggests that reinforcement is a fundamental condition of learning. Some studies indicate that knowledge and skills diminish two to four weeks following a diabetes education program. Health care professionals have suggested that follow-up after an education program supports learning by encouraging and maintaining behavioral change in individuals with chronic illness. Diabetes is a chronic condition and some individuals may need continuing education and support.

A follow-up study can be a useful source of information about the client's perception of the need for support following a diabetes education program. All clients may not agree but they have the right to choose or reject follow-up treatment, so it is important to determine the follow-up teaching and the support services that they would prefer (Redman, 1988).

Diabetes Mellitus is a serious health problem that can be controlled. If clients are to take it seriously, health professionals also must be seen to be serious. Reinforcing the acquired knowledge and skills in a systematic follow-up program could emphasize to the client that diabetes is a serious health problem. For those who perceive follow-up as a need, learning may be more effective if reinforcement is accessible.

Organization of the Theses

Chapter 1 describes the purpose of the study, the specific research questions, the definitions of terms, the assumptions, the limitations and delimitations, the significance of the study and concludes with an overview of the organization of each chapter in the thesis.

Chapter 2 is a review of the literature. This section includes an overview of diabetes education, and the theoretical model referred to in the study. Following is a review of diabetes knowledge and skills as they have evolved over time. The chapter concludes with an examination of two types of follow-up studies found in the literature.

Chapter 3 describes the design of the study. The setting, the sample and selection technique, followed by a discussion of the instrumentation. The chapter concludes with the methods of data collection and data analysis.

Chapter 4 provides the results of the data analysis and a summary of the findings as they related to the four research questions.

Chapter 5 is a summary of the study, conclusions and discussion. Finally the recommendations for a follow-up program and suggestions for further research are presented.

CHAPTER 2

REVIEW OF LITERATURE

This literature review consists of the following sections: diabetes education, theoretical framework, diabetes knowledge, skills and self-care management, and follow-up studies.

Diabetes Education

Diabetes Mellitus, the third leading cause of death in North America affects millions of individuals all over the world as a chronic disease (Etzwiler, 1986). Diabetes is due to a deficiency of insulin, or because the body does not use insulin effectively (Leiter & Gougeon, 1988). Generally, there are two types of diabetes: Type I insulin dependent (IDDM) and Type II non-insulin dependent (NIDDM). The presence of high blood sugar is the main characteristic common to both conditions, otherwise the cause, treatment and outcomes differ (Lewis, Corry, Hunt & Byres, 1989).

The goal of therapy for the person with diabetes is to learn to control the blood sugar by following a complex routine of self-care. Knowledge and skills are acquired by the client and then integrated into their lifestyle. Skills include: selecting appropriate foods, daily administration of medication, monitoring of blood sugar, and exercise. Historically, the physician has directed this treatment for the individual with diabetes.

In the last decade, health professionals began to encourage clients to participate in the management of their condition (Assals et al, 1985; Berger, 1987; Pichert, 1990). Clients may be actively involved in their care when a) they accept their illness; b) are motivated and c) have access to appropriate knowledge and skills needed for self-care (Assals et al, 1985; Pichert, 1990).

Since the discovery of insulin in the 1920s, those responsible have struggled to make diabetes education a systematic part of diabetes treatment. Not until the 1960s did education gain recognition as an important method of controlling diabetes (Panuncialman & Finnegan,

1979). By the late 1970s, after 50 years, diabetes education had, for the most part, become an integral part of treatment (Assals et al; 1985; Berger, 1987).

The Canadian Diabetes Association (1985) outlines the goals in the Standards and Guideline for Diabetes Education in Canada. These national standards aim to improve and maintain the health of people with diabetes through education programs. Programs goals should include: ideal body weight, desirable ranges of blood and/or urine glucose tests, infrequent absence from school or work, and participation in social and physical activities. Person with diabetes are expected to learn and use self-care skills that promote normal blood sugar levels over the long-term (Becker & Janz, 1985; Strowig, 1982). Rubin, Peyrot, Sardek (1989) believe "self-care skills training to be the cornerstone of diabetes education".

Diabetes Education Programs

Traditional diabetes programs tended to provide knowledge and skills using didactic methods. Patients attending these concentrated programs found they provided too much information, in too little time with no chance to practice the skills or techniques at home (Boninger, 1983; Strowig, 1982; Sulway, Tupling, Webb & Harris, 1980). Technological improvements in blood sugar monitoring and insulin administration, combined with the attitude of active participation, are empowering patients with self-care behaviors and independence. There are some patients who are unable to participate in or who are not interested in this trend. The present body of evidence suggests that the nearer the blood sugar is to normal the fewer the long term complications (Padgett, Mumford, Hynes, & Carter, 1988; Raskins & Rosenstock, 1986).

Daily control of diabetes relies on the individual's behavior. Circumstances may change during the day and patients often have to make critical adjustments to their diet, exercise and medication. More recently, many diabetes education programs are presented by a multi-discipline team of physicians, nurses, dietitians, and other health professionals to accommodate a flexible lifestyle. Programs are emphasizing behavioral and cognitive strategies, problem solving skills or psychosocial approaches to enhance traditional didactic instruction (Padgett et al., 1988; Pichert 1990).

The best type of program remains unsettled. Whitehouse et al. (1979) said, "Intuitively, we believe that basic diabetes education reinforced by follow-up sessions does favorably influence the future health of the person with diabetes". The most effective teaching programs for patients with diabetes are longitudinal with regular contact and feedback, but lack client retention (Brown, 1990). However, as a result of their work, Rubin et al. (1989) suggests that more studies should focus on the impact of short, intensive diabetes education.

Goals of Diabetes Education

In chronic conditions such as diabetes, education represents a therapeutic intervention (Assals et al., 1985; Berger & Jorgens, 1983). In diabetes education programs therapeutic and educational goals are combined. A difference should be noted between the direct effects of education on knowledge and the indirect effects of education on metabolic control (Watts, 1980). Many programs have demonstrated that the goals of teaching and treatment have merged successfully (Berger, 1987; Davidson, 1983; Miller & Goldstein, 1972).

Some have suggested that educational goals should be separate from the outcomes that measure metabolic control (Bloomgarden et al., 1987; Lorenz, 1986). Anderson (1986) questioned the limits of a diabetes education program, pointing out that the scope of this intervention should not be responsible for all the treatment outcomes. Yet, any program that does not demonstrate clinical value will have little merit (Watts, 1980).

The goal of teaching and treatment is to provide information that prevents uncontrolled blood sugar levels. There are three aspects to diabetes treatment: diet, exercise and medications. An important strategy for controlling blood sugar level is diet modification which is regarded as the mainstay of managing all type of diabetes, particularly those with NIDDM (Bille, 1986; Campbell et al, 1990; Davidson, 1983; Hollands, 1986).

It has been estimated that 20% of the diabetic population depend on insulin. The remaining 80% are non-insulin dependent and the majority of them are overweight (Leiter & Gougeon, 1988; Wing, 1989). The aim of dietary education is to have the client learn strategies and techniques to

maintain weight or restrict calories. Maintaining blood sugar levels is difficult because adhering to the treatment regimen is necessary. There are many factors contributing to this goal.

Factors Affecting Goal Attainment

For those with diabetes, the issues most difficult to contend with are those related to diet (Daschner, 1986; Lockwood, Frey, Gladish & Hiss, 1986). Dietary compliance is difficult particularly for those who are overweight. Problems related to noncompliance are attributed to the fact that the diet is restrictive, must be followed constantly and is used as a means of control and not a cure (Glanz, 1980).

Haynes (1979) refers to 200 variables that interfere with compliance and subsequently the goals of the diabetes education program. Most frequent were a) the complexity of the treatment routine, b) the high degree of behavioral change and c) length of treatment. A recent study identifies 60 items that are environmental barriers to self-care ability, such as diet, exercise, medication and blood glucose monitoring (Irvine, Saunders, , Blank, & Carter, 1990). Some people are able to cope with diabetes better than others. If individuals with diabetes have family and social support they are more likely to adhere to their treatment plan and achieve the goal of metabolic control (Assal et al., 1985; Gilden, Hendryk, Casia, & Singh, 1989; Schlenk & Hart, 1984).

Evaluating Diabetes Education Programs

Patient education is a process that uses a combination of methods to impact the patient's knowledge and health behavior (Bartlett, 1985a), and it has become an integral part of providing diabetes care. In this context, the quality of educational programs are evaluated. Most of the studies reported in literature evaluate the short-term impact of diabetes programs. Studies that evaluate the long-term outcomes of these programs are uncommon (Berger & Jorgens, 1983; Schlenk & Hart, 1984). To evaluate the true impact of the quality of teaching and therapy, long-term outcomes that include a number of control parameters are necessary (Berger & Jorgens, 1983).

Measuring a patient's knowledge is the most frequently used starting point for evaluating a program (Graber, Christmas, Alogna &

Davidson, 1977; Lane & Evans, 1979). While knowledge is a prerequisite of self-care and it generally improves following a program, many people do not transfer their knowledge into self-care behaviors (Kaplan, Chadwick, & Schimmel, 1985). Research in literature reports that the correlation between knowledge, metabolic control and adherence to treatment is low. Strowig, (1982) states in her article that "despite the proliferation of educational programs and the integration of planned educational experiences into the diabetic patient's therapeutic plan, efforts at increasing the patient's knowledge and improving compliance and / or metabolic control have historically been unsuccessful".

Evaluation studies of diabetes education programs have focused on outcomes such as knowledge test scores (Dunn et al., 1984; Garrard et al., 1987; Irvine, 1989; Mazzuca et al., 1986;), self-care behaviors (Bloomgarden et al., 1987; Irvine, 1989; Mazzuca et al., 1986; Rubin, et al., 1989), psychological factors, such as anxiety, depression, acceptance, adaptation and attitudes (Rubin et al., 1989; Scott et al., 1984).

Other indicators used to evaluate program effectiveness include: hospitalization (Miller, Goldstein, & Nicolaisen, 1978; Sinnock, 1984; Rettig et al., 1986), social support (Kaplan et al., 1985; Schlenk & Hart, 1984) and clinical measurements, such as body weight and (HbA1c) glycosylated hemoglobin (Assals et al., 1985; Bloomgarden et al., 1987; Estey et al., 1990; Irvine, 1989; Mazzuca et al., 1986). Clinical measurements are important indicators of metabolic control (Gorman, 1988/89; Watts, 1980;). Since the 1970's, HbA1c has become available as a reliable way to evaluate metabolic control as a program outcome. The glycosylated hemoglobin value measures the blood sugar control during the preceeding 8-12 weeks (Gabbay et al., 1977; Gorman, 1988/89; Karam, 1985). To date, few studies in diabetes education have been successful in determining if patient education contributes to metabolic control.

In general, diabetes education programs seem to benefit the clients because the levels of illness seem to decrease (Bloomgarden et al., 1987). However, periodic reinforcement of self-care knowledge and skills should be considered as a systematic part of the program (Rettig et al., 1986). Bloomgarden et al. (1987) suggests that the traditional information-based

program is a 'weak intervention as a mode of treatment' for diabetes because patients need time to develop motivation, understanding and skills. Some health care facilities offer follow-up service but it is often not an ongoing system (Graber et al., 1977). As a result, patients who are trying to integrate knowledge and skills into their daily living have limited access to ongoing care.

Summary: Education is an integral part of diabetes treatment but the acquisition of knowledge does not ensure the required behavioral changes. Chronic conditions, such as diabetes require ongoing care for maximum health. The most successful programs extend overtime and provide frequent patient contact and follow-up care. Most diabetes education consists of intensive, one-time programs that provide knowledge and skills and the long-term effects on behavior are uncertain.

Theoretical Model

This section reviews the PRECEDE model and literature that supports the theoretical model of the study.

The PRECEDE model, developed by Green et al. (1980), is an acronym for "Predisposing, Reinforcing, Enabling Causes in Educational Diagnosis and Evaluation. Three categories of factors that operationalizes significant components necessary in developing educational interventions are identified (Mann, 1989): a) Predisposing factors include any characteristic of the target population or patient that motivates health-related behavior; b) Enabling factors include characteristics in the environment that facilitate behavior or any skill or resource required by the patient's support group to acquire the health-related behavior; c) Reinforcing factors are related to the support received from others which encourage or discourage the maintenance of health-related behaviors (Green et al., 1980).

PRECEDE is a comprehensive model used for developing health education programs in a variety of settings (Wyness, 1989; Eriksen & Gielen, 1983). It has been selected for this study because: 1) it provides a structure that identifies the factors which affect health behavior and ultimately the quality of life (Green et al., 1980); 2) it recognizes that behavior is the result of interaction between the learner and environment and considers this in the design of educational interventions (Mann, 1989; Wyness 1989);

3) it acknowledges the complex nature of health behavior and attempts to systematically identify the factors that affect the relationship between health education and behavior (Wyness, 1989); 4) it emphasizes a diagnostic approach that enables systematic development, implementation and evaluation of educational intervention (Green et al., 1980; Eriksen & Gielen, 1983).

Predisposing factors: knowledge, values, attitudes and perceptions.

An assumption of the framework is that knowledge is essential, but it is an insufficient factor to change health behavior. Numerous studies on diabetes have found that improving the patient's knowledge is not always associated with improvement in self-care practices or adherence to a treatment regimen (Anderson, 1986; Etzwiler & Robb, 1972; Hulka et al., 1975; Korhonen et al., 1983; Mazzuca, 1989; Watkins, Williams, Martin, Hogan & Anderson, 1967). Yet, patient education leads to changes in knowledge and skills that contribute to better daily self-care behavior.

Etzwiler (1978) suggests a 1-2-3- approach to diabetes education that includes; 1) survival skills; initially learning the "need-to-know" content, such as general information, medication administration, monitoring blood sugar levels, diet and the action to be taken in emergencies; 2) later, the in-depth information; the relationship of meal planning, exercise and insulin, personal hygiene, foot care, and preventing complications; 3) continuing education and follow-up includes reinforcing concepts, problem solving skills, and reassessing the treatment plan.

Kerr (1985) found that providing information about a specific disease is the principal way of encouraging adherence to a treatment plan, but there was no long-term effect. Poor understanding leads to poor adherence to the treatment plan (Becker & Janz, 1985; Graber et al., 1977; Speers & Turks, 1981). One of the goals of a diabetes education program is to provide the patient with sufficient information for self-care. However, it is difficult to find out if the patient has applied the knowledge at home.

Implicit in the framework are beliefs, attitudes and values about an illness. These factors may effect an individual's motivation to learn and subsequently to change health behaviors. Subsumed in the PRECEDE framework is the Health Belief Model (HBM) (Becker, 1974). It was

originally developed to explain adherence to a medical regimen. Later, this model was used to predict health-related behavior in terms of certain belief patterns (Rosenstock, 1985).

The HBM model has been applied extensively in diabetes studies (Becker & Janz, 1985; Cerkoney & Hart, 1980; Harris, Linn, Skyler & Sandifer, 1987; Hurley, 1990; Rosenstock, 1985). The model is used to find out if patients are more motivated to take part in their own care if they believe:

- a. they are more susceptible to the illness;
- b. the disease is severe;
- c. there is greater benefit and less emotional, physical or financial cost in adherence;
- d. there is more social support with adherence (Kurtz, 1990);
- e. in their ability to achieve various self-care behaviors (self-efficacy) (Rosenstock, 1985).

"Health education can provide the cue to action if the predisposing factors represented by the health beliefs are correctly diagnosed" (Green et al., 1980, p. 73).

Anderson et al. (1988) indicate that the goal of diabetes education, to maximize adherence to the proposed treatment regime, is too restrictive. Unless the individual's beliefs, attitude and values are considered, the goal of adherence is less likely to succeed. Individuals are different in their capabilities to perform daily self-care. In spite of knowing the appropriate action to take, the individual's values, beliefs, attitudes may overpower their health-related behavior (Strowig, 1982).

Enabling factors: availability and accessibility of resources and skills.

"Enabling factors are skills and resources necessary to perform a health behavior" (Green et al., 1980, p. 75). The relationship between the educator and the patient is an important part of the learning process. From the beginning of this relationship, the patient should be aware that they are in charge of their diabetes. The role of the diabetes educator is to facilitate learning and to support patients in achieving their objectives. As such, the educator should be a resource that is accessible to help the patient improve their situation (Anderson et al., 1988; Strowig, 1982).

The educator can structure the environment to create a motivating learning experience. Learning barriers are reduced, when the learning environment is perceived as empathic (Kurtz, 1990; Lange, 1988). In this atmosphere, the person with diabetes is encouraged to learn and to practice the skills required for daily self-care management (Rankin & Stallings, 1990).

Reinforcing factors: attitudes and behavior of the patient's support group. "Reinforcing factors are those that determine whether health actions are supported" (Green et al., 1980, p. 76). Several diabetes studies report that reinforcement is necessary to sustain behavioral change, such as adherence to self-care behaviors (Hramiak, 1986; Jenny, 1983; Rosenstock, 1985; Speers & Turk, 1981; Whitehouse et al., 1979). If the relationship between the desired behavior and its consequence is not reinforced, the learned behavior may be extinguished (Jenny, 1983; Rosenstock, 1985; Strowig, 1982). The environment has many positive and negative consequences that encourage or diminish health behaviors (Benfari, Eaker & Stoll, 1981).

Reinforcement techniques have been used with success to modify behavior in various education programs, such as substance abuse and hypertension. The techniques include: self-reward, punishment, and stimulus narrowing to control smoking (Edinger, Nelson, Davidson & Wallace, 1978). Peer reinforcement, goal setting, reward and stimulus control have been used to encourage compliance in the treatment of hypertension (Mann, 1989; Ziesat, 1977-78).

In diabetes studies, the use of a telephone answering service (Miller & Goldstein, 1972), telephone interviews, home visits (Estey et al, 1990), contracts (Wilson & Boyer, 1988), as well as peer or family support (Glasgow, Toobert, Mitchell, Connelly, & Calder, 1989; Kaplan et al., 1985; Raz, Soskolin & Stein, 1988; Schafer, McCaul, Glasgow, 1986) are some of the strategies that have been used to reinforce learned behavior. Self-reinforcement, self-monitoring, monetary reinforcement, stimulus control and goal setting have been used for obesity in nondiabetes and for those with diabetes (Brownell, Heckerman, Westlake, Hayes, & Monti, 1978; Glasgow et al., 1989; Guare et al., 1989; Wing, 1989).

Generally these studies indicate that selected reinforcement techniques can be successful in helping patients make healthy behavior changes. According to Ausubel (1968), appropriate motivation is valuable to the learning process. Reinforcement can act as a motivating factor resulting in behavior being maintained. Diabetes education is a continuous process and systematic follow-up is a part of the process that should be incorporated if program outcomes are to persist.

Summary: Health and health related behaviors are influenced by many factors. The PRECEDE model can be used to assess the causes of health behavior. This model identifies three kinds of factors that combine to effect health behavior. Internalized by the individual, predisposing factors (knowledge, values, etc.) can only be influenced by educational intervention and have short term effects. Enabling factors (skills and resources) develop over time. Reinforcing factors (attitudes and support) can be structured into the educational environment and effect behavior for a longer time.

Behavioral change should occur as a result of identifying and modifying these predisposing, enabling and reinforcing factors. The model is useful for finding out factors that respond to health education. The more complex the behavior the wider the range of educational interventions that will be needed. Programs that are designed to influence most of the factors will likely have the most effect on long-term behavior (Green et al., 1980). Once the factors are identified, the educational interventions can be systematically planned, implemented and evaluated to meet specific needs.

Diabetes Knowledge, Skills and Self-Care Management

The purpose of this section is to review the information emerging from diabetes studies that is related to the patients, the educators and the diabetes education programs.

Generally, the studies are grouped in five areas (Garrard, Joynes, Mullen, McNeil & Etwiler, 1988). Early studies focused on the patients need for knowledge about diabetes and its management. Then there was interest in the patient characteristics and why some people were more knowledgeable about their condition than others. Researchers then

concentrated on the diabetes programs and their content. Concern for accurate measurement of knowledge and the validity of testing materials emerged. To further improve knowledge acquisition in patients, the characteristics of those responsible for teaching was investigated.

Beaser (1956) was the first to systematically measure and report on the knowledge of diabetes. The subjects completed a multiple choice test, and were found to be "all distinctly deficient in knowledge of the disease." Collier & Etzwiler (1971) surveyed the knowledge of parents of the children with diabetes. This representative sample also demonstrated a lack of knowledge that was disturbing. Later, Hulka et al. (1975) found that one third of the information that was communicated to patients by their physicians was not recalled after two weeks.

Other studies about diabetes knowledge emphasized the characteristics of patients who seemed to know the most about diabetes and its management (Collier & Etzwiler, 1971; Miller et al., 1978). Age was an important element that inversely related to knowledge (Lane & Evans, 1979). It was also found that insulin dependent patients tended to have more knowledge about diabetes management than non-insulin dependent patients (Manning & Lee, 1988; Watts, 1980). These studies did not completely explain why some individuals knew more about their condition than others.

Further investigations explored the relationships among variables. In 1967, Williams, Martin, Hogan, Watkins, and Ellis found that knowledge correlated positively with the performance of the recommended treatment regimen and negatively with metabolic control. Beggan, Cregan and Drury (1982) added to this information when they found that those who attended clinics regularly every 6 months had better metabolic control. These findings reinforced the need for those with diabetes to have regular contact with their doctor and that supportive outpatient facilities be developed.

Diabetes educators began to describe the content of patient education programs. The traditional model for diabetes patient education assumed that by improving diabetes knowledge and health behavior, control of blood sugar would follow and thereby avoid the short-and

long-term complications (Anderson et al., 1988; Dunn, 1990). It was increasingly evident this educational model was too narrow. The long-term behavioral changes required by those with chronic diabetes were not realized by teaching diabetes knowledge and skills alone. The factors that contribute to these aims vary continuously and their interactions are complex (Anderson et al., 1988; Green et al., 1980).

Other strategies had to be included if patients and programs were to be successful in the outcome of changing behaviors. Educators suggested that behavioral strategies be used in diabetes teaching programs (Bartlett, 1982; Dunbar, Marshall & Hovell, 1979; Mazzuca, 1982). Successful techniques included: regular contact with the same health care professional, daily self-care rituals, and reward for progress. Patients needed to know less about disease pathophysiology and more about integrating the new treatment plans into their daily routine (Mazzuca, 1982).

The problem of health professionals failing to recognize specific patient needs was identified by Davis, Hull and Boutaugh (1981). They suggested: that educational needs be diagnosed before intervention to ensure that the existing gaps in knowledge were not missed, that the program content was appropriate, and that time was not wasted duplicating what the patient already knew. At present, more attention should be given to the latter suggestion and what the patient wants to know.

The testing of diabetes knowledge developed. Each diabetes program had different instructional objectives and therefore the tests varied (Garrard et al., 1987). Consequently, the measurement results of diabetes knowledge presented a confusing and often contradictory view. Much of the contradictions arose from poorly standardized examinations (Dunn et al., 1984).

Gradually, the purpose of testing became explicit: to assess patient's educational needs, to design appropriate instructional experiences, and to measure program outcomes. A consensus emerged in the literature regarding the content for diabetes education programs. Five areas of study were described: general information, carbohydrates, blood sugar, food

exchange and the management and administration of insulin (Hess & Davis, 1983).

Valid knowledge tests should be used for the assessment of patient's diabetes knowledge (Garrard et al., 1988). A 15-item standardized knowledge scale was presented by Dunn et al. (1984) because the existing comprehensive tests, containing anywhere from 30 to 160 items, were taking valuable time that could be used to assess patient's needs.

Garrard et al. (1987) describes the development of the most recent edition of the Test of Patient Knowledge originally developed by Etzwiler and Associates at the International Diabetes Centre. This 50-item multiple choice exam has been evaluated for validity, reliability, and readability at 7th to 8th grade level.

After 50 years of endeavor, according to the standards of the American Diabetes Association and American Association of Diabetes Educators, patient knowledge of diabetes and its management is still inadequate (Teza, Davis & Hiss, 1988). Studies have consistently tried to demonstrate a relationship between knowledge and control. However, Lockington, Farrant, and Meadows, (1988) were the first to try a detailed analysis. Based on their findings, they suggested a minimum level for clinically significant diabetes knowledge after which other factors, such as attitude and motivation, are more likely to be important.

Patients are more likely to be motivated to learn and adhere to treatment if things are meaningful to them. In a recent study, diabetes patients and staff nurses were asked to judge the importance of content items. Both patients and nurses rated the survival skills of diabetes management, hygiene and diabetes complications as the most valuable information. The difference was that nurses had a more global view of the content while patients selected the content which was meaningful to their purposes (Duchin & Brown, 1990).

Diabetes educators assume that patients with diabetes do not have adequate knowledge and skills to manage their own condition, but patients do have their own ideas about the information they need. This does not always agree with the ideas that health care educators have of the information that is best for the patient. The study by Duchin and Brown,

(1990) supports the idea that a program may benefit from having patient input into the planning of diabetes teaching activities.

Finally, there are a group of studies that examine the characteristics of health professionals who are responsible for providing the knowledge and skills to patients. Several studies discuss patient-provider communication problems (D' Eramo-Milkus & Demas, 1989; Hulka et al., 1978; Rost, 1989). Others suggest that health care professionals lack adequate teaching skills because they have not been taught how to facilitate learning (Istre, 1989; Lorenz, 1989).

Speers and Turk (1981) suggested that health-care providers may not be aware of the internal processing of information. They provided insight into the learning process and discuss the barriers affecting recall and the ability to transfer the information to action. To overcome these obstacles, health-care providers were encouraged to assist the patient to rehearse mentally or practice. This seems to be a recommendation for those who provide health care to view the patient more as a student and to study the teaching-learning process.

An objective of diabetes care is to reduce the long-term complications of diabetes. By maintaining the blood glucose levels near normal it is thought that this aim could be achieved. A 10 year research study to establish this relationship conclusively is in progress. (DCCT Research Group, 1986). Beeney and Dunn (1990) concluded that neither total or specific knowledge improvement predicts metabolic control. They propose that program evaluation should focus on behavioral and attitudinal outcomes, which may be better predictors of metabolic control.

Summary: This section has reviewed five groups of studies related to the development of diabetes knowledge in clients with this health problem, educators of those with diabetes and the diabetic teaching program. Diabetes knowledge is essential for self-care management and contributes to the quality of life. Some people are able to do this better than others. The ability to retain information does not, necessarily, predict metabolic control. Evaluation of programs should concentrate on behaviors and attitudes. Knowledge can be measured more accurately since testing material is more valid and reliable. Diabetes educators who

are content specialists could make learning more effective by implementing teaching-learning principles and by improving their teaching skills.

Follow Up Studies

Literature on diabetes education reports two types of follow-up studies. One is related to the evaluation of educational programs and the other is related to the effects of reinforcement techniques, in support of what has been learned. Results of these studies may effect the design of future diabetes education programs. A discussion of related literature follows.

Follow-up Studies after Diabetes Education

Educational and therapeutic goals are linked in diabetes teaching programs. These programs integrate three aspects of diabetes management: knowledge of diabetes concepts; self-care management (which includes skill performance and adherence); and blood sugar control (indicators are physiological outcomes, such as the blood sugar range, HbA1c).

It was discovered that the simple testing of knowledge after the program is insufficient because the subjects must be able to integrate and transfer information into self-care behaviors that will enable them to manage and control the diabetes every day. To effectively evaluate a knowledge increase, it must be done within a certain length of time after a program (Berger & Jorgens, 1983). Awareness that a knowledge deficit exists is not useful in improving an educational program, unless it presents a barrier to the subject's ability to control the diabetes or that the lack of knowledge impedes the quality of life (Berger & Jorgens, 1983).

Early diabetes education programs, which used didactic methods to provide knowledge and skills, focused primarily on knowledge and the physiological outcomes. Since diabetes education programs are so varied, assessing the benefits of educational intervention has consistently shown mixed results (Pichert, 1990; Rubin et al., 1989). The length of time that the benefits persist is also unknown (Kaplan & Davis 1986).

Early Studies

Before the development of any formal diabetes education programs, follow-up studies assessed the general aspects of diabetes knowledge and the outcomes of therapy. Williams et al. (1967) found that knowledge correlated with self-care performance but not with blood sugar control, although there was a trend indicating improvement in blood sugar control. It was concluded that there was a need for supportive follow-up care.

Studies (Geller & Butler, 1981; Miller et al., 1978) that followed the treatment of patients with diabetes demonstrated that educational deficits were a factor in hospitalization rates for diabetes complications. Later Davidson (1983), reporting on an outpatient program, demonstrated a decreasing rate in hospital admissions. This program provided education and continuous, regular follow-up care to subjects with diabetes. Participants could access diabetes nurse practitioners by telephone or by drop-in appointment.

As diabetes education programs and technology developed, the long-term benefits of this educational intervention were evaluated in terms of patient compliance to treatment and blood sugar control. For the most part, the patient assessments were done from 6 months to 24 months following the programs. Many studies demonstrated that participants in a diabetes education program had improved their level of knowledge (Bloomgarden et al., 1987; Korhonen et al., 1983; Mulhauser et al., 1987; Rettig et al., 1986; Vinicor et al., 1987). The length of the effects of the programs remained controversial.

Other studies demonstrated that knowledge and skills decreased within two to four weeks after attending an education program (Estey et al., 1990; Hulka et al., 1975; Scott et al., 1984; Weinsier et al., 1974). Brown (1990), in a meta-analysis of 82 studies, showed that diabetes patient education had a moderate to large effect on improving knowledge with trends indicating a positive effect on patient outcomes. The results of studies assessing the benefits of educational intervention on self-care practices also showed varied results.

The results of follow-up studies relating knowledge and metabolic control were not always positive (Bloomgarden et al., 1987; Korhonen et al., 1983). If metabolic control was not shown to be improved, the program was viewed as a failure in effectively changing long-term behaviors (Scott et al., 1984). Innovative approaches were needed to encourage patients to achieve healthy outcomes (Beeney & Dunn, 1990; Bloomgarden et al., 1987; Rettig et al., 1986; Rosenstock, 1985; Korhonen et al., 1983).

New Approaches

Internal motivation is one of many complex factors that is necessary for the long-term maintenance of health behavior (Speers & Turk, 1981). Internal motivation may support long-term behavioral change. Dunbar et al. (1979) proposed that a well designed health education program using self-care behavior strategies based on the social learning theory of Bandura (1977) be developed to promote behavioral changes for a longer time. These strategies have been used in many health related problems such as: weight loss, hypertension and medication studies. The results of these studies varied.

Watts (1980) reported that only 50% of patients adhered to their self-care treatment plan. Since the problem of adhering to a treatment plan is so complicated, Speers and Turk, (1981) suggested looking at the factors that affect adherence as a group of problems rather than as a global problem. Using the problem solving strategy, success or failure with adherence would be viewed as a problem to be solved. For subjects who are unable to adhere to the treatment plan, alternatives could be explored. Health care professionals could prepare the clients for unexpected situations, discuss the possible solutions and communication between these two groups would be enhanced.

In 1986, Turk, Salovey, & Litt suggested that strategies from the cognitive-behavioral model could improve adherence. The strategies included: collaborative relationship with the patient and health professionals, problem solving, contingency contracts, social support, restructuring and relapse prevention therapy. Measuring the effects of these strategies has to be done over the long-term (Padgett et al., 1988).

Recent Studies

In a study by Rubin et al. (1989) subjects were followed at 6 and 12 months following a short, intensive diabetes education program. Using behavioral strategies and a cognitive-behavioral restructuring, the program was designed to improve self-care practices in IDDM and NIDDM. At 6 months, improvement was noted for most self-care behaviors and metabolic control. The follow-up assessment at 12 months, (Rubin et al., 1991) showed that blood sugar control was maintained.

The self-care behaviors requiring a life-style change (diet and exercise) did not improve, but the self-regulating behaviors (blood glucose monitoring and insulin adjustment) improved for the length of the study (Rubin et al., 1991). Similar results were found in a study by de Weert et al. (1989) at follow-up, six to seven months after a structured program designed to motivate IDDM to active self-care.

Hurley & Shea (1992) suggested that the cognitive behavior concept of self-efficacy be operationalized and introduced into diabetes education programs. Self efficacy is derived from Bandura's social learning theory (1977) and refers to a judgment in one's ability to cope with a situation or to perform a behavior. The basis of the judgment is derived from four sources of information. They are: the individual's own mastery experiences, vicarious experiences, verbal persuasion, and emotional arousal (eg, role playing). Hurley and Shea, (1992) suggest that one's own mastery experiences are the most convincing source of information. Implementing strategies, based on this concept, would help those with diabetes to prepare their own long-term strategies for diabetes management.

These strategies have been used with positive effects on behavior change in the self-care management among smokers, (DiClemente, 1981; Godding & Glasgow, 1985); in pain control (Vallis & Bucher, 1986); and rheumatoid arthritis (O'Leary, Shoor, Lorig & Holman, 1988; Parker et al., 1988.). There is evidence that self-efficacy may be an effective intervention in developing long-term behavior needed in diabetes self-care routines (Grossman, Brink & Hauser, 1987; Kingery & Glasgow, 1989; Padgett, 1991).

Glasgow et al. (1992) presented a self-management program to NIDDM subjects over 60. In this study, they developed a program that would provide for the older persons' needs to improve their cognitive-behavioral processes. Two strategies, self-efficacy and problem-solving, which were previously successful in predicting skills, were used. For the first time, three self care behaviors (diet, exercise and blood glucose monitoring) were measured simultaneously. The results at 6 months showed the program to be generally effective in producing behavioral change on the three self-care behaviors. The findings, relative to self-care behaviors, concur with those of Gilden et al. (1989). However, Glasgow et al. (1992) did not find improvement in self-efficacy, possibly because of the design limitations of their test instrument.

Summary: Educators involved in the follow-up studies seem to be searching for the definitive method or methods that will effectively change behavior for the long-term. A comparison among follow-up studies after a diabetes education program is difficult because the objectives, sample, methodologies and instruments are different. Educational and therapeutic goals are linked in diabetes teaching programs. Knowledge, skills and internal motivation are important in supporting long-term behavior change, but are not sufficient by themselves in maintaining long-term, self-care behavior.

The first follow-up studies primarily evaluated blood sugar control. It was found that education and regular follow-up somewhat reduced the distressing consequences of diabetes. When knowledge and blood sugar control were related the results vary. Knowledge and self-care behaviors were more often positively related.

The results of present research seems to indicate that a well designed educational program that includes behavioral-cognitive strategies, such as problem solving, can be effective in helping subjects to prolong self-care behavior for an indeterminate length of time and in some instances, may improve blood sugar control. Current studies demonstrate that more attention to the clients' judgments of their ability to manage a situation or carry out a task, may assist subjects in developing long range plans for diabetes management.

Follow-up Interventions

Until recently, the major concern of medicine has been on managing acute conditions (Assals & Lacroix, 1990). It has become apparent that the methods for treating acute conditions are inappropriate in caring for the increasing number of people with chronic illness. Behavioral and lifestyle changes should be the major focus for those with long term illnesses (Dunn, 1990).

Patient education is a complex process which presents many problems because of the multiple factors that affect health behavior. Health care professionals may forget this and simply tell patients what to do rather than letting them learn (Assals & Lacroix, 1990). Long term changes require understanding, integration of knowledge and skills, reinforcement and emotional support (Anderson et al., 1988). Management of patients with chronic conditions should emphasize follow-up care to support self-care behaviors (Estey et al., 1990; Hramiak, 1986; Mazzuca et al., 1986; Rosenstock, 1985).

The motivation required to sustain behavior and lifestyle changes cannot be provided by knowledge and skills. Motivation is a complex process made up of internal and external factors (Kort, 1987). Many of the self-care practices cannot be internalized during a short-term educational program. External support should be provided by educators in the diabetes education programs (Speers & Turk, 1981).

Flavin and Haire-Joshu, (1986) suggest that during the first attempts to manage a complicated diabetes regimen, intense follow-up by telephone, home visits, and /or clinic visits is essential. Estey (1990), used intense follow-up for 10 weeks with NIDDM (4 telephone calls and a home visit) following an education program. Results showed that adherence to certain aspects of the prescribed diabetes treatment were sustained. A person may persist with one aspect of treatment but not necessarily with other aspects (Turk et al., 1986).

Estey et al. (1990) also suggested that less frequent contact may sustain behavior changes. Contrary to this, however, Brownell et al. (1978), and Glasgow et al. (1989) implied that low-intensity behavioral

interventions might not be adequate to produce improvements in long-standing, resistant habits, (lifestyle changes) such as diet and weight. However, regular contact with the same health care professional has been a successful intervention (Eckerling & Kohrs, 1984; Mazzuca, 1982).

In a review of behavioral strategies for chronic alcohol and drug abuse, Hester, Nirenburg & Begin (1990), found that no single intervention is adequate for everyone. Those who are socially stable, benefit from short-term intense outpatient intervention while those who do not have this stability, benefit from longer, intense inpatient intervention. These findings may be applicable to those with diabetes. They concluded that the closer the intervention was to matching the individual needs, the greater the probability of a positive outcome.

As previously related, Dunbar et al. (1979) identified strategies that enhance behavioral change. These included: reinforcement, reminders, self monitoring, shaping and tailoring, goal setting and contracts.

Contracting has been used with some positive results for weight reduction, hypertension, smoking and exercise (Leslie & Schuster, 1991). Wilson and Boyer (1988) found that a contract provided systematic follow-up diabetes education, if the client was motivated. Morgan and Littel, (1988) had negative results with the use of contracts in a group of older NIDDM subjects. Mazzuca et al. (1986) used a combination of behavioral techniques (contacts, goal setting, and systematic follow-up) and didactic methods (lectures, discussion and audio-visual presentation). Results showed that knowledge had not improved significantly compared to the control group, but a prolonged effect (11-14 months) on skills and self-care behaviors was achieved.

Small group educational meetings were found to improve diabetes control in patients with NIDDM, 12 months after the intervention (Raz et al., 1988). A diabetes self-help group was effective in maintaining diabetes knowledge and control during the following 12 months (Jennings, Morgan & Barnet, 1987). Setting practical goals and modifying behavior seem to have a beneficial effect on the outcome of diabetes education. Without positive reinforcement, diabetes education appears to

have little impact on diabetes control (Adamson & Gullion, 1986; Mazze, Pasmantier, Murphy & Shamoon, 1985).

As a method of providing positive reinforcement, Ahring, Ahring, Joyce & Farid, (1992) reported using a telephone modem to access directly, the data stored in the blood sugar meters of 20 insulin using subjects. In this controlled trial, continuous, specialized counseling by telephone was provided. Results after 12 weeks showed a significant improvement in diabetes control compared to the control group. There was improvement on the other variables tested: weight, random blood testing and insulin requirements, however these were not significant.

In an interesting study related to quality assurance, (Allanach & Allanach, 1984) concluded that 100% attendance at a follow-up clinic was not realistic. In this study, non-returnees to a diabetes clinic were surveyed to find out why they had not kept their appointments. The reasons were categorized as justifiable or not, and the problems for not returning as resolvable or unresolvable. The authors recommended that if follow-up attendance at the diabetes clinic fell below 60%, the reasons for those not attending should be investigated because the system may be at fault.

A position statement on Standards of Medical Care for Patients with Diabetes Mellitus from the American Diabetes Association (ADA) (1990), recommends that continuous care is essential to managing each patient with diabetes. The frequency of visits are outlined and depend on four criteria; the type of diabetes, the degree of blood sugar control, any change in treatment, and the presence of complications. It is recommended that a physician with a special interest in diabetes should have daily contact with patients who are new on insulin and weekly contact with those who are new on oral medication. Subsequently, those with IDDM should be seen four times per year and those with NIDDM twice a year.

Similar recommendations are reflected, in a more general way, by the ADA, as guidelines for health professionals involved in the care and education of people with diabetes and their families (American Diabetes Association, 1992). The Canadian Diabetes Association Standards for

Diabetes Education in Canada are vague, suggesting only that the education programs should include plans for follow-up (Standards for Diabetes Education in Canada, 1988/89).

The importance of continuous, regular, periodic assessment for those with diabetes is being emphasized more frequently (Graber, 1988). Knowledge diminishes from lack of use, peoples interests and concerns change, as do their lifestyles and situations. The diabetes treatment regimen needs to be revised and information updated. Strategies help to improve long-term behavior and adherence to treatment but they do not provide a panacea (Pichert, 1990). "The quality of education may be more important than the methods used" (Bartlett, 1985b. p. 668).

Mullen and Green, (1990) present a synthesis of literature on educational and behavioral interventions in clinical preventive medicine. Their findings show that if the five principles of education are used in selecting and implementing interventions, their effectiveness is predictable. The principles, based on educational philosophy, are adapted from Neufeld, (1976), who cited his source in the World Health Organization Study Group on Training and Preparation of Teachers in Schools of Medicine and Allied Sciences, (1973).

The principles are as follows:

1. Individualize: allowing the subject to set their own pace for learning and to have questions answered. Examples include: clarifying information following discharge, telephone calls, program instruction using a combination of audio and visual materials depending on personal characteristics.

2. Relevancy: providing content and methods that are meaningful to the subject's characteristics and situation. Examples that demonstrate this principle include assessing the subject's needs, abilities, and home situation. Providing material related to the subject cultural background or ethnicity are other examples.

3. Reinforce: any action that rewards a desired behavior, except for feedback. Praise, encouragement, and providing resource materials are examples of this principle.

4. Feedback: any action that demonstrates to the subject the amount of progress he/she is achieving. Examples include answering questions, self-monitoring, assessing acquired information.

5. Facilitate: means reducing the barriers to learning, so the subject can take action to achieve the behavior. Referral, resources and assisting subjects to integrate acquired information into their lifestyle would be examples of the application of this principle.

Summary: Health and health related behavior is complicated by many factors. Behavioral and lifestyle changes are necessary for those with chronic conditions. It follows that the education of those with chronic illness is a complex, on-going process. The literature indicates that a combination of interventions may be more effective in producing long-term changes in behavior than any single method. Health educators must be sensitive and innovative in meeting the varying needs of their subjects.

CHAPTER 3

METHODOLOGY

The design and the research method of this study are presented in this chapter. Sources of the data are outlined including the sample, the setting and a description of the program. The instruments used for collection of data are discussed, as are the procedures in data analysis.

Design of the Study

The purpose of this study was to determine if there is a need to reinforce diabetes knowledge and performance skills in individuals with diabetes, four to ten weeks following a diabetes education program. To accomplish this, the researcher met with the subjects four to ten weeks after they attended a Diabetes Education Program (DEP). At this time, the *Diabetes-Related Knowledge Quiz* was administered. Using criteria and score sheets, two performance skills, *Blood Sugar Monitoring* and *Meal Planning* were assessed. Finally, using a structured question format, the subjects were interviewed for their perceptions of the need for educational follow-up of knowledge and skills and how to obtain assistance.

Setting

The subjects were selected from those attending a comprehensive four-day diabetes education program, which is affiliated with a 1300 bed, active teaching hospital in Western Canada. The program is provided to individuals with diabetes and their relatives or friends on a weekly basis. Those who attend this Metabolic Day Care Center (MDCC) are referred by a physician, are able to learn in a group setting and are required to understand English or be accompanied by someone who does. The hospital is in an affluent section of the city and these subjects may be more advantaged than subjects in other programs in terms of education and income.

Approximately 14 individuals, the majority from Alberta, attend the course each week as out-patients. One or two of these may be in-hospital patients. The program is held Monday through Thursday from 0715 to 1515 hours during the year except for one week twice a year dedicated to a diabetes update for health professionals.

The staff at the center includes: a physician, two diabetic nurse educators, two registered dietitians, a social worker, two secretaries and a dietary technician. The director of the MDCC is an endocrinologist and the coordinator is one of the registered nurses.

During the program, subjects are expected to gain knowledge and skills in order to manage their diabetic condition when they go home. The program includes general information about diabetes, the treatment, and complications. The subjects gain experience in selecting their meals and snacks from food that is available at the Center. A physician sees the clients each day and a social worker provides counseling to families or individuals upon request.

While attending the MDCC, the subjects and their significant others are encouraged by the staff to practice self-management skills such as planning and selecting their meals, blood glucose monitoring and insulin administration. Group and individual instruction is provided by the nurse educators and the dietitians. Guest lecturers include: a person from the Canadian Diabetes Association; a specialist in exercise; and the social worker who talks about adjusting to the diabetes condition.

Sample

The convenience sample consisted of 36 individuals with diabetes mellitus who met the criteria and who volunteered to participate in the six month study (August 1991 and January 1992). The following criteria were used to select subjects for the study. They had to: a) be 18 years or over; b) have completed the diabetes education program; c) understand English; d) reside in the greater Edmonton area; e) have access to a phone; and f) consent to be in the study.

From this sample, two groups were identified. They included: those who are insulin dependent (IDDM) and those who are non-insulin dependent (NIDDM). The literature suggests these two groups differ in several ways. NIDDM subjects have a lower level of knowledge about their condition than IDDM; NIDDM may not take their health problem seriously; and health care providers spend more time with those who are taking insulin (Manning & Lee, 1988; Teza et al., 1988).

Instrumentation

To study the variables, knowledge, skills and characteristics of the sample, data was gathered using the following instruments: *Demographics for Subjects with Diabetes; Diabetes-Related Knowledge Quiz; Blood Sugar Monitoring Skill Checklist and Rating Scale; Criteria for Blood Sugar Monitoring; Meal Planning Criteria, Score Sheet and Food Intake Diary*. In addition, *Home Visit Questions* were developed to assess the subjects' perception of the need for reinforcement of knowledge and skills and their knowledge of resources.

Demographic Information

A *Demographic Information* (Appendix 3) instrument, developed by the researcher, included variables such as, age, gender, occupation, marital status, education, previous knowledge of diabetes, treatment of diabetes, family history, and limitations to learning. These are variables that may influence the subjects' diabetes knowledge and their ability to perform skills (Hanrahan, 1988). This information enabled the development of the subjects' profile.

Diabetes-Related Knowledge Quiz

The *Diabetes-Related Knowledge Quiz* (Appendix 4) was adapted from a 24 question true-false test. Gilden et al. (1989) established content validity, face validity and internal consistency of this instrument. Cronbach's alpha was used to measure reliability (0.69). To determine content validity, the authors administered the test to health professionals and compared their scores with patients.

This test was selected because validity and reliability were established and it was relevant to the diabetes education program. The test evaluated three areas of diabetes knowledge: a) general knowledge; b) nutrition; and c) pharmacy. Subjects were required to answer questions, true-false or not sure which assessed their level of confidence. Two marks were given for the correct response, one mark for "not sure" and no mark for an incorrect response. The test took 10 minutes to complete.

For the current study, the quiz was reviewed for content and face validity by three diabetes educators. Three individuals who had

completed the program agreed to complete the quiz. Some items were modified to relate more personally to the subject's experience or to enhance readability. Four questions were added to the quiz: two in the general knowledge section (questions 11 & 12) and two in the pharmacy section (questions 5 & 6). The questions were added because they were dimensions which had not been included in the original questionnaire.

Self-care Skills

The *Blood Sugar Monitoring Skill Checklist and Rating Scale*, adapted by the investigator, follows the manufacturers' recommendations for use of the product and the *Criteria for Blood Sugar Monitoring* are adapted from Yale (1989) (Appendix 5). Face validity and content validity were established by three diabetes educators. Prior to using the instrument in the study, three participants in the DEP agreed to perform this skill. The checklist was pilot tested at this time.

The *Meal Planning Skills Criteria* and *Meal Planning Skills Score Sheet* (Appendix 6) were adapted from an instrument developed by registered dietitians at the University of Alberta Hospitals Fitness Center. The instrument was used to score healthy food choices, which is also a goal of the DEP. A pilot test was not undertaken.

Criteria for assessing meal planning skills includes the:

1. extent to which the client followed the Canada Food Guide.
2. extent to which the client followed the recommended meal and snack pattern.
3. complex carbohydrates food choices.
4. fat content in the food choices.

Participants demonstrated meal planning skills by writing a seven-day meal plan in a *Food Intake Diary* (Appendix 6). There were 46 points allowed for each day, for a weekly total of 322 points. The purpose of the food record was to find out if subjects were able to apply the general concepts of meal planning given during the program and to assess their overall eating patterns.

Home Visit Questions

The *Home Visit Questions* (Appendix 7) developed by the researcher were based on course content and included: blood glucose

monitoring, meal planning, exercise, medication, foot care, and acute complications of high and low blood sugar. General questions were asked about the subject's personal need for follow-up, the timing of this follow-up and the form it might take. Two questions relating to knowledge of existing support services were also part of the interview.

Two diabetes educators reviewed questions for content and face validity. To improve the quality, suggestions for revisions, wording, and use of the questions were requested. The revised questions were pilot tested with two participants from the DEP who agreed to be interviewed one month following their attendance at the program. Changes were requested related to the relevancy to the course, the clarity of the questions and the length of time required to complete the interview. Adjustments were made based on the participants' suggestions.

Access to Sample

Approval to proceed with the study was obtained from the University of Alberta Hospital Ethics committees. To initiate the study, the researcher met with the nurse educators of the DEP to familiarize them with the purpose of the research and the selection criteria for the subjects. To select potential subjects for the following week, the researcher obtained client information, specifically related to the criteria, from the secretary. In this way, over a 15 week period, the researcher screened 75 subjects.

The names of the subjects were subsequently given to the Diabetes Nurse Educators. On the first day (Monday) of the DEP, the nurse educators routinely assess the needs of all program participants individually. During this assessment, individuals who were potential subjects were invited to participate in the study by the nurse educators of the MDCC who also screened the subjects for the study at this time. The subjects were given an *Information Letter* (Appendix 1) explaining the study. An appointment was made by the nurse educators for the researcher to meet with interested subjects while they were attending the DEP.

There was one week when no subjects were recruited because the principal contact at the MDCC was not available. In the remaining 14 weeks of participation, a range of one to six subjects were recruited per week (an average of approximately 3 subjects per week).

One of the surprises of the study was the willingness of most subjects to participate. Credit must be given to the nurse educators who played a major role in recruitment. There were some subjects who declined to participate, stating they were too busy, too stressed or were not interested.

Data Collection

During the program

The researcher explained to each subject, the purpose of the study and their role in it. This 20 minute explanation included information related to: the data collection process; the instruments to be used; the time involved; and confidentiality. Clients were informed that three to four weeks after the program, the researcher would contact them by telephone to arrange a visit, preferably a home visit, that was mutually convenient. When the study had been explained, participants were invited to ask questions.

Subjects who volunteered to take part in the study, signed a *Consent* (Appendix 2) and each was given a copy. A *Food Intake Diary* was provided to every subject along with an explanation on how to complete it. The diary is similar to one completed for the dietitian before the clients come to the program. Consenting subjects completed a card with their name, address, and telephone number. This information was used to make the appointment for the home visit. *Demographic information* from each subject was gathered at this time.

During the telephone call

Approximately four weeks following attendance at the DEP, each subject was telephoned. The researcher reminded the subject to complete the *Food Intake Diary*. An appointment was made for the interview, at a mutually convenient time.

For the most part, arranging the appointment for the interview did not pose a problem. In some instances, circumstances in the subject's life

delayed the appointment, illness, a death, shift work, or a busy life schedule. In some cases, the appointment had to be made at a time later than originally expected, or the interview was conducted by telephone.

During the home visit

Each subject completed the *Diabetes-Related Knowledge Quiz*. The researcher evaluated the *Blood Glucose Monitoring Skill* using the checklist. The *Food Intake Diary* was collected, reviewed and clarified with the subject at this time. Subjects were interviewed using the *Home Visit Questions*. The visits took approximately one hour. The responses were recorded using a tape recorder or paper and pencil.

Data Analysis

All instruments were handscored. Frequency distribution and percentages were calculated on the demographic variables for both groups. Selected measures of central tendency and variability were applied to the total scores and to each of the three sections of the *Diabetes-Related Knowledge Quiz*, the *Food Diary* and the *Blood Glucose Monitoring Skills*, including mean, mode, median, frequency, percentages and range. Some graphs were used to demonstrate the results more effectively. Frequency distribution was used to analyze the *Home Visit Questions*.

Summary

This chapter included the design and research methodology used in the study. Sources of data included the setting and the sample population and a program description. The research instruments were discussed, followed by the method of data collection. Validity, reliability and ethical issues related to these aspects of the study were addressed. Finally, the procedures used for data analysis were presented.

CHAPTER 4

RESULTS AND ANALYSIS

In this chapter, a summary of the study findings and the results of the data analysis as they relate to research questions are presented. The purpose of this study and the four research questions are outlined.

Statement of the Problem

The purpose of this study was to determine the perceptions of subjects with diabetes regarding their need for follow-up support and reinforcement of information four to ten weeks after completing a four-day diabetes education program (DEP). The following questions guided the research:

1. What knowledge and self-care skills do these subjects retain four to ten weeks following the four-day diabetes education program?
2. What do subjects perceive their needs to be for knowledge and self-care skills four to ten weeks following the four-day diabetes education program?
3. What knowledge of existing support services do the subjects have?
4. What type of support services do the subjects prefer?

Sample Characteristics

Sample Selection

During the designated data collection period, 44 individuals from the DEP who met the criteria, volunteered to participate in the study and signed the informed consent. A total of eight subjects did not participate in the project for a variety of reasons. Three declined due to illness, two went on vacation, two did not return the telephone calls and one had personal problems. Data were collected from the remaining 36 subjects August 1991 through January 1992.

Demographic Information

The frequency and percentage distribution of the subjects' gender, age, occupation and education are shown in Figures 1 to 4.

Gender. There were 20 (55.5%) females and 16 (44.4%) males (Figure 1). This distribution is typical of diabetes in the total population. Diabetes is more prevalent in females than in males (Lemay, 1988; Malin, Fitzgerald, Wall, 1965). Males and females in the IDDM group were divided equally (9 each). They included; eight Type 1 (six females / two males) and ten Type 2 (three females / seven males). In the NIDDM group, 11 of the 18 subjects were female.

Age. The age of both groups ranged from under 40 to over 70 (Figure 2). Five IDDM subjects and one NIDDM subject were under 40 years. Three IDDM and four NIDDM subjects were between 41-49 years, while four IDDM and seven NIDDM subjects were in the 50-59 year range. There were five IDDM and four NIDDM subjects between 60-69 and one IDDM and two NIDDM subjects over 70.

Occupation. A total of 17 (9 IDDM / 8 NIDDM) participants were employed (Figure 3). In decreasing frequency, 10 were retired, (4 IDDM / 6 NIDDM), six were homemakers, (4 IDDM / 2 NIDDM) and three were unemployed, (1 IDDM / 2 NIDDM). There were none who were students or who could be classified as 'other'.

Education. The academic attainment of the subjects was reported by the level of education (Figure 4). There were 34 subjects, (17 from each group) who had completed high school. Of those, four (2 in each group) reported having one University degree or more, five (2 IDDM / 3 NIDDM) had completed college or technical school, and two (one in each group) completed elementary school. These findings are typical of the Alberta population. The median number of years of formal education of Alberta's adult population is 12.4 (Statistics Canada, 1989/90).

Figure 1
Gender of Subjects

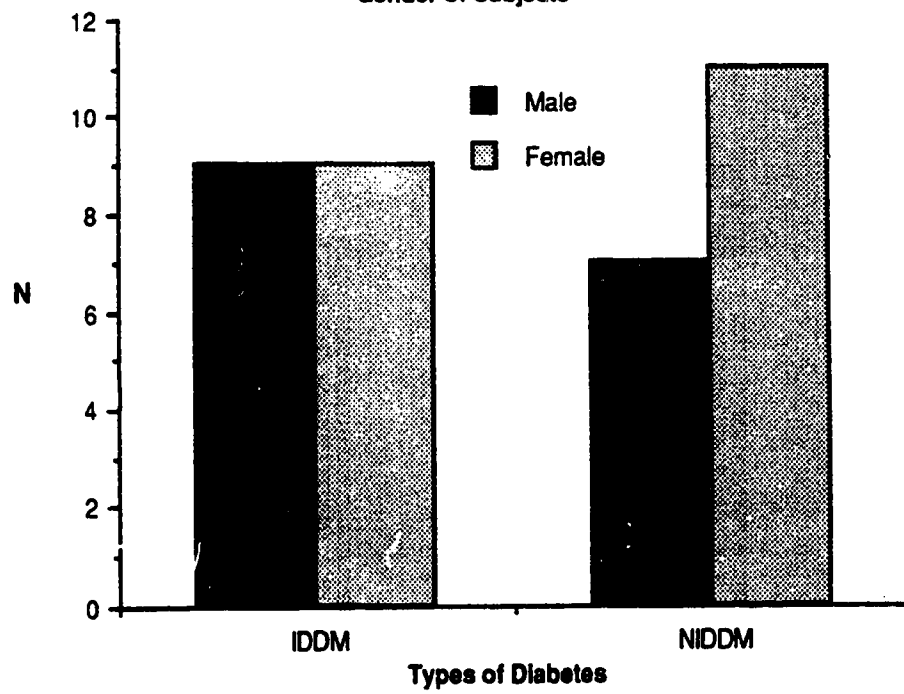


Figure 2
Age of Subjects

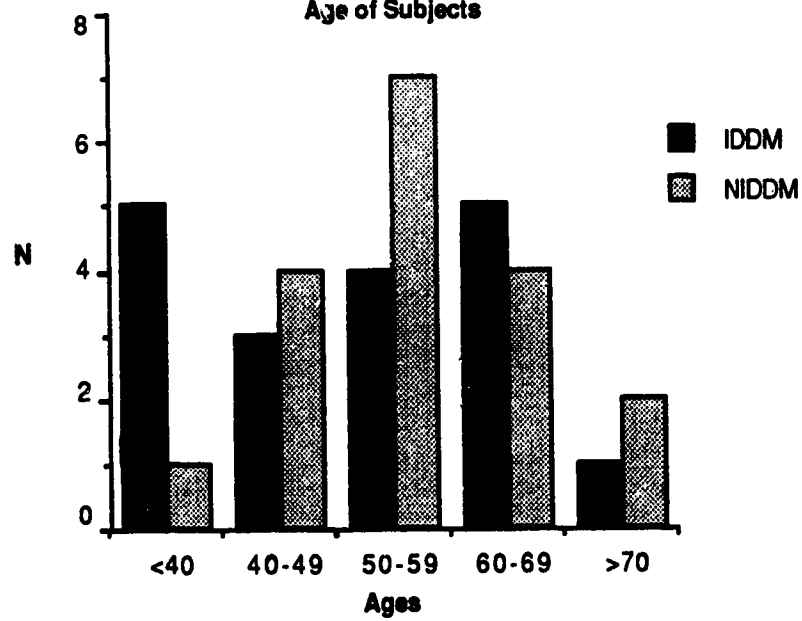


Figure 3
Occupational Classifications of Subjects

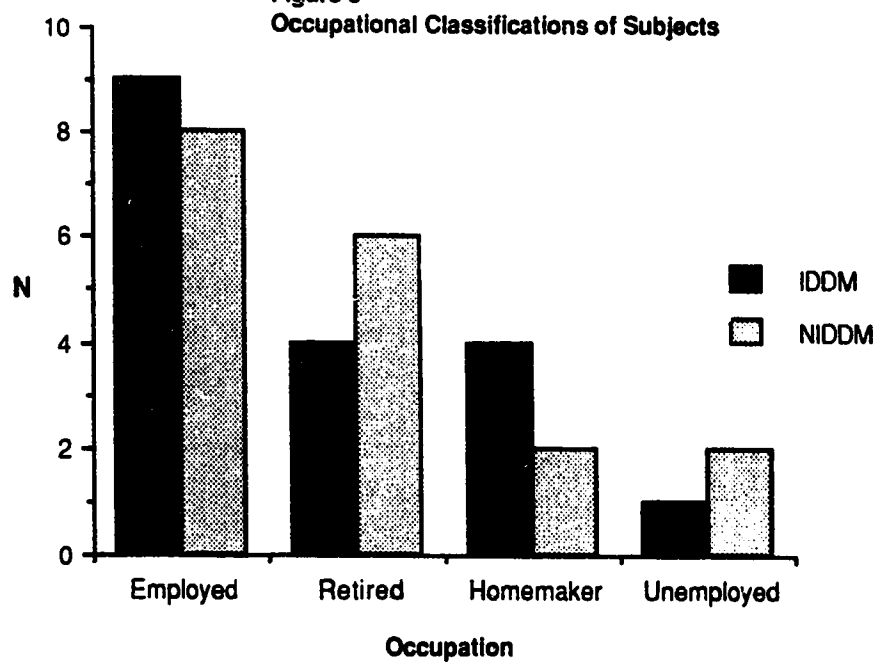
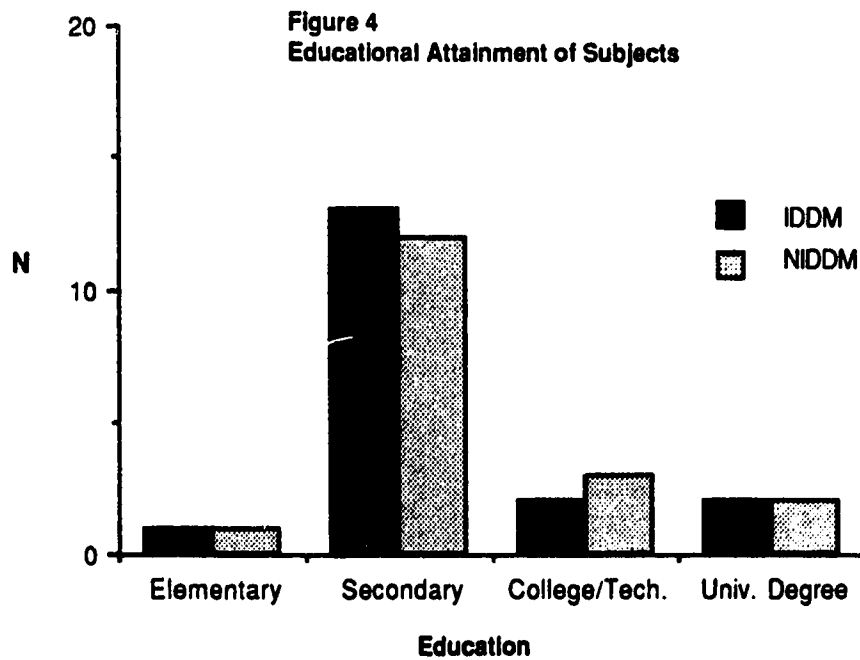


Figure 4
Educational Attainment of Subjects



Supporting Data

The supporting data were provided by the subjects' self-report. The frequency and percentage distribution summaries of nine variables are reported in Table 1. These items, identified in the literature, may affect the acquisition of knowledge and skills. The variables include: duration of diabetes, marital status, living with another person, visual or hearing defects, diabetes management, attended the diabetes education program with someone, lived with someone with diabetes, relatives with diabetes, attended a previous diabetes education program.

There were 16 subjects (3 IDDM / 13 NIDDM) who had diabetes for less than one year. Three subject (2 IDDM / 1 NIDDM) had this condition for one to three years. There were seven subjects (4 IDDM / 3 NIDDM) who had diabetes for four to ten years. The remaining ten subjects (9 IDDM / 1 NIDDM) had been diagnosed for more than ten years. Only three of the 36 subjects suffered any visual or hearing defects.

The marital status of the subjects was as follows: 15 males and ten females were married; one male and two females were single. Two females were divorced and six females were widowed and there were no males in these categories. Six subjects (1 male / 5 females) lived alone while an equal number of males and females (15) lived with other people.

In the group being treated with diet and insulin (IDDM), there were eight subjects (2 males / 6 females) who had developed diabetes (Type I) before the age of forty. Ten subjects (7 males / 3 females) who had late onset diabetes (Type II). In the NIDDM group, there were nine subjects (4 males / 5 females) on diet only. The remaining 3 males / 6 females were being treated with diet and diabetes pills.

The majority of subjects (24) were aware of a relative who had diabetes (11 males/ 13 females). However, only 12 subjects (5 males / 7 females) had lived with someone with this condition. There were 16 subjects (10 males / 6 females) who attended the diabetes education program (DEP) with a support person. Twenty subjects (11 males / 9 females) had not attended a DEP previously.

Table 1
Supporting Data

<u>Duration of diabetes</u>	<u>IDDM n=18</u>	<u>NIDDM n=18</u>	<u>TOTAL N=36</u>
< one year	3	13	16 (44%)
1 - 3 years	2	1	3 (8%)
4 -10 years	4	3	7 (19%)
10 + years	9	1	10 (28%)

<u>Marital status</u>	<u>married</u>	<u>single</u>	<u>divorced</u>	<u>widow/er</u>
Males n=16	15	1	0	0
Females n=20	10	2	2	6
Total	25	3	2	6

<u>Living with another</u>	<u>frequency</u>	<u>%</u>
Yes		
Males n=16	15	41.6
Females n=20	15	41.6
Total	30	
No		
Males	1	3.0
Females	5	14.0
Total	6	

<u>Diabetes management</u>	<u>frequency</u>	<u>%</u>
NIDDM		
Diet only		
Males	4	11
Females	5	14
Diet & oral agents		
Males	3	8
Females	6	17
Total NIDDM	18	50
IDDM		
Diet & insulin		
Type 1		
Males	2	6
Females	6	17
Type 2		
Males	7	19
Females	3	8
Total IDDM	18	50

Table 1
Supporting Data (Cont.)

<u>Hearing or seeing defect</u>	<u>frequency</u>	<u>%</u>
Yes	3	8
No	33	92
Total	36	

<u>Attended with another</u>	<u>frequency</u>	<u>%</u>
Yes Males	10	28
Females	6	16.5
No Males	6	16.5
Females	14	39
Total	36	

<u>Lived with someone with diabetes</u>	<u>frequency</u>	<u>%</u>
Yes Males	5	14
Females	4	11
No Males	11	30.5
Females	16	44
Total	36	

<u>Relative with diabetes</u>	<u>frequency</u>	<u>%</u>
Yes Males	11	30.5
Females	13	36
No Males	5	14
Females	7	19
Total	36	

<u>Attended previous program</u>	<u>frequency</u>	<u>%</u>
Yes Males	5	14
Females	11	30.5
No Males	11	30.5
Females	9	25
Total	36	

Diabetes-Related Knowledge and Self-Care Skill Results

In this section, the results of the Diabetes-Related Knowledge Quiz and the self-care skills evaluation are reported and analyzed as they relate to:

Research Question 1.

What knowledge and self-care skills do subjects with diabetes retain four to ten weeks following the four-day diabetes education program?

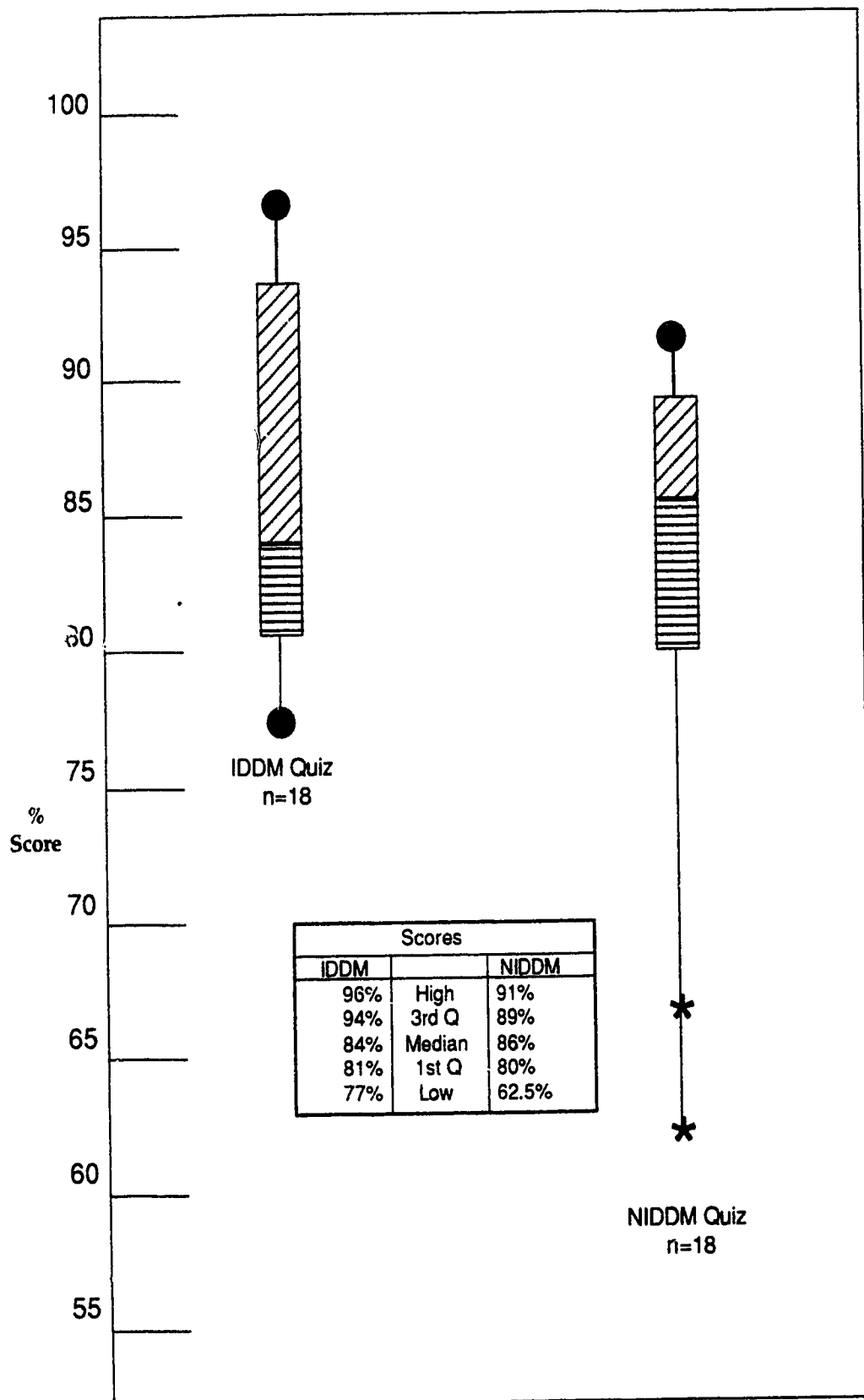
Knowledge Scores

The Diabetes-Related Knowledge Quiz was used to evaluate the subjects' knowledge of diabetes and its management. Total score for the quiz was 56. The range of scores for IDDM subjects for total knowledge was 43 (77%) to 54 (96%) and the median was 47 (84%). The range of scores for NIDDM for total knowledge was 35 (62.5%) to 51 (91%) and the median was 48 (86%).

The box and whisker graph (Figure 5) illustrates these data in a useful way to display differences in scores and to identify the subjects with extreme scores. The box is drawn so that the upper and lower boundaries are at the first and third quartiles. The line, drawn across the middle, is the median. Circles show the highest and lowest scores and are joined to the box by whiskers. The scores that fall one and a half box lengths beyond the upper or lower quartile, are marked by asterisks and are outliers (Erickson & Nosanchuk, 1977).

Using the NIDDM quiz scores as an example, the median (middle line) is 86%. The lower border of the box (first quartile) is located at 80% and the upper border of the box (third quartile) is located at 89%. The observations located one and a half box lengths (66.5%) beyond the upper or lower quartiles are different from the scores in the box. This graph illustrates that there are two NIDDM outliers at 66% and 62.5% and that the IDDM have more overall knowledge than the other group.

Figure 5 Diabetes-Related Knowledge Quiz Scores



The quiz had three parts; General Information, Nutrition and Pharmacy. The number of General Information items is 24; the median score for the IDDM was 20 (83%) and for the NIDDM was 21.5 (89.6%).

There are 20 Nutrition items on the quiz. The median score for the IDDM was 17.5 (88%) and for the NIDDM was 18 (90%) .

There are 12 Pharmacy items on the quiz. The median score for the IDDM group was 10.5 (88.5%) and the median for the NIDDM was 8 (67%) .

Self-Care Skills Results

There were five subjects (2 IDDM / 3 NIDDM) who did not perform the blood sugar monitoring skill. These five explained the procedure they followed for blood testing, the calibration and the cleaning of their respective machines.

A stem and leaf display was used to show the distribution of scores for Blood Sugar Monitoring (Table 2a) and the Food Diary (Table 2b). The display combines the characteristics of a bar graph and the data values of a table. The stem appears in the left column, and the attached leaves in the right column. The stem acts as the label for each line and provides the leading value to which the leaves are attached to recapture the original data values (Maguire, 1986). This method tells the number of cases that are on each stem and what the numbers are (Erickson & Nosanchuck, 1977).

Table 2a
Stem and Leaf Display
Blood Sugar Monitoring Skill Range (%)
(Stem: tens
Leaves: units)

IDDM n=16	NIDDM n=15
100: 0000	100: 0
90: 00122336	90: 1233
80: 0666	80: 00023569
	70: 29
(Median) Mdn = 92	Mdn= 85

Table 2a shows there is one row for each stem. In the bottom row, under IDDM, the row reads 80: 0666. The stem is 80 and the leaves are from 80 to 86. This means that one subject scored 80 (indicated by the "0"); three subjects scored 86 (indicated by the "6's"). The IDDM median score for Blood Sugar Monitoring was 92% and for the NIDDM was 84%. The median score for the IDDM group's Food Diary was 83.5% and the NIDDM score was 86.5%.

Table 2b
Stem and Leaf Display
Food Diary (%)
 (Stem: tens
 Leaves: units)

IDDM n=18	NIDDM n=18
90: 0013	90: 0114
80: 000345559	80: 0234677889
70: 03788	70: 389
	60: 2
	Mdn = 86.5
(Median) Mdn = 83.5	

A box and whisker display was used to compare the scores from the Nutrition part of the quiz and the Food Diary (Figure 6). The results of the Nutrition quiz and the Food Diary show that the NIDDM performance on both were slightly better than the IDDM, except that the NIDDM had two outliers on the quiz and one outlier on the Food Diary score.

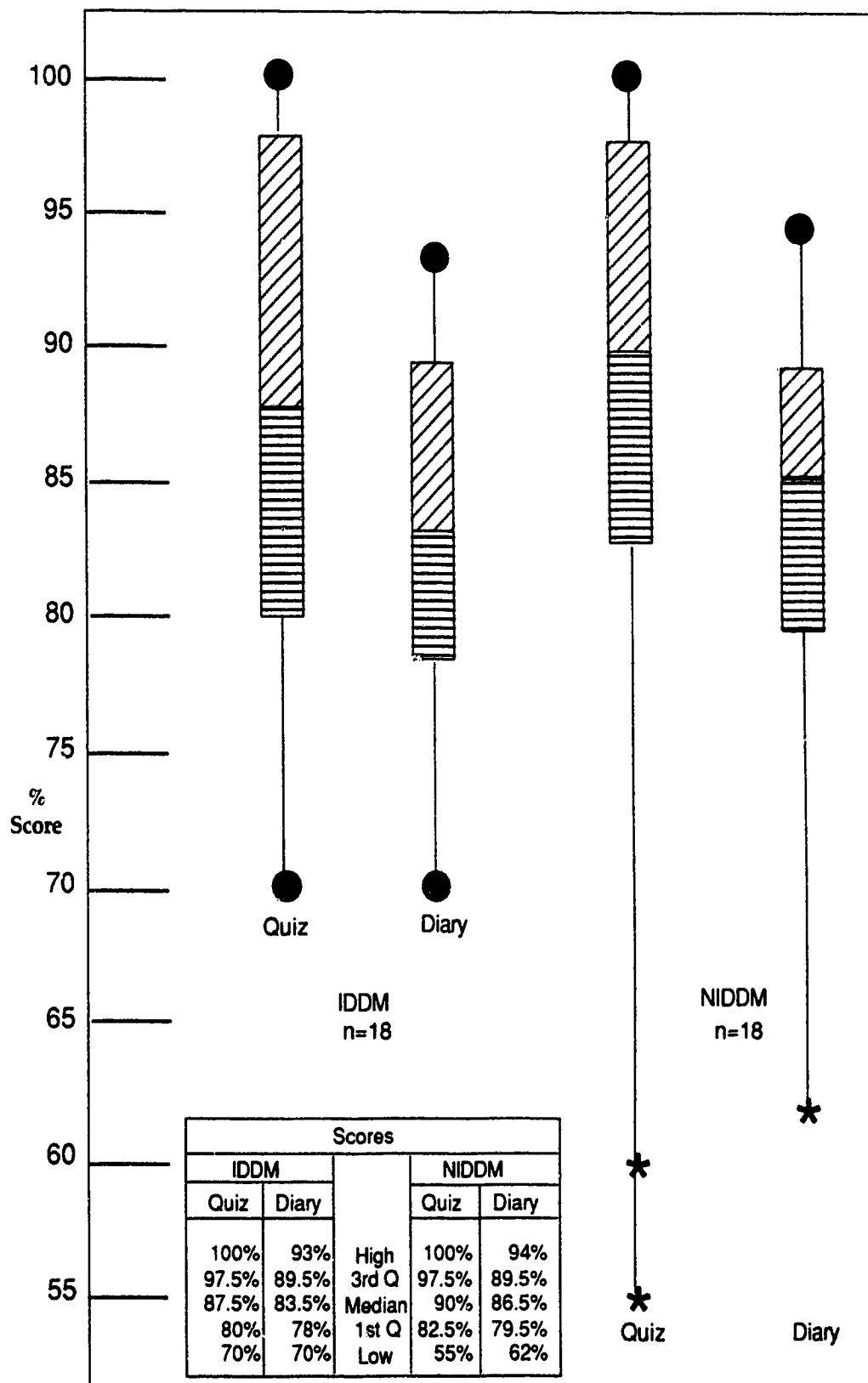
Home Visit Questions

The home visit questions contain seven content areas and include: blood sugar monitoring, meal planning, exercise, medication, foot care, and complications of high and low blood sugar. In this section, the results of the home visit questions are reported and analyzed as they relate to:

Research Question 2

What do clients perceive their needs to be for knowledge and self-care skills four to ten weeks following the four-day diabetes education course?

Figure 6 Nutrition Quiz and Food Diary Scores



Blood Sugar Monitoring (BSM)

The blood sugar may be tested by using a meter or visual test strips. At the time of the interview, all subjects had some method of testing their blood sugar. Twenty subjects (9 IDDM / 11 NIDDM) had meters that required the strip to be wiped. Thirteen subjects (9 IDDM / 4 NIDDM) had meters with strips that required no wiping, three NIDDM had no meter, but were using visual test strips.

Three aspects of using the meters were evaluated: the blood testing technique, the calibration, and cleaning. The blood testing technique was evaluated by the subject's adherence to the sequence of recommended steps. The calibration procedure is setting the meter to a particular standard. This procedure differs with each machine. Basically, the procedure requires the user to match the code in the meter with the code on the vial of test strips. The cleaning of each meter varies and some machines do not require cleaning.

Difficulty

When asked if they had difficulties with the blood sugar monitoring procedure, the 23 of the 36 subjects (13 IDDM / 10 NIDDM) stated they had no problem performing the blood testing procedure (Table 3). This group of subjects also knew how to maintain and calibrate their machines. Two older subjects over 70, one from each group replied they had difficulty; one NIDDM had recent cataract surgery and the other IDDM demonstrated his skill with the meter he owned, but expressed his preference for a simpler meter.

Table 3
Difficulty with Blood Sugar Monitoring

	Yes	No	Maybe
IDDM	1	13	4
NIDDM	1	10	2
Total	2	23	11

The remaining subjects (4 IDDM / 7 NIDDM), when asked about difficulties stated "No, but..." and were categorized as 'Maybe'. The difficulties

they related were meaningful to them as individuals and not to the procedures per se. These included:

1. hates to test because it makes the fingers sore
2. inability to get enough blood on the test strip
3. remembering to test
4. resented the cost of the test strips
5. unsure of how to read the visual strip, at times
6. questioned the frequency of testing (4 x / day) when the blood sugar is in the normal range

Probing revealed difficulties not necessarily perceived as such by the subjects. These were mainly related to the cleaning and the calibration procedures. Five subjects (1 IDDM / 4 NIDDM) were not aware of or did not remember receiving information related to calibration or cleaning of their meters and had not read the instruction manual.

One older NIDDM subject was unaware that the visual strips she was using were outdated and that she removed the blood from the strip incorrectly. Another NIDDM subject, who depended on his wife to do the blood test on him, had stopped testing altogether. The reason he gave was that his blood sugar was now normal.

In general, the blood testing procedure was performed satisfactorily by most subjects. The difficulties perceived by the subjects were relevant to their needs and less related to the meter procedures.

Accuracy

The subjects were asked how they knew the results they obtained from BSM were accurate. There are several quality control checks for accuracy that the subjects may perform. As previously described, calibrating the meter is one method of assuring accuracy. Other tests of accuracy include: visual backup; retesting; and the use of a checkstrip.

The visual backup means that after the meter provides the blood sugar reading, the test strip may be compared to a color chart. The rule of thumb is the darker the color, the higher the blood sugar reading. A total of 16 subjects (6 IDDM / 10 NIDDM) identified this as a test for accuracy (Table 4). Three of the meters used by subjects in this sample, do not provide this visual backup but rely on the meter for the reading.

Table 4
Monitoring Blood Sugar Accurately

	Visual Strip	Retest	Check Strip	Unsure	Other	Total
IDDM	6	2	3	2	5	18
NIDDM	10	1	2	4	1	18
Total	16	3	5	6	6	36

Retesting or repeating the blood sugar test, another test for accuracy, is not popular among those who dislike doing BSM. Three subjects (2 IDDM / 1 NIDDM) suggested this method of checking for accuracy.

One manufacturer provides the checkstrip test for accuracy. A control range of figures is installed in these meters, during the manufacturing process. At the time of purchase, a recommendation should be made to the purchaser to use the provided "checkstrip". For example, the meter range may be set between 4.2 and 5.7 millimoles. Daily use of the checkstrip will determine if the meter is reading within this range. There were (8 IDDM / 5 NIDDM) who owned this type of meter and 5 subjects (3 IDDM / 2 NIDDM) suggested it as a test for accuracy.

In total, 24 subjects responded that they could use these three tests for accuracy. Six subjects were unsure of how to check for accuracy and six subjects provided responses categorized as 'other '. Their responses included: a) they could feel when their blood sugar was low and therefore knew the meter was reading accurately; b) they trusted their meters; c) the meter had been checked in the MDCC.

One third of the subjects provided vague or no response to this question. Meters should be checked for accuracy on a regular basis. Subjective feeling or faith in the meter should be supplemented by objective tests for accuracy.

Use of Information

Fourteen IDDM subjects stated they would use the information obtained from blood testing to adjust their insulin. Four in this group did not adjust their own insulin but had their physician do it during a return medical visit. Of the 18 IDDM subjects, 8 said that they would also use the blood test as a way to monitor their food intake.

There were thirteen NIDDM subjects who stated that BSM was a method of regulating food intake. The remaining five stated that if their blood sugar was out of range and they had been following their meal plan, they would go to their physician. One subject had concluded that his blood sugar was kept within normal range because of exercise.

Confidence

When the subjects were asked if they were confident they were blood testing correctly 32 subjects (17 IDDM / 15 NIDDM) expressed confidence in their performance of this skill. The reasons they gave included:

1. attended classes previously
2. sufficient practice sessions were provided in class
3. followed the procedure as instructed

Of the four subjects (1 IDDM / 3 NIDDM) who expressed concern about blood testing, one lacked confidence due to visual problems. Another two questioned testing four times per day when the blood sugar was normal and one of these was unsure about reading the visual strip. The last subject was unsure whether assistance was available from the MDCC, if a problem developed.

Summary: Generally, the majority of subjects performed the BSM procedure very well. One older NIDDM who used visual test strips stated she had no problems. She was unaware that the strips were outdated and that the procedure she used to remove blood from the strip was incorrect.

Perceived difficulties included:

1. frequency of blood testing
2. unable to obtain enough blood for the strip.
3. establishing a new habit
4. cost of the test strips

5. unsure of reading the visual test strip
6. hated doing the test because the fingers became sore

Observed problems included:

1. calibration procedure
2. cleaning the meter
3. outdated strips/ incorrect removal of blood from strip
4. unaware of objective tests for accuracy
5. stopped testing when blood sugar normal
6. dependent on significant other to do the test
7. limited use of instruction manual

Meal Planning

For those with diabetes, balancing the amount and type of food with insulin and exercise is critical to the maintenance of good blood sugar control.

Difficulty

When asked if there was any difficulty following a prescribed meal plan the majority (28 subjects) expressed some kind of psychosocial difficulties (Table 5). Most subjects related more than one difficulty (30 IDDM / 34 NIDDM). The categories were similar for both groups except 2 NIDDM complained of food costs and 4 new NIDDM felt hungry. Two subjects stated that it had been a long time since they had felt hunger and it was not necessarily a negative experience. As a result of attending the class, all of these subjects now chose more appropriate foods to satisfy their hunger.

There were 8 individuals (4 IDDM / 4 NIDDM) who stated they had no difficulty following their meal plan. Reasons given for this included; that food was not important to them; they were not tempted by it; or they had no trouble disciplining themselves.

Twice as many IDDM than NIDDM said they found it difficult to resist the temptation of foods which would violate their dietary restrictions. More NIDDM than IDDM stated they felt their meals lacked variety. The reason for this may be that the information provided in class was too complicated or excessive and the subjects were unable to transfer it to everyday meals. Most stores do not provide food in small quantities,

and some couples or single subjects found purchasing food in small amounts a problem.

Changing old habits, an irregular lifestyle, and eating out are constant problems. A few subjects had not eaten out since they had attended class, due to unrelated circumstances or out of fear that they would not make the right choices. Planning and preparing balanced meals for a family, or for those who live alone, was another difficulty. Eating alone was viewed as a problem by single subjects or those whose family worked irregular hours. The miscellaneous category included the problem of feeling cheated and having to think constantly about whether a certain food was appropriate.

Table 5
Difficulty Following a Prescribed Meal Plan
for those with Diabetes

	IDDM	NIDDM	Total
To resist temptation	6	3	9
No problems	4	4	8
Changing old habits	3	4	7
Lack of variety	2	5	7
Irregular lifestyle	2	4	6
Eating out	4	2	6
Planning and Preparing meals	2	2	4
After dinner craving	3	1	4
Hungry	-	4	4
Eating alone	2	1	3
Cost	-	2	2
Miscellaneous	2	2	4
Total	30	34	64

Measuring and Selecting Food

When asked how they were doing with measuring and selecting food 34 subjects (17 IDDM / 17 NIDDM) responded positively, with comments such as no problem, "feel confident", "reasonably well", "it's a way of life". The wife of one person managed the selection and measuring because "if I didn't do it, he wouldn't bother".

Thirteen subjects (8 IDDM / 5 NIDDM) said that they had scales to weigh food. Of these, (2 IDDM / 3 NIDDM) said they measured food most of the time. Four stated it was a habit and one subject (NIDDM) stated that she weighed because she did not want to cheat herself.

The remaining 23 subjects (10 IDDM / 13 NIDDM) stated that they used the simpler methods of measuring, such as cups, spoons and relative sizes, suggested by the dietitians in class. One recently diagnosed NIDDM subject used all the methods of measuring so he would know the size of portions to take when he was eating out.

Two subjects (1 IDDM / 1 NIDDM) indicated they had difficulty with selection. One subject, formerly on oral medication for diabetes and now on insulin, stated that she was afraid to try food that was not on the food list. This is a list of foods in the five groups (grains/cereals; meats/cheese; fruits/vegetables; butter/ margarine; milk products). This subject had been given a simplified list by the dietitian, but was unable to apply the information to other food in the groups.

The NIDDM subject (an outlier) lived with his extended, ethnic family. He did not believe that diabetes was the problem that people made it out to be. Food was prepared by female family members who cooked ethnic food for the whole family. Even if he believed in diabetes management, selecting appropriate food would be difficult. He did say that he did not eat large portions.

Subjects who have knowledge of food groups and who have problem solving skills are usually able to select appropriate food. Comments related to selection of food choices for IDDM included:

1. If unsure of the food content, takes smaller portions or avoids the food
2. Lost the taste for sweets but likes salty snacks

Comments related to selection of food for NIDDM included:

1. Selecting recommended food difficult, due to cost
2. Follows the meal plan enough to maintain blood sugar in normal range
3. Making better choices since attending class

The responses were generally positive, expressing confidence in their ability to select and measure food well enough for their individual needs. Some subjects indicated they were still learning to integrate the meal plan into their lifestyle. Most of the comments reflect a reasonable attempt to adhere to the meal plan since completing the program.

Confidence in Measuring and Selecting Food

When the subjects were asked if they were uncertain about and believed they should know anything more about measuring or selecting appropriate foods, 13 subjects (6 IDDM / 7 NIDDM) said they were confident in their ability to select and measure food appropriately, at this time (Table 6). Three subjects (2 IDDM / 1 NIDDM) were unsure. One wondered if food labels were accurate; another expressed uncertainty about the fat content in certain food, such as peanut butter; one (NIDDM) did not understand the difference between the natural sugar and the added refined sugar in fruit juice.

Table 6
Confidence in Measuring and Selecting Food
for the Prescribed Meal Plan

	No	Yes	Yes with reason
IDDM	2	6	10
NIDDM	1	7	10
Total	3	13	20

The remaining 20 subjects (10 IDDM / 10 NIDDM) provided reasons why they were confident or not confident in their ability to perform these skills.

Summary of reasons:

1. The written meal plan is handy as a reference.
2. Meal plan is memorized.
3. Wife helps select and measure food.
4. Enough information provided in class
5. Confident in knowledge, uncertain about ability to follow meal plan.
6. No problem at home.
7. Four male subjects (1 IDDM / 3 NIDDM) who had lost an amount of weight, were uncertain why they were unable to lose any more, even though adhering to their meal plans.

The written meal plans, support person, skills learned in class, and memorizing their meal plan helped subjects sustain their behavior four to ten weeks following diabetes education.

Confidence in Food Selection When Eating Out

There were 11 subjects (5 IDDM / 6 NIDDM) who expressed confidence in their ability to select and measure food when eating out, but all subjects had concerns about this situation.

The following summarizes the comments related to this topic:

1. Constantly have to make thoughtful choices (4 IDDM/6 NIDDM).
2. Food was tempting but tried to make appropriate choices (4 IDDM / 3 NIDDM).
3. Concerned about ingredients in food combinations (3 IDDM)
4. Didn't follow meal plan when eating out (1 IDDM/ 2 NIDDM).
One IDDM allowed herself one free day per week.
5. Easier to eat out with advanced knowledge (2 IDDM / 1 NIDDM).
6. Appropriate choices were not always available (1 IDDM/ 2 NIDDM).
7. A frightening experience because of the temptation or fear of making the wrong choice (1 IDDM/ 1 NIDDM).
8. No problem-hadn't eat out much (1 IDDM/ 2 NIDDM).
9. Friends (Host) try to accommodate diet needs (1 NIDDM).

Confidence in Food Selection When Ill

When the subjects were asked how they would manage if they were ill, the IDDM knew more about food selection on sick days, than the NIDDM (Table 7a). Most people prefaced their statements with "I'm hardly ever sick". Subjects frequently indicated they would deal with it when they became ill.

Table 7a
Food Selection on Sick Days

		Knows	Partially Knows	Forgot
IDDM	n=18	11	4	3
NIDDM	n=18	6	5	7
Total		17	9	10

A total of seven subjects from both groups said they had the reference from class for this topic at hand, and four from the two groups said they would go to the doctor after a day or two, but none of these could remember exactly how to treat themselves when ill. When these figures were divided by gender, the females knew more about selecting food during illness than the males (Table 7b).

Table 7 b
Food Selection on Sick Days by Gender

		Knows	Partially Knows	Forgot
Males	n=16	3	6	7
Females	n=20	9	7	4
Total		12	13	11

Exercise Difficulty

The responses to the question of whether regular exercise (20 minutes, 3 times per week) was difficult are summarized in Table 8. Nine subjects stated they were not interested in exercising. There were twenty who stated they exercised regularly, while eight subjects claimed that the exercise they did was unplanned, which meant activities of daily living or working. The following reasons were given for not exercising; the weather, particularly the winter, didn't like it, and fear of the effects.

Table 8
Difficulty Adhering to a Regular Exercise Schedule
 (20 minutes 3 x / week)

	Yes Difficulty	No Difficulty	Unplanned Exercise
IDDM	3	9	6
NIDDM	6	11	1
Total	9 (25%)	20 (55%)	8 (22%)

Effects of Exercise on Blood Sugar

When asked if exercise effected their blood sugar, 20 subjects (14 IDDM / 6 NIDDM) stated they had experienced the symptoms of low blood sugar as a result of exercise and had monitored their blood sugar simultaneously observing these effects (Table 9). This question was asked because subjects who have experienced the positive consequences of exercise may be more inclined to exercise and to practice it safely more often than those who have not experienced the benefits. On the other hand, subjects who experience the negative effects of exercise, may be discouraged from exercising.

Table 9
Effects of Exercise on the Blood Sugar

	Yes	No	Unsure
IDDM	14	-	4
NIDDM	6	1	11
Total	20	1	15

Use of Information

The information about exercise provided in the MDCC class emphasizes the benefits of exercise for those with diabetes and the safety precautions to take. All subjects, from both groups who exercised regularly, had experienced its benefits and stated that they felt better for exercising. The nature of the responses differed between the two groups.

The 14 IDDM said that they planned exercise after eating and/or carried extra food, indicating that they knew how to prevent and treat symptoms of diabetes resulting from exercise, if they developed (Table 9). Six of these IDDM subjects chose not to adjust their insulin dose for exercise and two subjects indicated that they would adjust their insulin dose, if necessary. The remaining six subjects did not mention adjusting insulin as a method of managing exercise.

The four IDDM subjects who were unsure of the effects of exercise on their blood sugar, knew that exercise was beneficial, but could not remember exactly why. They did not remember the problems that exercise might cause or how to prevent them. These subjects did not participate in any planned activity.

The 11 NIDDM did not know the effects of exercise on their own blood sugar but remembered the safety precautions received in class on how to treat the side effects of exercise should they develop. They were told in class to carry food when they were away from home or when exercising, and to plan activity after eating. All of these subjects said they tried to remember to practice all or some of these suggestions. One elderly subject said, she exercised three times a week because she had been instructed to do so and felt better for it. She had forgotten the possible effect of exercise on the blood sugar and how to prevent it.

Summary: All the IDDM subjects except four were knowledgeable about the benefits of exercise and knew of some way to manage it. The four who were not aware of the effects of exercise on their blood sugar and who had forgotten the reasons for exercising, managed it by not exercising. All the NIDDM but one claimed to remember the instructions about exercise provided in class and said they tried to practice the suggestions although most of them were unaware of the effects on their blood sugar.

Confidence

When the subjects were asked if they were unsure about anything related to exercise that they believed they needed to know, 13 IDDM stated they were certain they understood what they needed to know for the exercise they did. Five of these had concerns. In the NIDDM group, 13

affirmed confidence in their knowledge about this subject while five claimed to have uncertainties.

IDDM Concerns

One recently diagnosed subject was uncertain about what his body needs were during exercise, two subjects were unsure if they needed to know more about the effects on their body of a specific kind of exercise, such as weight lifting. One was unsure of adjusting the insulin dose. One subject was afraid to exercise due to the consequences of low blood sugar reaction which she experienced. With reactions, she had a tendency to eat until her normal feelings returned, rather than taking a certain amount of food and then waiting for her blood sugar to increase.

NIDDM Concerns

One subject was concerned about being able to treat the effects of exercise in time; one wanted to know if she could test her blood sugar after exercise which was not at the regular testing time; two subjects knew that exercise benefited the condition, but did not remember why; one did not remember the effects of exercise on blood sugar.

Summary: About half the subjects in both groups reported exercising regularly. Many knew the benefits of exercise but some were not aware of the effects of exercise on their blood sugar. The IDDM were more knowledgeable and confident in their ability to manage exercise although most of the NIDDM remembered some safety precautions they received in class.

Medication

Insulin

There were 18 IDDM subjects (eight Type I / ten Type II). Nine of these individuals (two Type I / seven Type II) were put on insulin prior to or during the DEP.

Difficulty

Each morning, during the DEP, all of the subjects requiring insulin, have the opportunity to draw and administer their own insulin with assistance until confidence and skill mastery are demonstrated.

When asked if they had difficulty measuring insulin, 13 subjects said they did not. Two older subjects found this procedure simplified since using an insulin pen and one found drawing insulin from a single bottle (pre-mixed insulin) easier. Initially, one subject required family assistance because of a temporary visual impairment due to the diabetes. Establishing a new habit of two injections a day had been a problem for one subject.

Confidence in Measuring Accurately

The majority of subjects (15) thought they drew their insulin accurately. One subject claimed to have overdrawn the dose, at first, but had corrected this problem. Those subjects (2) using insulin pens, found they could dial the dose easily.

Use of Information

When asked how they used the information about insulin provided in class, the nature of the responses were different between the two groups of insulin dependent subjects. All of the Type I subjects (8) indicated they found the class on adjusting the insulin dose to be beneficial. One subject who had not attended any diabetes education classes for 15 years was enthusiastic about using this new concept. Five of these subjects suggested they had found knowing the peak action of insulin valuable, as they had forgotten the details or the information was new.

Six of the ten Type II subjects stated that they would use the guidelines learned during the DEP, to adjust their insulin dose. They felt confident about managing minor blood sugar fluctuations by adjusting their dose. Two of the remaining 4 subjects, who were new on insulin, said their blood sugars were normal and they had not adjusted their insulin dose, during this time. Two others did not feel comfortable adjusting the dose by themselves. Two of this total had received help by telephone from an in-hospital diabetes educator to adjust their insulin dose.

Confidence in Using Insulin Safely

There were 15 subjects who indicated they were confident that they gave insulin safely. Two of this group added they had no uncertainties as long as their present treatment regimen did not change. One person was still afraid that she might not be administering insulin safely.

Two questions about safe insulin administration were:

1. If there was a problem with insulin administration was the MDCC accessible for questions?
2. What do you do if you forget to take your insulin?

Oral Medication

Difficulty

Initially, there were 8 subjects on oral medication. When asked if there was any difficulty taking the oral diabetes medication, one subject had to have this medication discontinued by the family physician, as a result of low blood sugar. Two others had their dose reduced for the same reason. The remaining five subjects had no difficulties with their medication.

Confidence in Taking Medication Safely

Six of the seven subjects on oral medication stated they were confident about taking their medication safely. One older subject had taken a double dose of medication to compensate for a larger than normal breakfast, and subsequently experienced low blood sugar, which was remedied by the intake of food. Since that experience she had taken the prescribed dose and followed the meal plan very closely.

Foot Care

Difficulty

There were 17 IDDM who had no difficulties and one stated the neuropathy in his feet had improved since starting insulin. In the NIDDM group, 13 subjects stated they had no problems with their feet. Five NIDDM subjects had foot conditions that are potential problems for those with diabetes. The problems included: numbness, burning, calluses and cracked heels, chronic ingrown toenails, and the inability to cut toenails due to poor vision. These subjects were aware of the inherent problems and were attending to their feet.

Confidence in Providing Foot Care

All of the IDDM subjects (18) had confidence in their own ability to care for their feet or to judge whether they needed additional assistance if foot problems developed. Several subjects said that the films presented in class had been explicit. There were 17 NIDDM subjects who had no difficulty with foot care. One NIDDM subject did not believe that the kind of care suggested in class was necessary on a daily basis.

High Blood Sugar (HBS)

All 36 subjects had high blood sugar before being diagnosed. If the prescribed treatment is followed, the blood sugar should be brought under control. All subjects were asked if they had experienced this problem since starting their treatment. There were more subjects who had not experienced this problem. Table 10 summarizes their responses.

Table 10
Subjects Experiencing High Blood Sugar
since Beginning Treatment

High Blood Sugar (HBS)	Yes (Group A)	No (Group B)	Total
IDDM	9	9	18
NIDDM	3	15	18
Total	12	24	36

Difficulty with HBS - Group A

Group A subjects (12) who responded 'yes' were asked what difficulties they had as a result of HBS. They responded by providing the cause of this problem: irregular lifestyle, overeating, uncontrolled appetite and cravings, not blood testing regularly, physical illness, stress, attitude, having to start on insulin.

Use of Information to Treat HBS - Group A

All of the subjects in Group A provided appropriate responses related to using the information provided in class: adhere to meal plan, blood test, go to the doctor if treatment was not working. The IDDMs added they might adjust their insulin dose, if warranted. Further comments included:

1. adjusting insulin dose does not solve the problem of overeating.
2. regular blood testing is better than relying on feelings to detect extremes of blood sugar.
3. adjusting insulin provides more freedom and independence.

One subject had considered the strategies to reduce blood sugar provided in class, but admitted that he had not been able to practice them successfully.

Use of Information to Treat and Prevent HBS - Group B

The IDDM (9) in Group B said they knew what to do to treat HBS based on the information received in class. Upon probing, four subjects had limited knowledge about the causes and symptoms.

There were 15 NIDDM who had not experienced HBS. Five of this group said they would just go to their physician if the problem persisted. Five NIDDM said they would follow the recommended treatment. Four did not remember hearing about this subject at all and one did not want to know.

When the subjects in Group B were asked how they would prevent HBS, 9 IDDM said they would follow the treatment plan, giving examples of the actions they would take.

There were 14 NIDDM in this group (13 recently diagnosed) who said they knew that following the recommended treatment would prevent HBS. One did not know. Additional comments included:

1. the treatment works for you.
2. in two weeks my blood sugar returned to normal.
3. modify your lifestyle to include the treatment.
4. accept the diagnosis and be positive.
5. if you follow the treatment and your blood sugar remains high, go to the doctor.

Confidence in Preventing and Treating HBS - Group A

All the NIDDM (3) in this group were confident they knew how to treat and prevent HBS. The IDDM (9) were confident in their knowledge of prevention and treatment, but practicing a few of the strategies was a problem for some. One was afraid to adjust insulin dose. One admitted he had never accepted his diabetes and was not committed to following

the treatment. His blood sugar remained high. Another who had rejected the diagnosis for ten years said, the sooner you can accept the diabetes and follow the treatment, the better you feel.

Confidence in Preventing and Treating HBS - Group B

The nine IDDM were confident that following the prescribed treatment would prevent HBS. All of the subjects said they felt confident about how to treat this problem.

Seven of the NIDDM said they were confident they knew how to prevent and treat HBS. One did not know. The remaining seven had questions about the causes, the symptoms and the treatment of HBS.

Low Blood Sugar (LBS)

A total of 25 subjects (Group C) had experienced low blood sugar (LBS). Those who had not experienced this problem are Group D. Table 11 summarizes the results.

Table 11
Subjects Who Have Experienced
Low Blood Sugar

Low Blood Sugar (LBS)	Yes (Group C)	No (Group D)	Total
IDDM	15	3	18
NIDDM	10	8	18
Total	25	11	36

Difficulty with LBS - Group C

Five of the 15 IDDM who experienced LBS, said that it had not been a problem. Another six subjects had been able to treat the first physical symptoms quickly or had identified it when monitoring blood sugar. Four subjects stated that they had difficulty with severe reaction. The following comments describe their feelings during a LBS reaction. It causes:

1. panic and she continues to eat until she feels better.
2. 'butterflies' in the stomach and you know your brain isn't working.
3. random thought patterns and being physically incapable of action.
4. forgetting and an inability to move physically.

There were 10 NIDDM who were able to recognize and treat the LBS quickly. Two of these subjects had been frightened by the severity of their reaction. Another stated he had discovered the LBS when monitoring, but did not feel any symptoms.

Use of Information to Treat LBS - Group C

All the subjects in Group C responded appropriately to this question. The IDDM responses reflect greater insight into managing LBS than the NIDDM.

NIDDM responses:

--take some juice or quick acting sugar

IDDM responses:

--take a sweet followed by a starch

--carry food with you, when away from home

--try to prevent LBS by following the treatment plan

Use of Information to Treat LBS - Group D

All subjects in Group D who had not experienced LBS responded that they would take something sweet. They provided examples of the kinds of food that would be suitable.

Confidence in Prevention and Treatment of LBS - Group C

All the subjects who experienced LBS (15 IDDM / 10 NIDDM), expressed confidence in knowing how to prevent this problem. All IDDM subjects (15) in Group C, were confident they knew how to treat LBS and that they would probably adjust their insulin dose. Three subjects expressed uncertainty at being able to treat themselves, in the event of a severe reaction.

NIDDM subjects (10) specified the reasons for their LBS. These were a) not eating before exercise; b) taking an extra diabetic pill; c) forgetting to snack; d) not eating on time; and e) not following the treatment plan.

Confidence in Prevention and Treatment of LBS - Group D

All subjects in Group D (3 IDDM / 8 NIDDM) stated that if they followed the recommended treatment, they believed LBS could be prevented. The three, recently diagnosed and elderly IDDM, expressed confidence in their ability to treat this problem. None of these mentioned

adjusting insulin dose as an aspect of treatment perhaps because they went to their physician to have this done. All the NIDDM in this group stated they would be able to manage LBS except one who was uncertain about recognizing it.

Knowledge and Preference of Resources

In this section the results and analysis of the client's knowledge of resources as they relate to Research Questions 3 & 4 are reported.

Research Question 3

What knowledge of existing support services do subjects have?

Research Question 4

What type of support services do subjects prefer?

Blood Sugar Monitoring

When the subjects were asked the resource they would contact if their meters were not measuring the blood sugar test correctly, a total of 25 subjects (13 IDDM / 12 NIDDM) replied with a single answer. The remainder provided more than one response (5 IDDM gave 14 responses / 6 NIDDM gave 11 responses). Table 12 summarizes the responses.

Table 12
Knowledge of Resources for Blood Sugar Monitoring

<u>Resources</u>	<u>IDDM</u>	<u>NIDDM</u>	<u>Total</u>
Seller	10	8	18
MDCC	6	2	8
Family Physician	3	3	6
Instruction Manual	4	2	6
Manufacturer	2	2	4
Drugstore	-	3	3
Canadian Diabetes Association (CDA)	1	1	2
Medicenter, Laboratory	-	2	2
Self	1	-	1

When asked who they would prefer to contact if their blood glucose machine was not working 28 (14 IDDM / 14 NIDDM) preferred the

resources selected in the previous question. Exceptions to this were five subjects (3 IDDM / 2 NIDDM) who preferred the MDCC because they "dealt with this all the time". One of these subjects questioned if MDCC was available as a resource after classes. Two subjects mentioned the "self" as the preferred reference and one did not have a preference.

Meal Planning

When asked who they would contact if they were having difficulty with the meal plan, 31 subjects stated that they would contact the dietitian at the MDCC because they had been invited to do so. Four said they would call their family physician and one was not sure. Thirty four subjects said they preferred the dietitian at the MDCC, one preferred individual problem solving and one preferred the family physician.

Exercise

Table 13 summarizes the subject's responses when asked if they could identify any resources in the community that provide exercises which they might use.

Table 13
Knowledge of Resources for Exercise

	Identified community resources	Could not identify community resources	Total
IDDM	15	3	18
NIDDM	13	5	18
Total	28	8	36

Table 14 summarizes the kind of exercise the subjects preferred.

The majority of subjects stated they preferred an independent choice of activity such as: working around the house, outdoor activities, stationary bicycle. Eight subjects preferred walking. Five subjects were actively using a community resource at the time of the interview. Nine subjects were not interested in exercise because they: lacked motivation, did not like to exercise, or did not like to exercise alone.

Table 14
Exercise preference

	Independent	Walking	Community Resources	No Interest	Total
IDDM	8	4	3	3	18
NIDDM	6	1	2	6	18
Total	14	8	5	9	36

Medication

Insulin

There were a total of 18 subjects who were using insulin to treat their diabetes. When asked who they would contact if a problem related to insulin administration developed, 11 subjects stated someone with expertise in this area, such as a diabetes nurse or physician or the MDCC. Five subjects said they would go to their family physician. Two individuals who lived in the rural area said they would contact the community nurse.

When asked who they would prefer to contact with this problem, 15 subjects said a diabetes expert who was accessible. Three subjects preferred their family physician. Two of this total specified that they would not go to their family physician with this problem.

Oral Medication

There were nine NIDDM subjects were being treated with oral diabetes medication. When asked who they would contact, if a problem related to their medication, developed, all of these individuals stated they would contact their family physician and preferred this resource.

Foot Care

For problems related to foot care, all subjects, in both groups said they would go to their family physician or a foot doctor depending on the problem. In both groups, the subject stated they preferred these same resources.

Uncontrolled Blood Sugar

When asked who the subjects would contact if they were unable to control their blood sugar, two resources were cited by both groups: MDCC

and the family physician. There were ten IDDM subjects who stated they would contact the MDCC while seven subjects said they would contact their family physician for uncontrolled blood sugar (Table 15a). When asked who they would prefer to contact for this problem 12 IDDM said the MDCC and six preferred their physician (Table 15b). The IDDM gave the following reasons for consulting the family physician with this problem: a) a referral would be made if needed; b) the cause of the uncontrolled blood sugar would be determined; c) they trusted their family physician; d) their physician was accessible.

Table 15a
Resources to Contact for
Uncontrolled Blood Sugar

	MDCC	Family Dr.	Either	Total
IDDM	10	7	1	18
NIDDM	4	14	-	18
Total	14	21	1	36

In the NIDDM group, four subjects stated they would contact the MDCC and 14 subjects would consult their family physician with this problem (Table 15a). Six NIDDM stated that they would prefer to contact the MDCC while 10 preferred to consult their physician for the problem of uncontrolled blood sugar. The reasons for going to their own physician were: a) a referral would be made if needed; b) their physician was accessible; c) they had been instructed to do so.

Table 15b
Preferred Contact for
Uncontrolled Blood Sugar

	MDCC	Family Dr.	Either	Total
IDDM	12	6		18
NIDDM	6	10	2	18
Total	18	16	2	36

Need for Follow-up

When asked if they had a personal need for follow-up, five of the 18 IDDM subjects (28%) responded negatively (Table 16).

1. One subject was still trying to integrate the new concepts into her lifestyle, but wondered if the MDCC was accessible following the DEP.
2. Another subject would contact his own physician for advice regarding follow-up education.
3. One other stated that unless his regimen changed or he had to travel, he could manage independently.
4. Two subjects had several return visits to the clinic physician for insulin adjustment, but neither seemed to consider this follow-up.

Table 16
Subjects Perceived Need for Follow-up

Follow-up	Yes	No
IDDM	13	5
NIDDM	<u>10</u>	<u>8</u>
Total	23 (64%)	13 (36%)

There were eight of the 18 NIDDM subjects (44%) who responded 'no', when asked if they had a personal need for follow-up. All of these subjects were newly diagnosed (6 males /2 females). They all stated that they believed if they followed their treatment regimen, i.e. the meal plan, and no changes occurred, they would manage. This number included one male who did not believe diabetes was a problem and one female who said she had not been 'invited' back for follow-up.

When asked what kind of follow-up they would prefer, seven IDDM subjects suggested a half to one day program one to six months following the education program. The purposes of this visit would be to assess progress, to adjust treatment and to have diet counseling. The range suggested for a follow-up refresher course was one to four years with the majority favoring one to two years. Ten NIDDM proposed various times for follow-up to occur ranging from 3 months to two years. The majority of these favored a return after one year.

Reasons Suggested for Follow-up

1. To motivate in helping regain control
2. To update information, skills, new trends, products, etc.
3. To review forgotten information
4. To discuss feelings
5. To check progress and revise goals
6. To provide advanced information, not repeat the same classes
7. Assist with integrating treatment into lifestyle
8. To correct misunderstandings

Suggested Methods

1. Telephone access would be helpful.
2. Group experience: 10-12 people discussing issues, sharing information and problem solving, with fewer lectures.

Summary

A summary of the findings and the analysis of the data as they related to the four research questions have been discussed. Included are the sample characteristics, the results of a diabetes-related knowledge quiz and two self-care skills, blood sugar monitoring and the food diary.

The analysis includes data from the home visit interviews involving seven content areas: blood sugar monitoring, meal planning, exercise, medication, foot care and the complications of high and low blood sugar. In addition, the subjects' knowledge of the available resources and their preferences were analyzed. Conclusions, discussion and recommendations are addressed in Chapter 5.

CHAPTER 5

CONCLUSION, DISCUSSION AND RECOMMENDATIONS

A summary of the thesis, conclusions, discussion and recommendations for the study are presented in this chapter. The first section includes a summary of the purpose, methodology, data analysis and findings of the study. The conclusions and discussion are presented in the second section. The recommendations are in the final section.

Summary of Thesis

Purpose

The study was designed to gather information about the subjects' perceptions of the need for follow-up support for learning, four to ten weeks after a Diabetes Education Program. Follow-up reinforcement of knowledge and skills has seldom been a systematic part of a DEP. Those people with chronic diseases, such as diabetes, are required to integrate complex, self-care practices into their lifestyle to maintain health. Health related behaviors are influenced by a variety of factors which help or hinder the performance of these demanding self-care behaviors.

Methodology

Design of the Study

To gather data for this study, the researcher met with the subjects four to ten weeks following the diabetes education program. The subjects were given a Diabetes-Related Knowledge Quiz. Using criteria and a score sheet, two self-care skills: Blood Sugar Monitoring and Meal Planning were assessed.

A structured question format was used to interview each subject. The interview questions related to the content material from the diabetes education program. Finally, the subjects' knowledge of resources and preference for accessing them.

Sample

The subjects were selected from those attending a four-day diabetes education program. Data were collected from a convenience sample of 20 females and 16 males who met the selection criteria. Two equally distributed groups were identified and included: those with insulin dependent diabetes mellitus (IDDM) and those with non-insulin dependent diabetes mellitus (NIDDM).

Nine subjects, in the NIDDM group, were being treated by meal planning alone and the remaining nine were treated by meal planning and oral diabetes pills. The IDDM subjects were further grouped: eight with Type I and ten with Type II diabetes. Type I diabetes, is usually diagnosed before the age of 40 and necessitates treatment with insulin.

The age ranged from under 40 to over 70 with most subjects in the 50-59 year range. One half of the subjects were employed and one third were retired. All subjects except two had completed high school. There were 16 subjects who had been diagnosed for less than one year and 10 subjects who had diabetes for more than 10 years.

70% of the subjects were married and 80% did not live alone. Most of those who lived alone were female. 70% of the females attended the MDCC alone while 63% of the males were accompanied by a support person. 24 of the 36 subjects knew a relative with diabetes but had not lived with anyone with this condition. More than one half the subjects had not attended DEP previously.

Data Collection

During the program, demographic data were collected. Consenting subjects were provided with a Food Intake Diary to complete prior to the interview. Four to ten weeks after the program, the subjects were telephoned to arrange a home visit and reminded to complete the Food Intake Diary. During the home visit, subjects completed the Diabetes-Related Knowledge Quiz. The Blood Sugar Monitoring Skill was assessed and The Food Intake Diary was reviewed. Subsequently, the subjects were interviewed.

Instrumentation

There were three parts to the diabetes-related knowledge quiz: general information, nutrition and pharmacy. A skill checklist, rating scale and criteria were used to assess the blood sugar monitoring skill. Criteria adapted from an instrument developed by registered dietitians were used to evaluate the meal planning skills. The home visit interview questions were based on seven content areas from the DEP. Topics included blood sugar monitoring, meal planning, medication, exercise, foot care, and the complication of high and low blood sugar. The subject's knowledge of resources was also recorded.

Data Analysis

All instruments were scored manually. Frequency distribution and percentages were computed on the demographic data. Selected measures of central tendency and variability were applied to the quiz, and the skill performances. These included the mean, mode, median, range, frequency and percentages. Frequency distribution was used to analyze the data from the interview questions.

Summary of Findings

A summary of the findings will be addressed as they relate to the research questions.

What knowledge and self-care skills do these subjects retain four to ten weeks following the four-day diabetes education program?

The Diabetes Related Knowledge Quiz consisted of three parts: general information, nutrition and pharmacy. The total score results showed that the median for IDDM subjects was 84% and for NIDDM subjects was 86%. Although the median for NIDDM was higher than the median for IDDM, there were more IDDM subjects above the median and more NIDDM subjects below the median. Based on the total score results, all subjects in both groups correctly answered more than 75% of the questions, except for two NIDDM. These two subjects answered more than 60% of the questions (Figure 5).

The results were similar (75% +) on the general information section of the quiz, except that one subject in each group answered only 2/3 of

these questions. On the nutrition section of the quiz, all IDDM subjects answered 80% or more of the questions, except one subject whose mark was 70%. This person was a recently diagnosed senior, whose wife prepared the meals.

All the NIDDM subjects, except two, answered more than 80% of the questions on the nutrition section (Figure 6). One of these had an elementary education and the other lived in an extended, ethnic family situation and did not believe diabetes was a problem.

All but two subjects from each group attained 75% or more on the Food Diary (skill). The two IDDM subjects had correctly answered all the questions on the nutrition section of the quiz but had difficulty following the meal plan, as did all subjects (Figure 6). The same two NIDDM subjects who scored low on the nutrition quiz scored low on the Food Diary.

Thirteen of the 18 IDDM subjects correctly responded to 75% or more of the pharmacy questions. Of the five subjects who did not answer more than 75% of the questions, four were new on insulin and two of these subjects were newly diagnosed. One subject had diabetes for 47 years and may have found it difficult to change her knowledge base.

There were eight of the 18 NIDDM subjects who answered 75% of the pharmacy questions. Five of these subjects were recently diagnosed and on diabetes pills. There were 10 subjects all recently diagnosed, who were being treated by diet. Seven of these subjects obtained less than 75%. The information about pharmacy would not be meaningful or useful to subjects being treated by only diet.

The Blood Sugar Monitoring (BSM) skill was performed well by all but one NIDDM subject (Table 2a). This subject was a senior who was unable to see the figures on the meter, due to recent cataract surgery.

Diabetes knowledge and skills are required for management of diabetes, however, values, beliefs and confidence in one's ability may be more important factors in whether the information will be learned and applied. Based on the results of the Diabetes Related Knowledge Quiz and the assessment of skills, it is judged that the majority of subjects in both

groups retained sufficient information at the time of the interview to meet their diabetes needs.

What do clients perceive their needs to be for knowledge and self-care skills four to ten weeks following the four-day diabetes education course?

1. The performance and confidence level was high among all subjects, with regard to performing *blood sugar monitoring*. The needs expressed by the subjects were personally meaningful to them: sore fingers, frequency of testing, reading the test strip, etc. The researcher found that several subjects were unaware of certain inadequacies such as the significance of calibration and maintaining the machine in terms of obtaining an accurate reading. One subject was unaware of the outdated strips she was using. The majority of these concerns could be resolved during skill assessment at a follow-up visit.

2. Following a *meal plan* was not a problem for some subjects because they suggested that food was not important or was not tempting to them. Most subjects were confident that they knew what foods to select (Table 6), but the majority related psychosocial difficulties when following the meal plan (Table 5). The data indicated that some form of support is required to maintain the proper behavior in following a meal plan. Eating out was a constant problem for most of the subjects. About one half of the subjects, mainly males, did not remember how to manage their diabetes during illness although they expressed confidence in their ability to manage.

Subjects receive a great deal of information during the DEP, it is not surprising that some material is forgotten. Dietary counseling should be accessible in order to provide support, suggestions and changes, particularly for those who are newly diagnosed.

3. Most subjects were confident they could manage their diabetes, while performing their usual amount of *exercise*. Five subjects in each group expressed concerns about exercising. Those in the IDDM group wanted more information about the effects of a particular exercise on the body and how to maintain the blood sugar level during this exercise.

One subject was unsure of how to adjust the insulin dose for exercise. Another had discontinued exercise because of experiencing severe reactions.

Reinforcing the material provided in class satisfied the majority of NIDDM subjects. Most of the NIDDM were unaware of the effects of exercise on their blood sugar. During follow-up, subjects could be shown the effect of the exercise on the blood sugar by blood sugar monitoring before, during and after exercise. This might provide motivation and make exercise more meaningful. Some subjects may be more interested and ready to start an exercise program, a certain time after the DEP.

4. The majority of IDDM subjects were confident in their ability to *administer insulin safely and accurately*. Some newly diagnosed subjects had questions, for example, "What do you do if you forget to take your insulin?" The subject may not want to bother anyone with this kind of question. Telephone access to a diabetes educator could be available for such questions.

The IDDM subjects were more confident than the NIDDM subjects with regard to adjusting the insulin dose. At the time of this study, the concept of adjusting insulin was provided in class, however the subjects were unsure if follow-up support to encourage this practice at home was available. Changing the insulin dose, based on blood sugar readings is a challenging experience when it has not been done before. Many subjects are uncertain about doing this procedure without coaching.

5. *Foot care* was not perceived as a problem by the majority of subjects in both groups. The information given during DEP provided an awareness of potential problems. The subjects were confident in their ability to care for their feet or judge whether they needed additional help, if foot problems developed. One subject believed the routine care he took of his feet was sufficient and was unconvinced that the foot care suggested in DEP was necessary.

Subjects with diabetes need to be reminded to inspect their feet. Some subjects develop a condition called neuropathy which results in the loss of sensation. Injuries or ulcers can be present without being felt and this observation may prevent serious complications.

6. The majority of subjects had not experienced *high blood sugar* (HBS) since completing the DEP. Generally, subjects (12) who had experienced HBS were confident they could manage this situation. 24 subjects had not experienced high blood sugar since beginning treatment. 16 of these (9 IDDM / 7 NIDDM) were confident they could manage and one did not care to know anything about it. The remaining subjects (7) asked questions about the cause, symptoms and treatment.

The action that these subjects said they would take, would be to follow the prescribed treatment plan and to consult their physician, if they recognized the problem. This action is satisfactory, however, these subjects were very enthusiastic about the results they experienced from following the treatment. Some subjects seem to forget that this treatment is not a cure for diabetes.

Approximately one half of the subjects who had not experienced HBS since starting treatment had limited knowledge of the problem. Some of the subjects did not remember discussing this topic during the DEP. Most of these subjects were recently diagnosed NIDDM.

Information overload can occur during the DEP and subjects may forget some material. During follow-up, the idea that random blood sugar monitoring can be done on a regular basis should be emphasized. High blood sugar may indicate that it is time to follow the meal plan again. During illness or stress, blood sugar levels may become elevated and monitoring more frequently should be reinforced.

7. The majority of subjects had experienced *low blood sugar* (LBS). Most subjects stated they were confident they knew how to manage this problem. Although they know what to do, some subjects are never certain how they will behave during a reaction or if they will be physically able to carry out the treatment. One subject was aware that she panicked during all LBS reactions. She was unable to control the inappropriate treatment of eating continuously until normal feelings returned.

Subjects who have experienced severe reactions or who anticipate this experience, live with a degree of uncertainty and fear, even though the necessary precautions are taken. This uneasiness is due to not knowing how the reaction will effect them, if they will be able to respond

and if not, will treatment be accessible. During follow-up, management of difficulties that have arisen with regard to LBS could be assessed.

Reviewing this situation can be a learning experience. In some cases, referral may be needed for some aberrant behavior.

Summary of the findings about resources related to research questions:

What knowledge of existing support services do the subjects have?

What type of support services do the subjects prefer?

1. When the subjects were asked what resource they would use if their meters were giving an incorrect reading, all the responses were satisfactory. However, the service some resources provide are more direct than others. Half the subjects would return to the seller of their meters. A few remembered the 1-800 phone number of the manufacturer and the need to refer to their instruction manual. Some subjects prefer to remain loyal to the resources that are familiar and trusted.

2. Most subjects stated they would contact the dietitians at the MDCC for information about food or changes in their meal plans. The majority preferred this resource. The dietitians invite the subjects to contact them if questions arise or if changes are required to the meal plan.

3. Most of subjects in this sample were aware of some resources in the community where exercise was available, but the majority did not use these facilities. They preferred independent activities. A few of the subjects used a community resource on a regular basis.

4. All insulin users indicated that they had access to a suitable resource, if a problem related to insulin administration developed. Most of these subjects would prefer to contact someone with diabetes expertise for this type of problem. Some subjects did not have access to the resource that they preferred. Most of the subjects on oral medication were satisfied with their family physician as a resource for matters related to oral diabetes medication.

5. All subjects knew they should contact their family physician or a foot doctor for foot-related problems and they preferred these resources.

6. & 7. Two resources were cited for solving the problem of uncontrolled blood sugar: the MDCC and the family physician. The

majority of insulin requiring subjects would prefer to contact someone with diabetes expertise. Access to a preferred resource was not available to some subjects. Contacting a family physician depended on whether they had a physician and had confidence in the physician's ability to help them with a diabetes related problem.

The majority of non-insulin users indicated that they would contact their family physician, and preferred this resource because the physician was: accessible, trusted and they had been instructed to do so by those at the MDCC.

8. Follow-up was considered to be beneficial by most of the subjects in both groups. The majority of those who said 'no' to follow-up were recently diagnosed.

Conclusions

The following section identifies the conclusions which are derived from the findings. The conclusions are followed by a discussion.

Knowledge and skills

Knowledge and skills are necessary for understanding the self-management of diabetes. At the time of the interview, most subjects indicated they had sufficient information and skills to manage their diabetes satisfactorily to meet their needs.

Discussion

The results of the quiz indicate that IDDM are more knowledgeable about diabetes and its management than NIDDM. These results support studies by Manning and Lee, (1988), Teza et al, (1988). The IDDM have more knowledge related to medication than the NIDDM. This is an expected result, since the NIDDM are not treated with insulin and several quiz questions required this knowledge. One might have expected the marks to be higher for the IDDM in the pharmacy section of the quiz since they had the condition longer, but comments indicated that the information about insulin was new or had been forgotten.

Those with IDDM performed the blood sugar monitoring skill better than those with NIDDM. The reasons for this result may be that:

a) the NIDDM had meters that were less dependent on user skills; b) the research scale assessed maintenance and calibration of the meter; c) there were more recently diagnosed NIDDM subjects than IDDM.

The NIDDM performed slightly better on the nutrition quiz and the food diary than the IDDM. Reasons for this may be that: a) the instruction they received was effective; b) the meal plan is the main treatment for NIDDM c) they took pride in managing their blood sugar within the normal range. The IDDM have been diagnosed for a longer time and may be more relaxed about following their meal plan. The food diary demonstrates application of nutrition principles. An expected decrease in the application of knowledge was illustrated by both groups.

The NIDDM group had two extremely low scores on the nutrition quiz. Only one low score remained with the food diary results, indicating that the subject knew more about the application of food choices than was indicated by the quiz mark. This individual cited an elementary education and may have had a problem with reading skills.

The food diaries were marked by the investigator and the marks verified by a registered dietitian. It was noted that the food diary criteria tended to favor the subject by disregarding the quantity of food eaten. For example, only two marks would be taken off, regardless of the amount of food eaten from a red group choice (see Appendix 5; foods with high fat and high sugar content). Subjects may have had lower marks than the results indicated.

Blood Sugar Monitoring

Most subjects knew why they performed BSM and were confident in their performance of this skill. Some recently diagnosed subjects had individual problems and the researcher identified inadequacies in knowledge and skills related to maintaining and calibration of the meters. All subjects knew of a resource that would service their meters, although some subjects might benefit from information that would provide more direct service.

Discussion

During the DEP, subjects practice this procedure several times a day. This strategy of having the subjects practice the procedure several times a day seems effective. Less attention is given to calibration and meter maintenance. Most companies that provide blood testing equipment declare an accuracy rate within 10 to 20% of the blood sample tested for sugar in the laboratory. The better the blood testing technique, the more accurate the test results (Wornell, 1990). Calibration and cleaning of the meter is required to obtain accurate readings. As meter technology becomes simplified, calibration and maintenance procedures may become obsolete.

Individuals, particularly those who were recently diagnosed including seniors, realized some problems following the DEP. Subjects complete the DEP with the belief that they should test their blood sugar, four times a day. While this is ideal, it is not always possible or necessary, particularly for NIDDM.

If the fingers are sore or the blood sugar tests are consistently within the normal range, subjects are uncertain whether to continue this routine and may stop testing altogether. One solution for this would be to provide the subjects with alternate testing times. This information could be provided during follow-up because it may not be meaningful during DEP. Alternate testing times may also help to reduce the cost of buying test strips for blood testing.

Testing the blood sugar is an expensive procedure. It was surprising that only two subjects commented on the cost of the test strips. Possibly other subjects had the cost of the strips subsidized by private health insurance plans since the provincial health insurance provided no coverage for this product at the time of this study.

Both groups knew a variety of resources to contact if their meters were not functioning. Most subjects would contact the seller of the meter. The initial response of a few subjects was to look at the instruction manual. To encourage independence, the instruction manual might be an

appropriate starting place for those who are unfamiliar with meters. Most manufacturers have a toll-free telephone number for direct service.

Once a baseline skill and habit have been formed, follow-up reinforcement may include: a) calibration; b) maintenance of the meter; c) alternate times to test blood; d) how to obtain enough blood for the sample; e) how to obtain direct service for meters.

Meal Planning

The subjects were making a reasonable attempt to follow their meal plans, although most had some problems doing so. The majority identified some kind of support or strategy that helped them in their endeavor to follow the meal plan. Eating out is an enduring problem. Knowledge and skills about treatment during illness is better among IDDM than among the NIDDM. Continued access to nutritional expertise is an important resource.

Discussion

Meal planning is one of the most important self-care skills related to diabetes treatment, but the most difficult to follow (Lockwood et al., 1985). It presents the greatest challenge to those with diabetes and to those who are educators. In this study, the result of the quiz and the food diary indicate that the subjects were attempting to follow their meal plans reasonably well.

A variety of difficulties were cited by these subjects. Lack of will power being the most frequent. Several female subjects indicated they felt cheated or deprived while the males suggested changing old habits made it difficult to resist food. Irregular lifestyle made meal planning difficult for others. Lack of variety was the complaint of some subjects. Eating leftovers, living alone or the cost of food were the reasons for this difficulty. Other problems not categorized were; having to deal with cravings and the subsequent behavior of either resisting or yielding to these feelings. Daschner (1986) reported similar findings.

For one person, the meal plan was largely impossible to follow. Living with an extended family group posed many problems. The meals

were cooked by members who did not understand the limitations of the meal plan, food costs were high and catering to the ethnic tastes of the majority were identified as some of the difficulties.

Exercise

About one half of the subjects exercised regularly, experienced positive effects of exercise on their diabetes and were knowledgeable about managing the amount of activity they did. Non-exercisers and some newly diagnosed subjects did not know the safety precautions related to exercise. Subjects from both groups requested further information about exercise. Most subjects were aware of some community facilities but preferred activity of their own choosing. A few subjects did enjoy these facilities.

Discussion

The DEP provides a 45 minute lecture on exercise. It was interesting that in this small sample, 55% of the subjects reported no difficulty exercising regularly, the implication being that these subjects were exercising prior to the program. Bartlett, (1991) (cited in Scnoenborn) states that 53% of Canadians reported regular exercise, compared to 40% in the United States. In an unpublished study by Wong and McManus (1991), 295 subjects from this DEP were surveyed for compliance with diabetes treatment after four years. They reported, that exercise was one area most successfully followed by subjects.

Subjects who experienced acute symptoms seemed confident in their ability to manage the effects of exercise, except one IDDM who had stopped exercising because of the reactions she experienced. The IDDM were more knowledgeable and confident in their ability to manage exercise than the NIDDM.

Most subjects were not interested in exercising at a community resource. The concerns, they had as a group, probably could not be addressed at these facilities. One subject stated that she had to discover additional information about exercise, for herself.

There may not be a need for unusual precautions to be taken for simple exercise, such as walking for 20 minutes 3 times per week.

Strenuous activity may require that different measures be taken. Written resources about exercise are limited and are just recently becoming available to those with diabetes who are interested in more energetic activities.

Medication

None of the IDDM subjects perceived insulin administration to be a problem, at the time of the interview. Adjusting insulin dosage posed a problem for some who were new on insulin. In general, Type I subjects knew how to adjust their insulin dose and found it beneficial because it gave them freedom and control. Type II subjects were more cautious or did not choose to practice this technique. Recently diagnosed subjects had inquiries about insulin. Those subjects who were using new insulin-related products were satisfied.

Subjects who were on oral medication seemed able to solve their difficulties. All subjects were knowledgeable about resources to consult for insulin administration problems, although some did not have access to the resources they preferred.

Discussion

The majority of IDDM subjects were satisfied and confident in their ability to give insulin. Subjects indicated that the practice sessions provided during the DEP were effective and they were confident in their ability to inject their insulin safely. This contradicts the study by Brown (1990), which showed "that diabetes patient education is not very effective in helping patients learn insulin injection". Based on a review of four articles, Brown's study demonstrated that the subjects received little supervised practice, during the respective programs.

Although the new insulin and the new devices for administering insulin are not appropriate for all subjects, those who were using them found administration easier. The technique of insulin adjustment requires practice and the older subjects need time, encouragement and confidence to achieve mastery.

Footcare

The subjects did not perceive foot care to be a problem. Belief in the instructions provided by the DEP may influence adherence to suggested foot care recommendations. All subjects were aware of the available resources for foot-related problems.

Discussion

The majority of subjects stated they were confident in their ability to determine when they required expert assistance with foot care. IDDM had fewer foot problems than NIDDM. In the study by Wong & McManus (1991), the subjects reported that it was difficult to adhere to a daily foot care routine. One subject in this study stated that he did not believe the foot care routine discussed in class was necessary. Perhaps subjects do not perform this activity because they believe it is not necessary. Most subjects thought the normal daily hygiene (regular bath or shower and clean socks), that they participated in, was sufficient.

Uncontrolled Blood Sugar

Most subjects who had experienced high and low blood sugar were knowledgeable and confident in their ability to manage these problems. In spite of knowing what to do, lack of confidence, fear and attitude, kept a few subjects from practicing the recommended treatment and prevention methods.

Subjects, inexperienced with high and low blood sugar, believed that they could manage these complications, if they developed. Enthusiasm about the positive effects experienced by following the diabetes regimen may cause some subjects to forget that the treatment is not a cure for diabetes. These subjects knew less about HBS than about LBS and asked questions about the former. All subjects knew a resource to access for these complications and the IDDM preferred someone with diabetes expertise.

High Blood Sugar (HBS)

Group A subjects who had experience with HBS were confident in their ability to treat this problem within their limitations. The responses they gave showed knowledge and insight into the problem. Group B

(9 IDDM), were confident they could treat HBS. Four of this total were confident that they knew the treatment but had rather superficial knowledge of the subject, unable to remember the causes and symptoms.

Most of the NIDDM were enthusiastic about the successful results they had experienced following their treatment plan. They indicated their belief in the treatment and that maintaining this treatment would prevent recurrence of HBS. They knew the ritual of treating HBS but did not understand it. Approximately 50% of the NIDDM had questions about the causes, symptoms and treatment.

Discussion

Personal experiences motivate and reinforce individuals to remember and take action. Studies indicate various reasons why NIDDM are less knowledgeable than IDDM about diabetes (Glasgow et al., 1992; Manning & Lee, 1988; Watts, 1980). Lack of experience is not mentioned as one of these reasons. Knowles, (1990) declares that "experience is the richest resource for adults' learning therefore analysis of experience is the core methodology of adult education". Mazzuca, (1989) states that "the real lessons to be learned" are in the lives of those with diabetes. NIDDM have not experienced and may never experience many of the problems. The information they receive about these problem may seem irrelevant and the subjects are not inclined to remember it. Educators need to find ways to reinforce this information in a meaningful way.

Low Blood Sugar (LBS)

Five IDDM subjects in Group C who had experienced LBS, had no problem, six had been able to treat the problem before serious consequences developed and four had experienced alarming symptoms. All of these were confident in their knowledge of how to treat LBS. Three of the four who had severe reaction were unsure they could treat LBS due to the physical incapacity. All of the NIDDM (10), experienced with LBS, knew why it had occurred. They expressed confidence in their knowledge, and ability to treat this problem, should it occur again. IDDM had more in-depth knowledge of treatment methods than NIDDM.

Most subjects in Group D expressed confidence in their knowledge and ability to treat LBS although they had not experienced LBS. They

expressed the belief that following the treatment plan would prevent this problem. Subjects with IDDM preferred to contact a diabetes specialist for uncontrolled blood sugar. Most NIDDM are referred back to their family physician, and this is who they prefer to contact.

Discussion

As described in the literature review, the Health Belief Model is subsumed in the Precede Framework (Green et al., 1980). Beliefs are one group of variables in these models. Beliefs can be so strong that they take precedence over the individual's self-care behavior. Several subjects in this study demonstrated strong beliefs in reference to foot care and uncontrolled blood sugar. Some subjects seemed to believe that following the treatment plan will prevent further difficulties with the blood sugar.

One subject discontinued monitoring his blood sugar. He contended that if he followed the meal plan, his sugars would remain in the normal range. He did not believe it was necessary to test his blood sugar any longer. Subjects may forget that illness, stress or body change can effect the diabetes even if one is following the treatment. If subjects fail to monitor the blood sugar randomly, they may not be aware of the gradual return of the symptoms of diabetes.

Need for Follow-up

Most subjects perceived that follow-up would be a benefit, some suggesting telephone access to diabetes expertise or small discussion groups as a method for follow-up. The subjects who responded negatively were, for the most part, recently diagnosed. The IDDM who responded negatively, qualified their responses by expressing the particular conditions under which they would return for follow-up education.

Discussion

Dunbar et al. (1979) declared that "1/3 of those with diabetes would achieve and maintain good compliance without systematic intervention". Tough (1985) found "that most men and women are reasonably successful in achieving the changes they choose". The implications of these findings are that all subjects will not want or require follow-up (Allanach & Allanach, 1984). Those that choose to accept the diagnosis and follow the treatment plan will probably manage their treatment reasonably well.

Subjects may not be able to achieve all the changes required by the diabetes treatment plan, after a four day diabetes program, but with assistance and follow-up their chances may be increased.

Recommendations

Generalizability of this study is limited because Diabetes Education Programs differ across the country. It is likely, however, that the needs of those with diabetes are similar and the rationale for the study would be meaningful. The sample may be biased due to the criteria for inclusion. Most of the subjects were middle class with Grade 12 education, and may be inclined to adhere to their treatment more than is typical of the total diabetes population. Lower socio-economic and some ethnic groups may provide different results.

Based on the findings it is recommend that:

1. If possible, separate follow-up education programs be established, at this Metabolic Day Care Center for IDDM and NIDDM since their needs, knowledge and experiences are different.
2. All subjects who have completed the basic Diabetes Education Program have access to a follow-up program as required, particularly IDDM and NIDDM subjects who are recently diagnosed.
3. Consideration be given for a follow-up program based on the findings of this study (Appendix 8).
4. A follow-up program should use strategies that embody the principles of education (Mullen & Green, 1990):
 - a. *individualize*: the diabetes regimen to meet client needs, goals, characteristics and circumstances.
 - b. *reinforce*: positive behavior changes by verbal encouragement and reassurance; educational material previously presented.
 - c. *feedback* related to: goal progress, new products.
 - d. *relevancy*: information and methods used are meaningful to the client's background and situation.

- e. *facilitate*: diabetes educators should specify their intentions to provide learning assistance following the diabetes education program and when these resources are available; discover and implement educational strategies that will encourage the long-term self-care management of a diabetic regimen; develop educational materials that support the client's learning need.

Further discussion

Follow-up programs can provide a means of on-going evaluation. Records of questions asked by the clients should be kept and analyzed for the purpose of revising the program and determining outcomes. Further study could evaluate the learning strategies that are most effective for particular clients.

Replication of the study with the separate groups of IDDM and NIDDM to determine the knowledge, skills and behavior that need to be reinforced at a different time would be useful. Clients with diabetes in rural areas may have a need for follow-up. It could be an advantage to study clients' confidence in their abilities to practice self-care for long-term management of diabetes and to predict based on fact, not intuition, who will require follow-up education.

It is apparent from incidental comments made by the some individuals in the study, that diabetes expertise is not always accessible. Several clients asked if the staff at the MDCC were available for questions following the DEP. A few others stated they would prefer diabetes expertise for some aspects of care, but they did not know how to obtain it. Some stated they wouldn't bother the nurses at the MDCC because they were "too busy."

Clients have access to diet counseling, but did not feel free to contact the diabetes nurse educators. A telephone answering machine or voice mail would be useful. These needs could also be met in an adult outpatient clinic. Those who have concerns could then have access to nursing, as well as all aspects of diabetes education.

With the shift to health promotion and disease prevention, many individuals are taking more responsibility for their own health. The awareness that chronic conditions need long-term maintenance means that clients should have access to all aspects of follow-up diabetes education.

References

- Adamson, E. T., & Gullion, D. S. (1986). Assessment of diabetes continuing medical education. *Diabetes Care*, 9, 11-16.
- Ahring, K. K., Ahring, J. P. K., Joyce, C., & Farid, N. R. (1992). Telephone modem access improves diabetes control in those with insulin requiring diabetes. *Diabetes Care*, 15 (8), 971-975.
- Allanach, E. J., & Allanach, Bruce. (1984). Diabetes follow-up compliance: a quality assurance evaluation. *Military Medicine*, 149 (2), 73-75.
- American Diabetes Association. (1992). National Standards for Diabetes Patient Education and American Diabetes Association Review Criteria. *Diabetes Care*, 15 (Suppl. 2), 75-80. (Reprinted from *Diabetes Care*, 1986, 9, 36-40).
- American Diabetes Association. (1990). Standards of Medical Care for Patients with Diabetes Mellitus. *Diabetes Care*, 13 (Suppl. 1), 10-17. (Reprinted from *Diabetes Care*, 1989, 12, 365-368).
- Anderson, R., M. (1986). Assessing values of diabetes patient education. *Diabetes Care*, 9 (5), 553.
- Anderson, R. M., Donnelly, M. B., & Dedrick, R. F. (1990). Measuring the attitudes of patients towards diabetes and its treatment. *Patient Education and Counseling*, 16 (3), 231-245.
- Anderson, R. M., & Nowacek, G., & Richards, F. (1988). Influencing the personal meaning of diabetes: research and practice. *The Diabetes Educator*, 14 (4), 297-302.

- Assals, J. P., & Lacroix, A. (1990). Educating the patient to manage his disease: the example of diabetes mellitus. *Journal of Human Hypertension*, 4, (Suppl. 1), 13-20.
- Assals, J. P., Muhlauser, I., Pernet, A., Gfeller, R., Jorgens, V., & Berger, M. (1985). Patient education as the basis for diabetes care in clinical practice and research. *Diabetologia*, 28, 602-613.
- Ausubel, D. P. (1968). *Educational Psychology: A Cognitive View*. New York: Holt, Rinehart and Winston.
- Bandura, Albert. (1977). *Social Learning Theory*. Englewood Cliffs, NJ: Prentice-Hall, Inc.
- Bartlett, E. E. (1985a). At last a definition. (Editorial). *Patient Education and Counseling*, 7, 323-324.
- Bartlett, E. E. (1985b). Eight principles from patient education research. *Preventive Medicine*, 14, 667-669.
- Bartlett, E. E. (1991). Understanding the cross-national dynamics of behavior changes. (Editorial). *Patient Counseling and Health Education*, 18 (2), 91-92.
- Beaser, S. B. (1956). Teaching the diabetic patient. *Diabetes*, 5, 146-149.
- Becker, M. (1974). The health belief model and sick-role behavior. *Health Education Monographs*, 174, 409-419.
- Becker, M., & Janz, N. (1985). The health belief model applied to understanding diabetes regimen compliance. *The Diabetes Educator*, 11 (1), 41-47.

- Beeney, L. J., & Dunn, S.M. (1990). Knowledge improvement and metabolic control in diabetes education: approaching the limits? *Patient Education and Counseling*, 16 (3), 217-229.
- Beggan, M., Cregan, D., & Drury, M. (1982). Assessment of the outcome of an educational programme of diabetes self-care. *Diabetologia*, 23 , 246-251.
- Benfari, R. C., Eaker, E., & Stoll, J. G. (1981). Behavioral interventions and compliance to treatment regimes. *Annual Review of Public Health*, 2, 431-471.
- Berger, M. (1987). Diabetes care based upon self-monitoring and self-treatment by the patient. *Diabetes Medicine*, 4, 327-329.
- Berger, M., & Jorgens, V. (1983). Therapeutic effects of diabetes education: evaluation of diabetes teaching programmes. In J. Assal, M. Berger, N. Gay, and J. Canivet (Eds.), *Diabetes Education How to Improve Patient Education*. (pp. 37-50). Amsterdam: Excerpta Medica.
- Bille, D. A. (1986). Tailoring your diabetic patient's care plan to fit his life-style. *Nursing*, 16 (2), 55-57.
- Bloomgarden, Z. T., Karmally, W., Metzger, M. J., Brothers, M., Nechemias, C., Bookman, J., Faierman, D., Ginsberg-Fellner, F., Rayfield, E., & Brown, W. V. (1987). Randomized, controlled trial of diabetic patient education: improved knowledge without improved metabolic status. *Diabetes Care*, 10 (3), 268-272.
- Boninger, C. (1983). Problems encountered with patient education as seen from the point of view of institutionalized and centralized diabetes education. In J. Assal, M. Berger, N. Gay, and J. Canivet. (Eds.), *Diabetes Education How to Improve Patient Education*. (pp. 94-106). Amsterdam: Excerpta Medica.

- Brown, Sharon A. (1990). Studies of educational interventions and outcomes in diabetic adults: A meta-analysis revisited. *Patient Education and Counseling* 16, 189-215.
- Brownell, K. D., Heckerman, C. L., Westlake, R. J., Hayes, S. C., & Monti, P. M. (1978). The effect of couples training and partner cooperativeness in the behavior treatment of obesity. *Behavioral Research Therapy*, 16, 323-34.
- Campbell, L. V., Barth, R., Gosper, J. K., Jupp, J. J., Simons, L. A., & Chisolm, D. J. (1990). Impact of intensive educational approach to dietary change in NIDDM. *Diabetes Care*, 13 (8), 841-847.
- Canadian Diabetes Association. (1988-89). *Standards for diabetes education in Canada: Review and Criteria Guide*. Toronto, Ontario: Author.
- Canadian Diabetes Association. (1985). *Standards and Guidelines for Diabetes Education*. (2nd ed.). Toronto, Ontario: Author.
- Cerkoney, K. A. B., & Hart, L. K. (1980). The relationship between the health belief model and compliance of persons with diabetes mellitus. *Diabetes Care*, 3 (5), 594-598.
- Collier, P., & Etzwiler D. (1971). Comparative study of diabetes knowledge among juvenile diabetics and their parents. *Diabetes* 20, 51-57.
- Daschner, Barbara. (1986). Problems perceived by adults in adhering to a prescribed diet. *The Diabetes Educator*, 12 (2), 113-115.
- Davidson, John, K. (1983). The Grady Memorial Hospital diabetic unit ambulatory care program. In J. Assal, M. Berger, N. Gay, and J. Canivet (Eds.), *Diabetes Education How to Improve Patient Education*. (pp. 286-297). Amsterdam: Excerpta Medica.

- Davis, W. K., Hull, A. L., & Boutaugh, M. L. (1981). Factors affecting diagnosis of diabetic patients. *Diabetes Care*, 4, 275-278.
- DCCT Research Group. (1986). Diabetes control and complications trial for outpatient (DCCT): design and methodological considerations for the feasibility phase. *Diabetes*, 35, 520-545.
- D'eraimo-Milkus, G., & Demas, P. (1989). Patient perceptions of diabetes treatment goals. *The Diabetes Educator*, 15 (5), 440-443.
- deWeerd, Inge, Visser, A., Kok, G., & van der Veen, E. A. (1989). Randomized controlled evaluation of an education program for insulin treated patients with diabetes: effects on psychosocial variables. *Patient Education and Counseling*, 14, 191-215.
- DiClemente, C., C. (1981). Self-efficacy and smoking cessation maintenance: a preliminary report. *Cognitive Therapy and Research*, 5, 175-187.
- Duchin, S. P., & Brown, S. A. (1990). Patients should participate in designing diabetes education content. *Patient Education and Counseling*, 16 (3), 255-267.
- Dunbar, J. M., Marshall, G. D., & Hovell, M. F. (1979). Behavioral strategies for improving compliance. In R. B. Haynes, D. W. Taylor, D. L. Sackett (Eds.), *Compliance in Health Care*. (pp. 174-190). Baltimore: The John Hopkins University Press.
- Dunn, S. M. (1990). Rethinking the models and modes of diabetes education. *Patient Education and Counseling*, 16 (3), 281-286.

- Dunn, S. M., Bryson, J. M., Hoskins, P. L., Alford, J. B., Handelsman, D. J., & Turtle, J. R. (1984). Development of the diabetes knowledge (DKN) scale: forms DKNA, DKNB, and DKNC. *Diabetes Care*, 7 (1), 36-41.
- Eckerling, L., & Kohrs, M. (1984). Research on compliance with diabetic regimens: application to practice. *Journal of the American Dietetic Association*, 84, 805-809.
- Edinger, J., Nelson, W., Davidson, K., & Wallace, J. (1978). Modification of smoking behaviors in a correctional institute. *Journal of Clinical Psychology*, 34, 991-998.
- Erickson, B. H., & Nosanchuk, T. A. (1977). *Understanding data*. Toronto: McGraw-Hill Ryerson Ltd.
- Eriksen, M. P., & Gielen, A. C., (1983). The application of health education principles to automobile child restraint programs. *Health Education Quarterly*, 10 (1), 30-55.
- Estey, A. L., Tan, M. H., & Mann, K. (1990). Follow-up intervention: its effect on compliance behavior to a diabetes regimen. *The Diabetes Educator*, 16 (4), 291-295.
- Etzwiler D. D. (1978). Education of the patient with diabetes. *Medical Clinics of North America*, 62, 857-866.
- Etzwiler, D. D. (1986). Diabetes education in the 20th century. *Beta Release*, 10 (4), 18
- Etzwiler, D. D., & Robb, J. R. (1972). Evaluation of programmed education among juvenile diabetics and their families. *Diabetes*, 21, 967-71.

- Flavin, K., & Haire-Joshu, D. (1986). The Pharmacologic Repertoire. *American Journal of Nursing*, 86 (11), 1244-1251.
- Gabbay, K. H., Hasty, K., Breslow, J. L., Ellison, R. C., Brunn, H. F., & Gallop, P. M. (1977). Glycosylated hemoglobins and long-term blood glucose control in diabetes mellitus. *Journal of Clinical Endocrinology and Metabolism*, 44, 859-864.
- Garrard, J., Joynes, J. O., Mullen, L., McNeil, L., Etzwiler, D. (1988). Differences in patient knowledge about diabetes as a function of type of primary care physician. *The Diabetes Educator*, 14 (2), 142-147.
- Garrard, J., Joynes, J. O., Mullen, L., McNeil, L., Mensing, C., Feste, C., & Etzwiler, D. D. (1987). Psychometric study of patient knowledge test. *Diabetes Care*, 10 (4), 500-509.
- Geller, J., & Butler, K., (1981). Study of educational deficits as the cause of hospital admissions for diabetes mellitus in a community hospital. *Diabetes Care*, 4, 487-489.
- Gilden, J. L., Hendryx, M., Casia, C., & Singh, S. P. (1989). The effectiveness of diabetes education programs for older patients and their spouses. *Journal of the American Geriatric Society*, 37 (11), 1023-1027.
- Glanz, K. (1980). Compliance with dietary regimens: its magnitude, measures and determinants. *Preventive Medicine*, 9, 787-804.
- Glasgow, R. E., Toobert, D. J., Hampson, S. E., Brown, J. E., Lewinsohn, P.M., & Donnelly, J. (1992). Improving self-care among older patients with type II diabetes: The "Sixty something . . ." study. *Patient Education and Counseling*, 19, 61-74.

- Glasgow, R. E., Toobert, D. J., Mitchell, D. L., Donnelly, J. E., & Calder, D. (1989). Nutrition education and social learning intervention for type II diabetes. *Diabetes Care*, 12 (2), 150-152.
- Godding, P. R., & Glasgow, R. E. (1985). Self-efficacy and outcome expectations as predictors of controlled smoking status *Cognitive Therapy and Research*, 9, 79-94.
- Gorman, K. C. (1988/89). Hemoglobin A1c (glycosylated hemoglobin)--- help or hindrance? *Diabetes Dialogue*, 35 (4), 28-30.
- Graber, A. L. (1988). Evolution of diabetes education programs. (Editorial) *The Diabetes Educator*, 14 (1), 9-10.
- Graber, A. L., Christmas, B. G., Alogna, M. T., & Davidson, J. K. (1977). Evaluation of diabetes patient education programs. *Diabetes*, 26 (1), 61-64.
- Green, L. W., Kreuter, M. W., Deeds, S. G., & Partridge, K. B. (1980). *Health education planning: A diagnostic approach*. Palo Alto: Mayfield Publishing Co.
- Greene, D. S., Beaudin, B., & Bryan, M. J. (1991). Addressing attitudes during diabetes education: Suggestions from adult education. *The Diabetes Educator*, 17 (6), 470-473.
- Grossman, H. Y., Brink, K. S., & Hauser, S. (1987). Self-efficacy in adolescent girls and boys with insulin dependent diabetes mellitus. *Diabetes Care*, 10, 324-29.
- Guare, J. C., Wing, R. R., Marcus, M., Epstein, L. H., Burton, L. R., & Gooding, W. E. (1989). Analysis of changes in eating behavior and weight loss in type II diabetic patients. *Diabetes Care*, 12 (7), 500-503.

- Hanrahan, Dianne M. (1988). *The relationship between timing and the level of knowledge of a diabetic teaching program*. Unpublished master's thesis. University of Alberta, Edmonton, AB.
- Harris, R., Linn, M. W., Skyler, J.S., & Sandifer, R. (1987). Development of the diabetes health belief scale. *The Diabetes Educator*, 113 (3), 292-297.
- Haynes, R. B. (1979). Determinants of compliance: the disease and the mechanics of treatment. In R. B. Haynes, D. W. Taylor, D. L. Sackett (Eds.), *Compliance in Health Care*. (pp.174-109). Baltimore: The John Hopkins University Press.
- Haynes, R., & Sackett, D. L. (1976). Appendix 1: An annotated bibliography. In D. L. Sackett, R. B. Haynes (Eds), *Compliance with Therapeutic Regimens*. (193-279). Baltimore: John Hopkins University Press.
- Hester, R. K., Nirenberg, T. D., & Begin, A. M. (1990). Behavioral treatment of alcohol and drug abuse. *Recent Developments in Alcoholism*, 8, 305-327.
- Hess, G. E., & Davis, W. K. (1983). The validation of a diabetes patient knowledge test. *Diabetes Care*, 6 (6), 591-596.
- Hollands, Marjorie, H. (1986). Meal planning for type I and type II diabetes. *Diabetes Dialogue*, 33 (3), 17-20.
- Hramiak, I. M. (1986). Teaching strategies in diabetic patients. *Diabetes Care*, 9, 674-675.
- Hulka, B. S., Kupper, L. L., Cassel, J. C., & Mayo, F. (1975). Doctor-patient communication and outcomes among diabetic patients. *Journal of Community Health*, 1 (1), 15-27.

- Hurley, A. C. (1990). The health belief model: evaluation of a diabetes scale. *The Diabetes Educator*, 16 (1), 44-48.
- Hurley, A. C., & Shea, C. (1992). Self-efficacy: strategy for enhancing diabetes self-care. *The Diabetes Educator*, 13 (2), 146-150.
- Irvine, A. A., Saunders, J. T. Blank, M. B., & Carter, W. R. (1990). Validation of scale measuring environmental barriers to diabetes-regimen adherence. *Diabetes Care*, 13 (7), 705-711.
- Irvine, Audrey. (1989). Self-care behavior in rural population with diabetes. *Patient Education and Counseling*, 13 (1), 3-13.
- Istre, S. M. (1989). The art and science of successful teaching. *The Diabetes Educator*, 15 (1), 67-75.
- Jennings, P., Morgan, H., & Barnett, A. (1987). Improved diabetes control and knowledge during a diabetes self-help group. *The Diabetes Educator*, 13 (4), 390-393.
- Jenny, J. (1983). A compliance model for diabetic instruction. *Rehabilitation Literature*, 44, 258-263, 299.
- Kaplan, R. M., Chadwick, M. W., & Schimmel, L. E. (1985). Social learning intervention to promote metabolic control in type 1 diabetes mellitus: pilot experiment results. *Diabetes Care*, 8 (2), 152-155.
- Kaplan, R. M., & Davis, W. K. (1986). Evaluating the costs and benefits of outpatient diabetes education and nutrition counseling. *Diabetes Care*, 9 (1), 81-86.

- Karam, J. H. (1985). Diabetes mellitus, hypoglycemia and lipoprotein disorders. In M. A. Krupp, M. J. Chatton (Eds.), *Current Medical Diagnosis and Treatment*. pp. 761-792.
- Kerr, J. A. C. (1985). Adherence and Self-Care. *Heart and Lung*, 14 (1), 24-31.
- Kingery, P. M., & Glasgow, R. E. (1989). Self-efficacy and outcome expectations in the self-regulation of non-insulin dependent diabetes mellitus. *Health Education*, 20 (7), 13-19.
- Knowles, Malcolm S. (1990). *The adult learner: a neglected species*. (4th ed.). Houston: Gulf Publishing.
- Korhonen, T., Huttunen, J. K., Aro, A., Hentinen, M., Ihalainen, O., Majander, H., Siitonen, O., Uusitupa, M., & Pyorala, K. (1983). A controlled trial on the effects of patient education in the treatment of insulin-dependent diabetes. *Diabetes Care*, 6 (3), 256-261.
- Kort, M. (1987). Motivation: the challenge for today's health promoter. *The Canadian Nurse*, 83 (9), 16-18.
- Kurtz, S. M. (1990). Adherence to diabetes regimens: empirical status and clinical application. *The Diabetes Educator*, 16 (1), 50-56.
- Lane, D. S., & Evans, David. (1979). Measures and methods in evaluating patient education programs for chronic illness. *Medical Care*, 17 (1), 30-42.
- Lange, M. (1988). Empirical identification of techniques useful for counseling patients with diabetes. *The Diabetes Educator*, 14 (4), 303-376.

- Lawrence, P. A., & Cheely, J. (1980). Deterioration of diabetic patient's knowledge and management skills as determined during outpatient visits. *Diabetes Care*, 3, 214-218.
- Leiter, L. A., & Gougeon, L. (1988). New strategies for type II diabetes mellitus. *Beta Release*, 12 (4), 17-19.
- Lemay, Patricia. (1988). Diabetes in Canada: Some demographic information. *Chronic Disease in Canada*, 9 (2), 35-37.
- Leslie, M., & Schuster, P. A. (1991). The effect of contingency contracting on adherence and knowledge of exercise regimens. *Patient Education and Counseling*, 18 (3), 231- 241.
- Lewis, A., Corry, G., Hunt, J. A., & Byres, I. (1989). *Exercise and the Curious Diabetic*. Vancouver, BC: Canadian Diabetes Association.
- Lockington, T. J., Farrant, S., Meadows, K. A. (1988). Knowledge profile and control in diabetic patients. *Diabetic Medicine*, 5, 381-386.
- Lockwood, D. D., Frey, M. L., Gladish, N. A., & Hiss, Roland. (1986). The biggest problem in diabetes. *The Diabetes Educator*, 12 (1), 30-33.
- Lorenz, R. D. (1986). Training health professionals to improve the effectiveness of patient education programs. [Special Issue]. *The Diabetes Educator*, 12, 204-209.
- Lorenz, R. D. (1989). Teaching skills of health professionals. *The Diabetes Educator*, 15 (2), 149-152.
- Maguire, T. O. (1986). New directions in statistics. *Alberta Journal of Educational Research*, 32 (2), 154-171.

- Malin, J. M., Fitzgerald, M. G., & Wall, M. (1965). A change in the sex incidence of diabetes. *Diabetologia*, 1, 35-39.
- Mann, Karen, V. (1989). Promoting adherence in hypertension. *Canadian Journal of Cardiology Nursing*, 1 (1), 8-14.
- Manning, L. V., & Lee, J. (1988). Patient knowledge of diabetes: an area of concern. *Health Education Journal*, 47 (4), 153-155.
- Mazze, R. S., Pasmantier, R., Murphy, J. A., & Shamoon, H. (1985). Self monitoring of capillary blood glucose: changing the performance of individuals with diabetes. *Diabetes Care*, 8, 207-213.
- Mazzuca, S. A. (1982). Does patient education in chronic disease have therapeutic value. *Journal of Chronic Disease*, 16 (35), 521-529.
- Mazzuca, S. A. (1989). Discussion: the recent past, present and foreseeable future of research on patient teaching. *The Diabetes Educator*, 15 (2), 157-160.
- Mazzuca, S. A., Moorman, N. H., Wheeler, M. L., Norton, J. A., Fineberg, N. S., Vinicor, F., Cohen, S. J., & Clark, C. M. (1986). The diabetes education study: a controlled trial of the effects of diabetes patient education. *Diabetes Care*, 9 (1), 1-10.
- Miller, L. V., & Goldstein, J. (1972). More efficient care of diabetic patients in a county-hospital setting. *New England Journal of Medicine*, 286, 1388-1391.
- Miller, L. V., Goldstein, J. & Nicolaisen, G. (1978). Evaluation of patients' knowledge of self-care. *Diabetes Care*, 1, 275-280.

- Morgan, B., & Littell, D. H. (1988). A closer look at teaching and contingency contracting with type II diabetes. *Patient Education and Counseling*, 12, 145-158.
- Muhlhauser, I., Bruckner, I., Berger, M., Cheta, D., Jorgens, V., Ionescu-Tirgoviste, C., Scholz, V., Mincu, I. (1987). Evaluation of an intensified insulin treatment and teaching programme as routine management of Type I (insulin-dependent) diabetes. *Diabetologia*, 30, 681-690.
- Mullen, P. D., & Green, L. W. (1990). Educating and counseling for prevention from theory and research to principles. In R. B. Goldbloom and R. S. Lawrence. (Eds.), *Preventing Diseases Beyond the Rhetoric*. (pp. 474-479). New York: Springer-Verlag.
- Neufeld, V.R. (1976). Patient education: a critique. In D. L. Sackett and R. B. Haynes. (Eds.) *Compliance with Therapeutic Regimens*. (pp. 83-92). Baltimore: John Hopkins University Press.
- O'Leary, A., Shoor, S., Lorig, K., & Holman, H. R. (1988). A cognitive behavioral treatment for rheumatoid arthritis. Special issue: clinical health psychology. *Health Psychology*, 7, 527-544.
- Padgett, Deborah. (1991). Correlates of self-efficacy beliefs among patients with non-insulin dependent diabetes mellitus in Zagreb, Yugoslavia. *Patient Education and Counseling*, 18, 139-147.
- Padgett, Deborah, Mumford, E., Hynes, M., & Carter, R. (1988). Meta-analysis of the effects of educational and psychosocial interventions on management of diabetes mellitus. *Journal of Clinical Epidemiology*, 41 (10), 1007-1030.
- Panuncialman, J., & Finnegan, C. (1979). Self-care and the diabetic: An historical perspective. *The Diabetes Educator*, 5 (1), 26-27.

- Parker, J., Frank, R., Beck, N., Smarr, K., Buescher, K., Phillips, L., Smith, E., Anderson, S., & Wallace, S. (1988). Pain management in RA: a cognitive behavioral approach. *Arthritis and Rheumatism*, 31, 593-601.
- Pichert, J. W. (1990). Improving the impact of diabetes education: A research challenge. *Beta Release*, 14 (1), 7-12.
- Rankin, S. H., & Stallings, K. D. (1990). *Patient education: Issues, Principles, Practice*. (2nd ed.). Philadelphia: J. B. Lippincott and Co.
- Raskin P., & Rosenstock, J. (1986). Blood glucose control and diabetic complications. *Annals of Internal Medicine*, 105 (2), 254-263.
- Raz, I., Soskolin, V., & Stein, P. (1988). Influence of small-group education session on glucose homeostasis in NIDDM. *Diabetes Care*, 11 (1), 67-71.
- Redman, B. K. (1988). *The Process of Patient Teaching*. (6th ed.). Toronto: C. V. Mosby.
- Rettig, B. A., Shrauger, D. G., Recker, R. R., Gallagher, T. F., Wiltse, H. (1986). A randomized study of the effects of a home diabetes education program. *Diabetes Care*, 9 (2), 173-178.
- Rosenstock, I. M. (1985). Understanding and enhancing patient compliance with diabetic regimens. *Diabetes Care*, 8 (6), 610-616.
- Rost, Kathryn. (1989). The influence of patient participation on satisfaction and compliance. *The Diabetes Educator*, 15 (2), 139-142.
- Rubin, R., Peyrot, M., Saudek, C. (1989). Effect of diabetes education on self-care, metabolic control, and emotional well-being. *Diabetes Care*, 12 (10), 673-679.

- Rubin, R., Peyrot, M., Saudek, C. (1991). Differential effects of diabetes education on self-regulation and lifestyle behavior. *Diabetes Care*, 14 (4), 335-338.
- Schafer, L. C., McCaul, K. D., & Glasgow, R. E. (1986). Supportive and nonsupportive family behaviors: relationship to adherence and metabolic control in persons with type 1 diabetes. *Diabetes Care*, 9 (2), 179-185.
- Schlenk, E. A., & Hart, L. K. (1984). Relationship between health locus of control, health value and social support and compliance of persons with diabetes mellitus. *Diabetes Care*, 7, 566-574.
- Schoenborn, S. (1988). *Adult Health Practices in the U. S. & Canada*. (DHHS Publication No. PHS 88-1479). Hyattsville, MD: National Center for Health Statistics. Vital & Health Statistics Series 5 #3. .
- Scott, R. S., Beaven, D. W., Stafford, J. M. (1984). The effectiveness of diabetes education for non-insulin-dependent diabetic persons. *The Diabetes Educator*, 10 (1), 36-39.
- Sinnock, Pomeroy. (1984). Use of hospitalization data to evaluate patient education programs. [Special issue]. *The Diabetes Educator*, 10, 43-45.
- Speers, M. A., & Turk, D. C. (1981). Diabetes self-care: knowledge, beliefs, and action. *Patient Counseling and Health Education*, 3 (4), 144-149.
- Statistics Canada. (1989/90). *Education in Canada: a statistical review for 1989-90*. Ottawa, Ontario: Author. p 245.
- Strowig, Suzanne. (1982). Patient education: a model for autonomous decision-making and deliberate action in diabetes self-managment. *Medical Clinics of North American*, 66 (6), 1293-1307.

- Sulway, M., Tupling, H., Webb, K., & Harris, G. (1980). New techniques for changing compliance in diabetes. *Diabetes Care*, 3, 108-111.
- Teza, S. L., Davis, W. K., & Hiss, R. G. (1988). Patient knowledge compared with national guidelines for diabetes care. *Diabetes Educator*, 14, 207-211.
- Tough, Allen. (1985). How adults learn and change. [Special Issue]. *The Diabetes Educator*, 11, 21-25.
- Turk, D. C., Salovey, P., & Litt, M. (1986). Adherence: A cognitive behavioral perspective. In K. Gerber & A. Nehmekis (Eds.), *Compliance in the Chronically Ill*. (pp. 45-72). New York: Springer Publishing Co.
- Vallis, T. M., & Bucher, B. (1986). Self-efficacy as a predictor of behavior change: interaction with type of training for pain tolerance. *Cognitive Therapy and Research*, 10, 79-94.
- Van Hoozer, Helen, Bratton, B. D., Ostmo, P. M., Weinholtz, Donn., Craft, M. J., Albanese, M. A., & Gjerde, C. L. (1987). *The Teaching Process*. Norwalk, CT: Appleton-Century-Crofts.
- Vinacor, F., Cohen, S. T., Mazzuca, S. A., Moorman, N., Wheeler, M., Kuebler, T., Swanson, S., Fineberg, S. E., Gordon, E. E., Duckworth, W., Norton, J. A., Fineberg, N. S., Clark, C. M. (1987). Diabeds: a randomized trial of the effects of physician and/or patient education on diabetes patient outcomes. *Journal of Chronic Disease*, 40, 345-356.
- Watkins, J. D., Williams, T. F., Martin, D. A., Hogan, M. D., & Anderson, E. (1967). A study of diabetic patients at home. *American Journal of Public Health*, 57, 452-459.

- Watts, Fraser, N. (1980). Behavioral aspects of the management of diabetes mellitus: Education, self-care, and metabolic control. *Behavioral Research and Therapy*, 18, 171-180.
- Weinsier, R., Seeman, A., Herrera, M., Simmons, J., & Colloins, M. (1974). Diet Therapy of Diabetes. *Diabetes*, 23, 669-673.
- Whitehouse, F. W., Whitehouse, I. J., Smith, J., & Hohl, R. D. (1979). Teaching the person with diabetes: experience with a follow-up session. *Diabetes Care*, 2 (1), 35-38
- Williams, T. F., Martin, D. A., Hogan, M. D., Watkins, J. F., & Ellis, E. V. (1967). The clinical picture of diabetic control, studied in four settings. *American Journal of Public Health*. 57, 441-451.
- Wilson, M., & Boyer, C. (1988). A contract for change in diabetes self-management: case report. *The Diabetes Educator*, 14 (1), 37-40.
- Wing, R. R. (1989). Behavioral strategies for weight reduction in obese type II diabetes patients. *Diabetes Care*, 12 (2), 139-144.
- Wong, V. P., & McManus, R. M. (1991). Compliance with diabetes self-care in relation to time from education. Unpublished manuscript.
- World Health Organization. (1973). *Training and preparation of teachers for schools of medicine and of allied health sciences: report of a WHO study group*. Geneva: WHO Technical Report Series #521
- Wornell, Charleen. (1990). 10 tips for proper blood glucose monitoring. *Diabeticare News, Summer*, 1-2.
- Wyness, M. A. (1989). Warfarin patient education: are we neglecting the program design process? *Patient Education and Counseling*, 14, 159-169.

Yale, Jean-Francois. (1989). Assessment of blood glucose monitoring systems. *Beta Release*, 2 (1), 1-3.

Ziesat, H. A., (1977-78). Behavior modification in the treatment of hypertension. *International Journal of Psychiatric Medicine*, 8, 257-265.

APPENDIX 1
INFORMATION LETTER

10776-31 Avenue,
Edmonton, AB. T6J 3S5
_____, 1991.

Dear Interested Participant:

Thank you for your interest in this study. I have been a diabetes educator for several years and am now working toward a Master's degree in Education at the University of Alberta.

The diabetes education program provides you with information and skills so that you will be able to take care of your condition. I would like to find out if you have any questions about what you have learned in the program after you have returned home and put the information and skills into practice.

It is hoped the results of this study will be useful in the future to help others with diabetes who take this program.

If you agree to take part in the study, I will need to gather some information during an interview, 4 to 6 weeks after the program. You will be asked to complete a Food Intake Diary. This food record is similar to the one that you prepared for the dietitian before the program started.

Three to four weeks after the program, you will receive a telephone call from me to arrange an interview at a convenient time and place. At this time, you will be reminded to fill in the food record which will be collected during the interview.

During the interview, you will complete a short written quiz about diabetes, and the researcher will observe you checking your blood sugar. In addition, you will be asked what information and skills you think need to be reviewed after attending the Diabetes Education Program and how this review might be arranged.

All information will be confidential. Your name will not appear on any of the forms. Your identity will be known only to me and I will be the only one who will see the completed forms. You are free to withdraw from the study at any time. The care you receive will not be affected should you choose to withdraw.

Thank you again for your assistance.

Yours truly,

Marcia Shaw, R. N.

APPENDIX 2
CONSENT FORM

Consent

Title of Research: Follow-up: Patient perception of the need to reinforce learning after diabetes teaching program.

Researcher: M. Shaw, RN
MEd Candidate
Faculty of Education
Phone.....

Advisor: Dr. Fred Ilott
Professor
Dept. of Adult, Career & Technology
Phone.....

You are invited to participate in a study at the University of Alberta Hospitals. There are 4 points that you must understand if you agree to take part in this study.

1. All information is confidential. Your name will not appear anywhere, except on this consent form. All information including your name, address and phone number will be kept in a locked file. At the end of the study, this information will be destroyed .

2. You can withdraw from this study at any time. Your hospital care will not be affected. If you want to drop out of the study, let the researcher know by calling one of above telephone numbers.

3. You may not benefit from this study, however, the information learned from this study may help others.

4. If you have any questions or concerns at any time, you are free to call the researcher, Marcia Shaw or advisor, Dr. Fred Ilott.

Purpose of the Study

The purpose of this study is to find out what additional help you might need to apply the information and skills that you learned four to six weeks after attending the Diabetes Education Program.

Procedure

To find this out, you will be asked to complete an information sheet, which includes such things as your age, marital status, schooling, work, as well as your history and treatment of diabetes. This will take about 10 minutes.

Before leaving the Diabetes Education Program, you will be given a Food Intake Diary to be completed before the interview similar to the one you completed before the program started. Three to four weeks after the

program, you will receive a telephone call from me to arrange an interview at a convenient time and place. At this time, you will be reminded to fill in the Food Record which will be collected during the interview.

During the interview, you will have a short written quiz about diabetes, and the researcher will observe you checking your blood sugar. In addition, you will be asked what information and skills you think need to be reviewed after attending the Diabetes Education Program and how this review might be arranged. This will take about one hour.

Please complete the following:

I have read the explanation and understand this study. I have had a chance to discuss it and ask questions. I am aware that during this study, should the researcher become aware of information which may be harmful to my health, she will discuss this with me. I have received a copy of this consent form.

Signature of Subject

Signature of Witness

Date _____

Option

I will allow a tape recorder to be used to collect information for this study with the understanding that the tape will be erased when the data has been compiled.

YES NO (Please Circle)

I wish to be informed of the study results. YES NO (Please Circle)

If you answered YES to the last question please fill in your address

Name _____

Address _____

Postal Code _____

APPENDIX 3
DEMOGRAPHIC INFORMATION

Part B Diabetes Information

When were you told you had diabetes Year _____

Are you attending the diabetes education program with a friend or relative?

Yes _____ No _____

Please check the method of managing diabetes at the END of classes.

_____ none	_____ diet only
_____ pills only	_____ insulin and diet
_____ diet and pills	

Do you test your blood sugar regularly at home? Yes___ No___

Have you ever lived with a person with diabetes? Yes___ No___

Are there other family members with diabetes ? Yes___ No___

Have you attended diabetes classes before? Yes___ No___

If yes to the above question, about how long ago? _____

APPENDIX 4

DIABETES-RELATED KNOWLEDGE QUIZ

Diabetes-Related Knowledge

A. General Information:

(Please answer the following questions by circling the letter you think answers the question correctly).

t for true f for false n for not sure

- | | | | |
|--|---|---|---|
| 1. The usual cause of diabetes is eating too much sugar and other sweet food. | t | f | n |
| 2. Common symptoms of high blood sugar are: sneezing, red spots, and dandruff. | t | f | n |
| 3. Foot care should be done every day. | t | f | n |
| 4. Your blood sugar may be low if you are: shaky, weak, sweaty, and you feel like passing out. | t | f | n |
| 5. You can treat your low blood sugar reaction with diet drinks. | t | f | n |
| 6. If you have stomach flu, you should not take your diabetes medication. | t | f | n |
| 7. It is all right to drink alcohol if you take the diabetes pill. | t | f | n |
| 8. Your blood sugar can only be checked in a laboratory. | t | f | n |
| 9. Complications of uncontrolled blood sugar can be: blindness, kidney failure, heart disease and impotence. | t | f | n |
| 10. Infection or stress may cause your blood sugar to rise. | t | f | n |
| 11. People with diabetes should exercise before meals. | t | f | n |
| 12. Type two is a less severe form of diabetes. | t | f | n |

B. Nutrition

- | | | | |
|---|---|---|---|
| 1. Fresh fruit is a "free food" in a diabetic meal plan. | t | f | n |
| 2. Any food product that says "dietetic" on the label can be eaten as desired. | t | f | n |
| 3. Eating whole wheat bread instead of white bread is one way to increase the fiber content of your diet. | t | f | n |

- | | | | |
|--|---|---|---|
| 4. Twice as much meat can be served at supper if none was eaten at lunch. | t | f | n |
| 5. During illness, such as stomach flu, it is okay to eat items such as regular soda pop or jello. | t | f | n |
| 6. Another name for 1% milk is skim milk. | t | f | n |
| 7. Margarine has fewer calories than butter. | t | f | n |
| 8. Vinegar and oil is a calorie-free salad dressing. | t | f | n |
| 9. Cream cheese and butter are both considered to be fat choices. | t | f | n |
| 10. It's okay to miss meals if you're on a diabetic diet. | t | f | n |

C. Pharmacy

- | | | | |
|---|---|---|---|
| 1. Insulin you are using may be stored at room temperature. | t | f | n |
| 2. Diabetes medication may not work properly if one drinks alcohol. | t | f | n |
| 3. Oral medications for diabetes are effective only if the pancreas is able to produce insulin. | t | f | n |
| 4. Always draw the longer acting insulin into the syringe first. | t | f | n |
| 5. Diabetes can be treated with oral medication alone. | t | f | n |
| 6. When diabetes pills or insulin are at peak times, you should have a snack. | t | f | n |

Client Number _____

Date _____

Scoring total 56 marks
 2 marks for the correct answer
 1 mark for "not sure"
 No marks for an incorrect answer.

APPENDIX 5

BLOOD SUGAR MONITORING SKILL PACKAGE

Includes

Checklist and Rating Scale for Monitoring Blood Sugar
Criteria for Blood Sugar Monitoring

Monitoring Blood Sugar--checklist and rating scale

Client Number _____ Method _____ Date _____

One point for each completed item. **One point** may not be given if an important step is out of order or left out. **One point** will not be given if supervision was required during the procedure.

1. _____ Check to see is machine window is clean.
2. _____ #Meter calibrated.
3. _____ Turns on the instrument in time.
- *4. _____ #Cleans hands.
- *5. _____ #Obtains a suitable drop of blood.
- *6. _____ #Completely cover test reagent strip with blood drop.
7. _____ #Presses on Start button.
- *8. _____ Wipes blood from strip appropriately.
9. _____ #Places strip in the machine.
- *10. _____ #Reading taken.
- *11. _____ Accurately times the blood on reagent test strip .
- *12. _____ #Follows steps / manufacturer's instructions.
- *13. _____ #Records blood sugar level.
- *14. _____ #Discards used equipment appropriately

Score = 14

One-Touch does not requires 7, 8, 11 above score = 11

#Exactech procedure total score = 10

*Chemstrip visual requires steps 4, 5, 6, 8, 10, 11, 12, 13,14 Score = 9

Rating:

The procedure for monitoring blood sugar levels should be followed exactly and the skill mastered. Performance will be diagnosed using the above criteria.

Rating scale :

- 90-100% - excellent performance
- 80-89% - discuss omissions
- 70-79% - review procedure & return demonstration
- 60-69% - review procedure & return demonstration
- 50-59% - complete review and return demonstration

Criteria for Blood Sugar Monitoring

Preparation

Check if the window is clean and the meter is calibrated.

Start the instrument

Wash hands in warm water

Keep the hand low for a few moments.

Prick a finger with a blood letting device.

Obtain a good hanging drop of blood.

Completely cover the reagent pad with a drop of blood.

Place the strip
in the meter

Place the strip
in the meter

Place the strip
in the meter.
Press the timer
and remove the
strip.

Press on
Start

Apply a drop of blood to reagent pad	Press on Timer	Read after 30 seconds	Exactech
---	-------------------	--------------------------	----------

Read after 45 seconds	One Touch
-----------------------------	-----------

Wait 60 seconds	Wipe off the blood	Read after 60 seconds	Chemstrip bG visual
--------------------	-----------------------	-----------------------------	------------------------

Press on Start	Wait 60 seconds	Wipe off the blood	Place the strip in the meter	Read after 60 seconds	Accucheck II
-------------------	--------------------	-----------------------	---------------------------------	--------------------------	--------------

Press on Start	Wait 40 seconds	Blot the blood x 2	Place the strip in the meter	Read after 20 seconds	Glucoscan 2000/3000
-------------------	--------------------	-----------------------	---------------------------------	--------------------------	------------------------

Wait 30 seconds	Blot the blood	Place the strip in the meter	Read after 20 seconds	Glucometer II /GX
--------------------	-------------------	---------------------------------	--------------------------	----------------------

Press on Timer	Wait 60 seconds	Wipe off the blood	Place the strip in the meter	Read after 60 seconds	Tracer
-------------------	--------------------	-----------------------	---------------------------------	--------------------------	--------

adapted from: Yale, Jean-Francois (1989). Assessment of Blood Glucose Monitoring Systems; Beta Release, 2 (1), 1-3.

APPENDIX 6

MEAL PLANNING SKILL PACKAGE

Includes

**Criteria for Meal Planning
Meal Planning Skills Score Sheet
Food Intake Diary**

Meal Planning Skills Criteria

The standards for this record include:

1. The extent to which the main food groups in the Canada Food Guide are followed (Carbohydrate, Protein, Fat, Fruit & Vegetables and Milk) during the day.
2. The extent to which the client follows the meal and snack pattern (for example, 3 meals and 3 snacks per day unless otherwise suggested)
3. The fat content of the food intake.
4. The amount of complex carbohydrates in the food intake.

Scoring guidelines

1. **Canada's Food Guide (CFG)** -- 5 points for eating the stated number of servings from each food group each day. (Total 20 points per day)

Milk and Milk Products	2 servings (cups) for adults per day
Meat and / Alternates	2-(2-3 oz) servings per day
Fruit and Vegetables	5 or more servings per day
Bread and Cereal	5 or more servings per day (whole grain enriched)

2. Follows the **meal and snack pattern** (for example, 3 meals and 3 snacks per day unless otherwise suggested) - (Total of 6 points per day)

3. A total of 10 points per day will be given for selecting food with the appropriate **FAT CONTENT**.

Green group choices	FULL marks.
Yellow group choices	One mark taken off.
Red group choices	Two marks taken off.

Green

- * low fat choices--1% or skim milk, 0-12 % milk fat (mf) or less cheese ,
- *light sour cream / yogurt, light margarine or butter, lean meat, fish,
- *skinless poultry (4-6 oz.).

Yellow

- *medium fat--2% milk, 13-23 mf cheese, 2% yogurt 2 %, low fat ice cream,
- *frozen yogurt, meat, poultry, (7-12 oz.), fish, lobster, shrimp
- *peanut butter.

Red

- *high fat choices--homo milk, cheese with mf 23% or more, 4% yogurt
- *ice cream and 4% frozen yogurt, butter, margarine oil, regular mayonnaise, chocolate,
- *fried foods, regular luncheon meat and ground beef, sausage,
- *breaded meat or fish, pork and bean, bacon,

4. A total of 10 points per day will be given for selecting food with the appropriate **COMPLEX CARBOHYDRATES**

Green group choices	FULL marks.
Yellow group choices	One mark taken off.
Red group choices	Two marks taken off.

Green

- *fresh/frozen fruit and vegetables, (no sauce), unsweetened juices
- *fruit packed in pear juice or own juice,
- *pretzels, unbuttered popcorn, unsweetened whole grain bread, and
- *cereals, low fat crackers, pasta, rice, roll, bun (no butter or margarine), oat
- *bran cereal (hot), all bran, rolled oats, plain bagel
- *lentils, beans, chick peas.

Yellow

- * 2"home-made muffins, soda crackers, graham wafers, stone wheat thins,
- *arrowroot biscuits, pancakes, high fiber whole grain crackers, small plain
- *doughnut, bread or rolls with butter or margarine, multi-grain bread,
- *pumpnickel, rye bread, cold cereals, bran flaked cereal,
- *avacado, commercial soups, died fruit.

Red

- *commercial muffins, cheese bread, croissants, butterrolls, granola, cakes,
- *doughnuts, or cookies (all kinds),
- *french fries, potato chips, cheezies, taco chips,
- *fast foods, pasta with cream, cheese sauce,
- *mayonnaise, candy, chocolate, fruit drinks or crystal, pickled vegetables,
- *fruit in syrup, coconut, vegetables in sauces.

MEAL PLANNING SKILLS-SCORE SHEET

Client Number _____ Date _____

Day 1 CFG _____
 C CHO _____
 Fat _____
 Snacks _____ Day Total _____ /46 points

Day 2 CFG _____
 C CHO _____
 Fat _____
 Snacks _____ Day Total _____ /46 points

Day 3 CFG _____
 C CHO _____
 Fat _____
 Snacks _____ Day Total _____ /46 points

Day 4 CFG _____
 C CHO _____
 Fat _____
 Snacks _____ Day Total _____ /46 points

Day 5 CFG _____
 C CHO _____
 Fat _____
 Snacks _____ Day Total _____ /46 points

Day 6 CFG _____
 C CHO _____
 Fat _____
 Snacks _____ Day Total _____ /46 points

Day 7 CFG _____
 C CHO _____
 Fat _____
 Snacks _____ Day Total _____ /46 points

Weeks Total _____ /322

Rating scale:

90-100% - excellent
 80- 89% - satisfactory
 70-79% - refer to dietitian
 60-69% - refer to dietitian
 50-59% - refer to dietitian

Instructions: Before the home visit, please record your food intake on the form provided for seven days in a row. Two of these days should be on the weekend. Please note any changes in your schedule: eating out, changes in shift work, holidays, etc.

Date _____	
BREAKFAST Starch Protein Fruit/Veg Fat Milk	Special Conditions for
	Snacks (after breakfast)
LUNCH Starch Protein Fruit/Veg. Fat Milk	Snacks (after lunch)
SUPPER Starch Protein Fruit/Veg. Fat Milk	Snacks (after supper)

APPENDIX 7

HOME VISIT QUESTIONS

HOME VISIT QUESTIONS

Client Number _____ Date _____

BLOOD SUGAR MONITORING**Research Question #2**

What do clients perceive their needs to be for knowledge and skills four to ten weeks following the four-day DEP?

1. What difficulties have you had with the procedure when in measuring your blood sugar?
2. How would you know if your measurements are accurate?
3. Is there anything about blood sugar monitoring that you are unsure about and believe you should know about testing your blood sugar correctly?

Research Question #3

What is the client's knowledge of existing support services?

Who would you contact if you were not sure if your meter was measuring your blood sugar correctly?

Research Question #4

What type of support services do clients prefer?

Who would you prefer to contact if your meter was not working correctly?

MEAL PLANNING**Research Question #2**

What do clients perceive their needs to be for knowledge and skills four to ten weeks following the four-day DEP?

1. What difficulties have you had following your meal plan?
2. How do you think you are doing with measuring and selecting food for snacks and meals?
3. Is there anything about meal planning you are uncertain about and believe you need to know to measure and select appropriate food for meals and snacks?
4. Is there anything about meal planning that you are uncertain about and believe you should know to use your meal plan
 - a. on social occasions?
 - b. during illness?

Research Questions #3

What is the client's knowledge of existing support services?

Who would you contact if you were having difficulty with you meal plan or wanted help to change your meal plan?

Research Questions #4**What type of support services do clients prefer?****Who would you prefer to contact about your meal plan?****EXERCISE****Research Question #2****What do clients perceive their needs to be for knowledge and skills four to ten weeks following the four-day DEP?**

1. Have you had any difficulty exercising regularly? (20 minutes 3x/week)?
2. How do you use the information you received in class to practice exercise safely?
3. Is there anything about exercise that you are uncertain about and believe you need to know to treat your diabetes during exercise?
4. Do you know if exercise affects your blood sugar?

Research Questions #3**What is the client's knowledge of existing support services?****What services in the community would help you with exercising?****Research Question #4****What type of support services do clients prefer?****What kind of service would you prefer to contact if you wanted help with exercising.****MEDICATION****Insulin****Research Question #2****What do clients perceive their needs to be for knowledge and skills four to ten weeks following the four-day DEP?**

1. Have you had any difficulty measuring your insulin?
2. Do you think you measure accurately enough?
3. How do you use the information about insulin you learned in class?
4. Is there anything about insulin that you are unsure about and believe you need to know to give yourself insulin safely?

Research Questions #3**What is the client's knowledge of existing support services?****If you had a problem with insulin administration who would you contact?****Research Question #4****What type of support services do clients prefer?****What kind of service would you prefer to contact to assist you with insulin administration?****Oral agents****Research Question #2****What do clients perceive their needs to be for knowledge and skills four to ten weeks following the four-day DEP?**

1. What difficulty have you had taking your oral diabetes medication?
2. Is there anything that you are uncertain about and believe you need to know to take your diabetes medication.

Research Questions #3

What is the client's knowledge of existing support services?

If you had a problem with your diabetes medication who would you contact?

Research Question #4

What type of support services do clients prefer?

What kind of service do you think should be available to assist you with diabetes medication?

FOOT CARE

Research Question #2

What do clients perceive their needs to be for knowledge and skills four to ten weeks following the four-day DEP?

1. What difficulties have you had following the instructions you received about foot care from the MDCC.
2. Is there anything you are uncertain about and believe you should know to give care to your feet?

Research Questions #3

What is the client's knowledge of existing support services?

Who would you contact if you were have problems with your feet?

Research Question #4

What type of support services do clients prefer?

Who would you prefer to contact for foot problems?

HIGH BLOOD SUGAR

Research Question #2

What do clients perceive their needs to be for knowledge and skills four to ten weeks following the four-day DEP?

Have you experienced high blood sugar over a long period of time?

YES NO

a. If YES

1. What difficulty have you had with high blood sugar?
2. How did you use the information you learned in class to treat this problem?
3. Is there anything you are unsure about and believe you need to know to prevent high blood sugar?
4. Is there anything you are unsure about and believe you need to know to treat high blood sugar?

b. IF NO

1. How do you use the information you learned in class to prevent high blood sugar?
2. How do you use the information you learned in class to treat high blood sugar?
3. What are you unsure about and believe you need to know to prevent high blood sugar?
4. What are you unsure about and believe you need to know to treat high blood sugar?

LOW BLOOD SUGAR

Have you ever had low blood sugar? YES NO

a. IF YES

1. What kind of difficulties have you had with low blood sugar?
2. How did you use the information you learned in class to treat low blood sugar?
3. Is there anything you are unsure about and believe you need to know to prevent low blood sugar?
4. Is there anything you are unsure about and believe you need to know to treat low blood sugar?

b. IF NO

1. How would you use the information you learned in class to prevent low blood sugar?
2. What are you unsure about and believe you need to know to prevent low blood sugar?
3. What are you unsure about and believe you need to know to treat low blood sugar?

Research Questions #3

What is the client's knowledge of existing support services?

Who would you contact if you were unable to control your blood sugars?

Research Question #4

What type of support services do clients prefer?

Who would you prefer to contact if you were unable to control your blood sugar?

General Questions

Do you personally have a need for follow-up after the Diabetes Education Program?

What kind of follow-up would you be interested in having?

APPENDIX 8

PROPOSED CONTENT FOR FOLLOW-UP PROGRAM

PROPOSED CONTENT FOR EDUCATIONAL FOLLOW-UP

The Diabetes Education Program provides general facts about how to manage diabetes. Meaningful information will be used by the client and integrated their lifestyle. Follow-up education includes reassessment of the client's treatment plan, knowledge and skills. Reeducation may be necessary to correct misunderstanding and to reinforce information. Referral to appropriate resources may be necessary.

The Canadian Diabetes Association Standards and Guideline (1988-89) suggests that the outline for a Diabetes Education Program should include plans for patient follow-up. Most subjects are referred back to their family physicians for medical evaluation. The American Diabetes Association Standards of Medical Care (1990) are more specific suggesting that knowledge of diabetes and self-care skills be reassessed annually.

This study found newly diagnosed clients particularly in need of follow-up. The programs should probably be separate because the IDDM are more knowledgeable than the NIDDM and their needs differ.

The purpose of follow-up will be to revise the treatment plan, find out the barriers to following the treatment plan and create a practical plan to overcome these barriers based on the individual client. The main focus for reinforcement and support is in the following areas: blood sugar monitoring, meal planning, exercise, foot care, medication and the complications of high and low blood sugar

Blood Sugar Monitoring (BSM)

- Assess the BSM skill, calibration procedure and cleaning of the meter.
- Reinforce resources for obtaining direct service if meter is malfunctioning.
- Find out what problems the client has with this procedure at home.
- Facilitate solving these difficulties, e.g. random blood testing, reinforce blood testing 4x / day during illness or stress etc., blood letting techniques.

Meal Planning

- Assess the barriers to following the meal plan.
- Individualize meal plan and revise according to likes and dislikes.

- Negotiate a step-by step plan with the client, that will enable them to work at following the meal plan.
- Make an appointment to follow the progress. Revise the goals as needed.
- Discuss alternatives and problem solve the difficulties of eating out.
- Reinforce the treatment for sick days.

Exercise

- Assess the subject need for reinforcement of the safety precautions during exercise.
- Assess whether the client knows if exercise affects their blood sugar
- Suggest they test their blood sugar to determine the affect of exercise.
- Determine barriers to exercising and individualize an exercise plan.
- Facilitate further learning and referral for those who want to exercise more actively.

Medication for IDDM

- Assess insulin administration skills.
- Obtain feedback from individual clients regarding difficulties with insulin administration.
- Reinforce 'how-to' adjust the insulin dose, if appropriate.

Foot Care

- Assess clients tendency to do foot care.
- Reinforce the need to attend to foot problems early.
- Facilitate referral if foot problems are presented.

Uncontrolled Blood Sugar

- Assess the need to reinforce basic information about high / low blood sugar.
- Identify the clients difficulties.
- Find out what the client is willing to do to overcome these difficulties and facilitate the action.

General suggestions

- A combination of strategies is more effective than a single approach.
- Strategies will be more effective if they match the clients goals, needs characteristics and situation.