

Nutrition Education in Patients with Diabetes Mellitus

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**ABSTRACT**

Much research has been done concerning the effectiveness of self-management for diabetic patients. In comparison, information on how effective education techniques are in improving self-management of non insulin dependent diabetes mellitus (NIDDM) patients is limited. This study tested the relationship between knowledge of self-care techniques and health status in individuals with NIDDM. The basis of the study was a three-part survey used to gain information on sources of self-care education, level of knowledge, and various elements of health status. The subject group consisted of 37 men and women with NIDDM who had a median age of 55. The scores for health status and knowledge were compared as were the scores for the patient activity index and knowledge. Data also was compiled on sources of self-care information, willingness to learn, and self-evaluation of personal understanding of diabetes management. Analysis of data was performed using simple and polynomial linear regression. Results indicated that the most significant correlation ( $p < 0.0001$ ) was between the total score on diabetes knowledge and the participant's activity index ( $R^2 = 0.517$ ). Similarly, the relationship between total knowledge score and

health status showed another strong correlation ( $R^2=0.0476$ ). While self-evaluation of level of understanding of diabetes care did not accurately predict actual understanding, all participants reported a willingness to learn more about diabetes. This study indicates that the ability to provide effective self-management may be directly related to improved quality of life for patients with diabetes mellitus.

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## TABLE OF CONTENTS

	Page
ABSTRACT.....	ii
ACKNOWLEDGEMENTS.....	iv
TABLE OF CONTENTS.....	v
LIST OF TABLES.....	vi
LIST OF FIGURES.....	vii
INTRODUCTION.....	1
METHODS.....	11
Survey.....	11
Subjects.....	13
Evaluation.....	13
Statistical Analysis.....	15
RESULTS.....	15
Demographics.....	15
Sources of Diabetes Information.....	16
Statistical Results.....	21
DISCUSSION.....	25
APPLICATION.....	31
APPENDIX-Survey.....	33
BIBLIOGRAPHY.....	39
VITA.....	42

## LIST OF TABLES

Table		Page
1	RELATIONSHIP BETWEEN HEALTH STATUS/ ACTIVITY INDEX AND SECTIONS OF THE SELF- CARE KNOWLEDGE PORTION OF THE SURVEY.....	22

## LIST OF FIGURES

Figure		Page
1	SOURCES OF DIABETES CARE INFORMATION REPORTED BY STUDY PARTICIPANTS.....	17
2	UNDERSTANDING OF DIABETES SELF-CARE AS REPORTED BY PARTICIPANTS.....	19
3	ACTUAL UNDERSTANDING OF DIABETES CARE.....	20
4	RELATIONSHIP BETWEEN PATIENTS' TOTAL SCORE AND THEIR HEALTH STATUS.....	23
5	RELATIONSHIP BETWEEN PATIENTS' TOTAL AND THEIR ACTIVITY INDEX.....	24
6	RELATIONSHIP BETWEEN PATIENTS' TOTAL SCORE AND THEIR HEALTH STATUS GRAPHED WITH A POLYNOMIAL CURVE.....	26
7	RELATIONSHIP BETWEEN PATIENTS' TOTAL SCORE AND THEIR ACTIVITY INDEX GRAPHED WITH A POLYNOMIAL CURVE.....	27

## **Introduction**

Since it was first described in the seventeenth century by an English physician, health care providers have been searching for an effective treatment for patients with diabetes mellitus (1). Diabetes is an incurable disease in which the body either does not produce or does not properly use insulin, an anabolic hormone which is intimately involved in carbohydrate metabolism.

There are two main types of diabetes mellitus. They include insulin dependent diabetes mellitus (IDDM) or type one, and non-insulin dependent diabetes mellitus (NIDDM) or type two. In IDDM, the individual must take insulin injections because he or she lacks the ability to produce insulin due to an auto-immune dysfunction of the pancreas. In NIDDM, the individual's use of insulin in metabolism is impaired. NIDDM diabetes, also known as ketosis resistant, involves ninety percent of the population with diabetes (2).

Diabetes mellitus affects over 5 million people (3). Besides the direct consequences of diabetes, it can also lead to serious complications such as heart disease, kidney failure, and blindness. Diabetes is the seventh leading cause of death in the United States.



Each year 250,000 people die from causes related directly to diabetes (4). Diabetes Mellitus is the number one cause of new blindness in adults. People with diabetes are up to four times more likely to develop heart disease and up to six times more likely to have a stroke. Diabetes is also related to complications during pregnancy and delivery and to birth defects (5).

Certain groups have a greater tendency toward diabetes. The Hispanic Health and Nutrition Examination Survey (HHANES) showed that the prevalence of self-reported diabetes was 6.8% among Hispanic men and 7.6% among Hispanic women (6). This is much higher than the overall U.S. population rate of 2.9% and 3.8% for men and women, respectively (7). Other groups with higher risk of developing diabetes include African Americans and Native Americans (8). The tendency also increases with age, obesity, and family history of diabetes (9).

While there is no cure for diabetes, scientific technology has done much in the way of treating the diabetic patient. This includes better ways of delivering insulin, more acceptable forms of insulin, as well as new, more accurate ways to monitor serum glucose levels. In addition, great progress has been made in

the nutritional management of diabetes.

Today, nutrition management is indicated throughout treatment. The dietitian, as the nutrition educator, provides an essential role in the diabetes health care team. While diet instructions vary from individual to individual according to lifestyle and severity of the disease, the backbone of the diabetic diet is a low-fat, high complex carbohydrate diet (10). The diet is not unlike the diet currently recommended for overall health. Carbohydrate content of the diet is divided equally throughout the day so that injected insulin or impaired insulin response can effectively aid the body in converting glucose to energy (11). While type one diabetics must take insulin on a daily basis, type two diabetics may follow only a diabetic diet and/or take oral hypoglycemic agents that aid in the use of their own insulin. Only in some cases do they combine the use of insulin and oral hypoglycemic agents. For both types, the diet is modified in order to maximize the benefits of treatment and reduce medical intervention as much as possible.

One essential element of diabetic treatment is patient self-care. Because diabetes is a chronic disease, its care requires on-going, life-long changes

in the diabetic's lifestyle. This requires that the diabetic individual understand all areas of diabetes treatment including medication, dietary modification, and exercise.

In her research in the area of diabetes self-care, Heather M. Maclean defines self-care as representing, "the range of behavior undertaken by individuals to promote or restore their health" (12). Success of a self-care program must incorporate a balance that does not compromise health yet is personally satisfying to the individual. Maclean found that the most influential factors in determining success were first, autonomy and control and second, personal interpretation of health.

Research by Inge de Weerd et al. at Free University Hospital in Amsterdam also confirmed the importance of attitude in active self-care programs (13). In studying the determinants of active self-care behavior, they showed that a sufficient level of knowledge and low emphasis on the control of health by others were prerequisites for a positive attitude.

While little research has been done on patient knowledge in the area of type two diabetics, several researchers have analyzed the effects of diabetes knowledge on patients with insulin-dependent diabetes

mellitus. Researchers at Washington University in St. Louis, Missouri, analyzed the psychological effect of high patient knowledge on reaction to illness associated with IDDM (4). They found that knowledgeable patients had the most positive reaction to their illness if blood glucose was well controlled; however, these patients had the most negative reactions if their blood glucose was poorly controlled. Nevertheless, the researchers concluded that greater knowledge may have long term benefits if the patient receives a broad-based education. This education should include common reactions to illness and the origin of diabetes-related illnesses. Part of the rationale for a broad-based education is to reduce the effects of self-blame in cases of poor blood glucose control. In their words, "It is not so much the knowledge, but how that knowledge is used, that appears to produce the deleterious effects...".

Education for diabetes self-care has been associated with reductions in hospitalizations and with the prevention of some of the complications of diabetes (14). However, there are several barriers to providing sufficient patient instruction. These include limited knowledge of the health-care team, limited numbers of

health-care providers, lack of support for research into educational strategies that promote behavioral change, and limitations on third-party reimbursement for patient education (15). The goal of the National Long-Range Plan to Combat Diabetes is to provide "available, accessible, and affordable patient education to all persons with diabetes as an integral component of their treatment."

Now that the value of self-care has been established, how can the health care team provide the patient knowledge and motivation necessary for self-care? Several health care professionals serve as sources of patient information. These include doctors, nurses, and dietitians. In addition, specialized teaching is given by those licensed as Certified Diabetic Educators (C.D.E.).

While information is needed in all areas of diabetes management, this paper will focus on nutrition education. The major goals of all nutrition intervention are to "achieve metabolic control as close to normal as possible and to prevent or delay microvascular and macrovascular complications" (16). Diet instruction should empower the individual and their care-providers with the tools necessary to personally be

responsible for achieving this control.

While every diabetes educator has his or her own style of teaching, there are several basic forms of diet teaching that are widely used by health professionals. The most widely used method is the exchange group system developed by the American Diabetes Association and the American Dietetic Association (17). In this intervention strategy, diabetics are given a meal plan based on servings of starch/breads, meat and substitutes, vegetables, fruit, milk, and fat. Numbers of servings are equivalent to the appropriate number of calories that should be consumed per day.

A second method is following basic food guidelines such as those set forth by the Surgeon General (17), the Department of Health and Human Services (18), the American Heart Association (19), and the National Cancer Institute (20). Guidelines include reducing fat, cholesterol, sodium, and sweets. They also include increasing intake of fruits, vegetables, and complex carbohydrates.

A third method is carbohydrate counting (21). This method follows the assumption that carbohydrate is the major factor influencing blood glucose levels and therefore, insulin needs. It requires that the diabetic

calculate amounts of carbohydrate in each food eaten and administer insulin accordingly. This is the primary intervention technique used in the United Kingdom.

Yet another technique is the Total Available Glucose (TAG) method (21). In this method, a scale defines foods in terms of their individual affect on blood glucose. Diabetics moderate meals so that their intake will not go over the allotted TAG that their bodies can metabolize. The TAG value is determined with the aid of health care providers.

Other approaches include simply reducing overall energy and/or fat intakes and eliminating certain high calorie foods in order to promote weight loss (22). In general, the severity of the disease will dictate the strictness of the diet.

The Diabetes Control and Complications Trial (DCCT), which began in 1985 and ended in 1993, was designed to compare the effects of intensive insulin therapy with those of conventional therapy on complications of IDDM (23, 24). The dietitians involved in the trial tested the various nutrition intervention methods to see which proved most effective. The results indicate that following a consistent meal pattern and being able to adjust insulin dosage with food variation

are critical to maintaining glucose levels within the normal range. However, the choice of dietary intervention depended both on the dietitian's experience with the different strategies, as well as the needs of the patient.

Another study of nutrition intervention techniques compared nutrient-based and exchange group methods in NIDDM (25). The study found that a group of type two diabetics can learn a sophisticated method of diet planning involving calculations of calories, cholesterol, sodium and essential vitamins and minerals at the same rate as they can learn to use the exchange method. This allows the diabetic greater understanding of the nutritive values of various foods and greater flexibility in meal-planning. However, it should be noted that not all individuals were comfortable with the lack of exact specifications toward meal planning, indicating that the use of this method of should be on an individual basis.

Evaluation of success of nutrition intervention is another important part of diabetes education. Without feedback from the diabetic on whether or not the nutrition counseling has indeed aided in control of the disease, the counselor cannot modify instructions to



meet individual needs. A dietitian can spend several hours in a hospital room with a diabetic patient; however, illness and stress involved with hospitalization may make it a poor time for learning. Therefore, the diabetic educator must have a method of assessing the success rate of the diet instructions he or she has delivered.

Compliance to diet instructions can be assessed by weight-loss by patients with NIDDM and blood-glucose monitoring by patients with IDDM. In addition, whether or not the patient eats meals at regular intervals, their success in decreasing fat consumption, and their ability to keep appointments are indicators of compliance (26). Most health institutions have a set process of evaluation that is developed by the dietary department, patient education department, or other administration.

It is the area of patient evaluation that this study examines. The goal of the research was to determine if patient knowledge can be used as an indicator of health status in patients with type two diabetes. The hypothesis is that understanding of self-care techniques affects quality of life for patients with diabetes mellitus.

## **Methods**

### Survey

A three-part survey was developed to analyze the various components of diabetes education (Appendix). The purpose of the survey was to gather information about sources of information, knowledge of diabetes and related diet information, and patient medical history and health status.

The survey consisted of 29 multiple-choice questions on information related to diabetes. The survey was written at a seventh to eighth grade level. In a cover letter that accompanied the survey, participants were guaranteed confidentiality and were given the option of receiving the results of the survey.

Part one of the survey consisted of questions about where the participant received diet instruction and educational information. There were also questions about the amount of time since their last consultation, the number of consultations, who accompanied them, and their willingness to learn. Finally, the participant was asked if he felt that he understood the diet instructions.

The second portion of the survey involved questions

that tested the participant's understanding of the diet instructions. Questions were divided into the areas of (a) general medicine, which pertained to basic facts about the disease, (b) food groups, which contained questions about basic nutrition, and (c) exchanges, which asked questions on the exchange system of dietary management. The majority of the questions were derived from the International Diabetes Center Diabetes Information Test (27).

The final portion of the survey asked the participant about his medical history and overall health. Information was also requested regarding anthropometric data such as height, weight, and age. Medical history questions included items such as time since diagnosis, change in weight, forms of treatment, and complications related to diabetes. Another portion of this section of the survey asked the participant to rate ability to perform a variety of functions. For this part, the activity index was derived from an index developed by Dr. Anita Stewart et al. published in Medical Care (28).

After the survey was compiled, the answers to each question were assigned numerical values so that an overall score for both knowledge and health status could

be calculated.

### Subjects

The participants were selected with the assistance of several registered dietitians in the College Station, Texas, area. All participants were diagnosed with type two, ketosis-resistant, diabetes mellitus. To test the hypothesis that understanding of self-care techniques affects the quality of life for diabetic patients, participants were required to have been instructed by a health care professional.

The participants were given the survey either as an inpatient at a local hospital, as part of a support group meeting, or in conjunction with outpatient diet teaching by a dietitian. A total of 40 surveys were completed. However, only 37 were useable; the other 3 were incomplete.

### Evaluation

The diabetes knowledge portion of the test was scored according to number of correctly answered questions. The possible range of scores was 0 to 14 with 14 being a perfect score. A total score and scores for sections on food groups, exchanges, and medicine

were recorded.

The participants were also given a score for the health status section of the survey. This score included complications, degree of obesity, weight change, and activity level. The range of points assigned for activity ranged from 14 to 42, with 42 indicating the greatest degree of difficulty in performing specified tasks. A total health status score was also recorded. The total health status score ranged from 9 to 82, with 82 being equivalent to the lowest health status.

The diet instruction resources section answers were also recorded for comparison among the surveys and to help in the explanation of the results of the knowledge and health status scores. Results were recorded for areas such as numbers of participants who received information from a certain resource, location at which the information was provided, and frequency of visits with various health care professionals. In this section, participants were also asked to rate their understanding of diabetes self-care and their willingness to learn more about the treatment of diabetes.

### Statistical Analysis

The results of the surveys were analyzed using the general linear models procedure of the Statistical Analysis System (SAS, 1986) (28). The relationships between total score on knowledge and history status, total score and activity index, and the relationship between each of the sections of the knowledge portion of the survey and both health status and activity index were evaluated by linear regression. A predetermined significance of  $P < 0.05$  was used to indicate statistical significance of the correlation coefficients.

## **Results**

### Demographics of the Survey Group

The participants in the study consisted of 20 males (54%) and 17 females (46%). The average age of the participants was 55. The average body mass index (Quelelet's Index), a height-weight index using the formula  $\text{kg/m}^2$  (30), was 30. This score is categorized as grade 2 obesity and is associated with a rapid increase in mortality. Only 6 participants were in the

desirable range of 20-25 for their height-weight index.

Of the participants, the majority (68%) had been diagnosed with diabetes over three years ago. All surveyed reported a willingness to learn more about diabetes and its treatment.

#### Sources of Diabetes Information

Participants reported receiving information from a variety of health care professionals as shown in Figure 1. Most of the participants received information on diet from more than one source. The most common source of information was the registered dietitian (R.D.). Of the participants, 78% said that they were instructed by an R.D. at some time.

The majority of the individuals (51%) who were surveyed reported that they received information while hospitalized. Other locations included a doctor's office (43%), a dietitian's out-patient office (19%), and clinics (16%).

Fifteen participants had received diet instructions in the last two weeks, 5 in 2 weeks to 2 months, 4 in the last 2 to 6 months. Ten individuals reported that they had not discussed their diet in the last 6 months, and 2 were unsure of the time since diet instructions

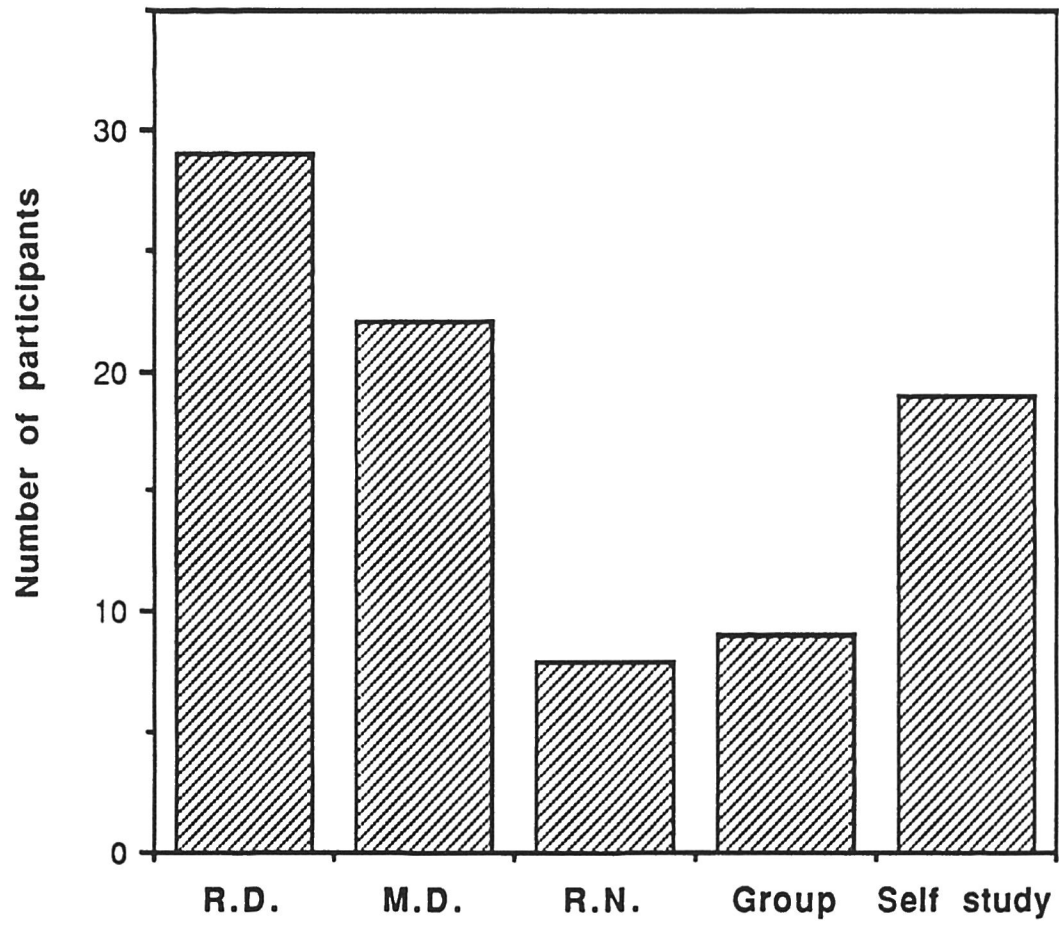


Figure 1. Sources of diabetes care information reported by study participants.

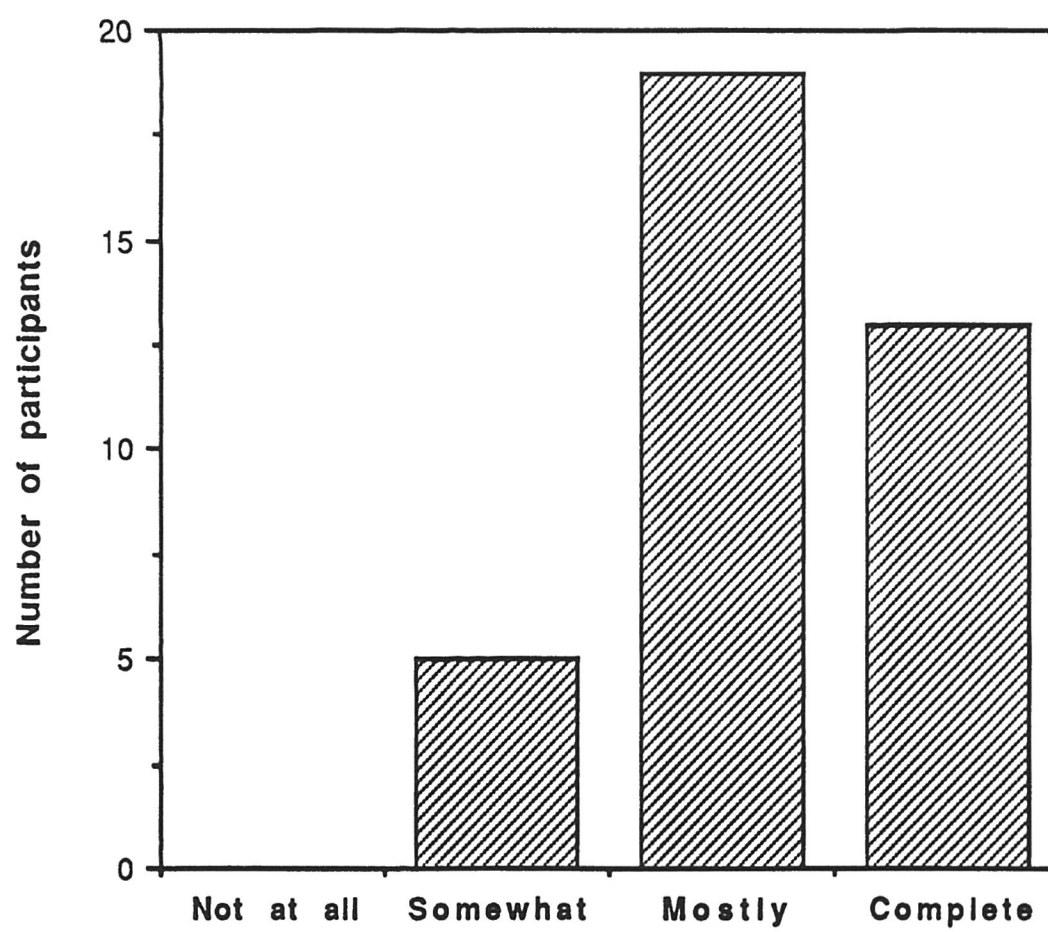


were last given.

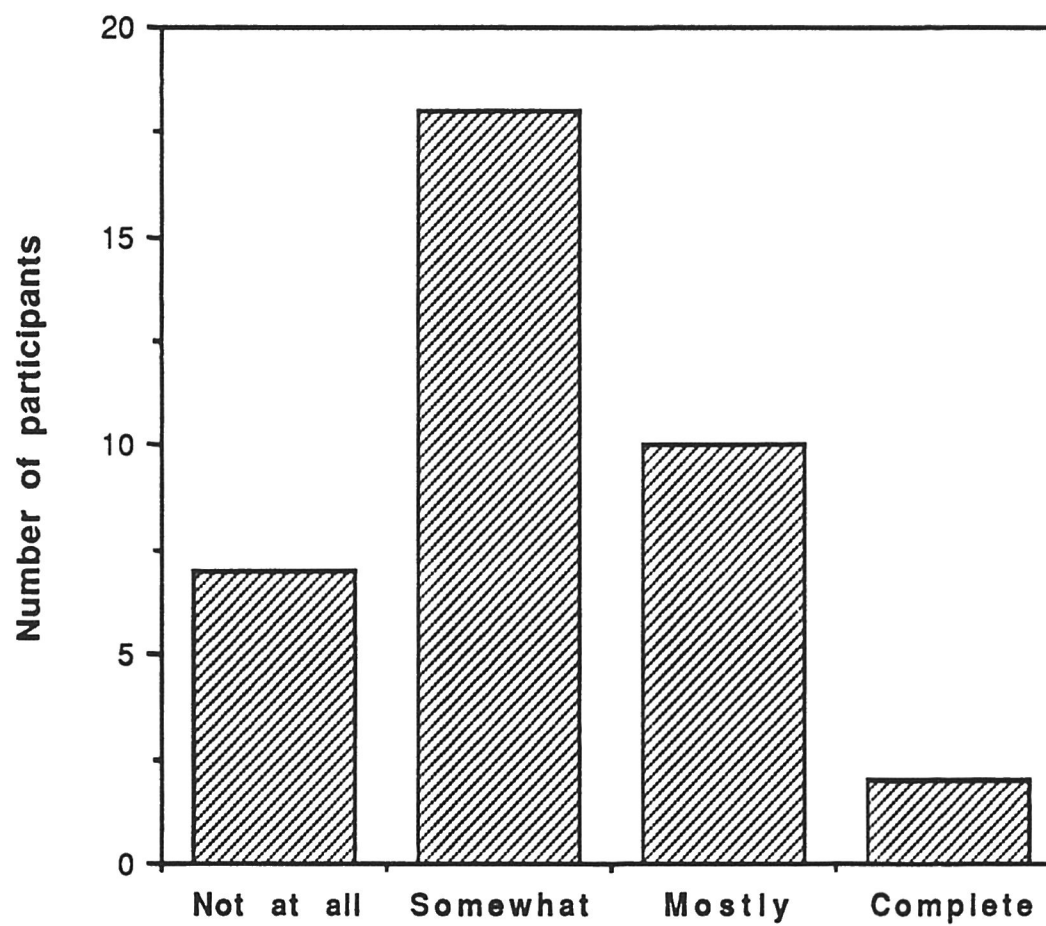
When asked about who was present when diet instructions were given, 14 of the participants responded that no one accompanied them. Seven reported that they are seldom accompanied, while 5 have a friend or family member present most of the time and 11 were always accompanied.

One question asked of participants was what they felt was their level of understanding of the diet instructions they were given to follow. As shown in Figure 2, 13 participants said that they completely understand, 19 said that they mostly understand, and 5 said that they somewhat understand their diet. No one reported that they did not understand at all.

A very different set of values is seen when actual understanding is graphed using the scores from the knowledge section of the survey (Figure 3). Complete understanding is equivalent to a score of 14, mostly equal to 10 to 13, somewhat 5 to 9, and not at all equal to less than 5 answers given correctly. Two participants showed complete understanding, 10 mostly, 18 somewhat, and 7 not at all.



**Figure 2. Understanding of diabetes self care as reported by participants.**



**Figure 3. Actual understanding of diabetes self care expressed as complete (all correct answers), mostly (10-13 correct), somewhat (5-9 correct), and not at all (4 or less correct).**

### Statistical Results

In the assessment of the information gathered through the survey, various relationships between scores on the knowledge section and scores on health status were analyzed. The purpose was to see if there is a correlation between knowledge levels and health status.

Each of the sections of the diabetes knowledge portion of the test was regressed against the activity index and the overall health status score of the participants, as shown in Table 1. However, no one relationship had a  $R^2$  value higher than 0.377 (general medicine v. health status).

A much greater correlation was found when total knowledge score was compared. When the relationship between patients' total score and their health status was evaluated by using simple linear regression, an  $R^2$  value of 0.444 ( $p < 0.0001$ ) was observed (Figure 4). When the activity index was substituted for health status in this analysis, the significance increased to 0.466 ( $p < 0.0001$ ) (Figure 5).

When these same values were re-evaluated by polynomial regression, the ability to predict health and activity levels based on scores on the knowledge section increased even further. The  $R^2$  for the relationship

**Table 1. Relationship between both health status and activity index and the general medicine, general exchange, and food groups sections of the knowledge portion of the survey**

	Activity index	Health status
General medicine	0.367 <sup>a</sup>	0.377 <sup>a</sup>
General exchange	0.056	0.054
Food groups	0.249 <sup>b</sup>	0.244 <sup>c</sup>

<sup>a</sup> P<0.0001

<sup>b</sup> P<0.0017

<sup>c</sup> P<0.0019

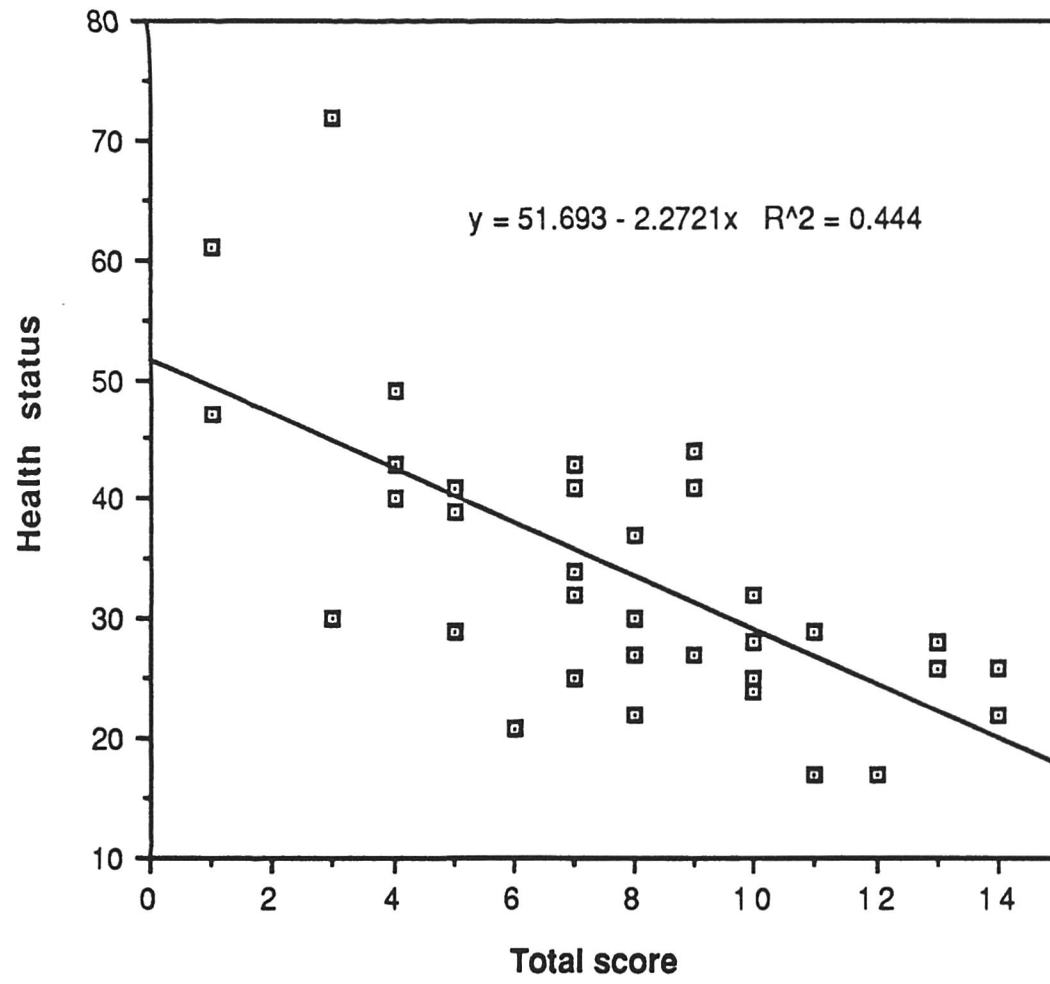


Figure 4. Relationship between patients' total score and their health status.

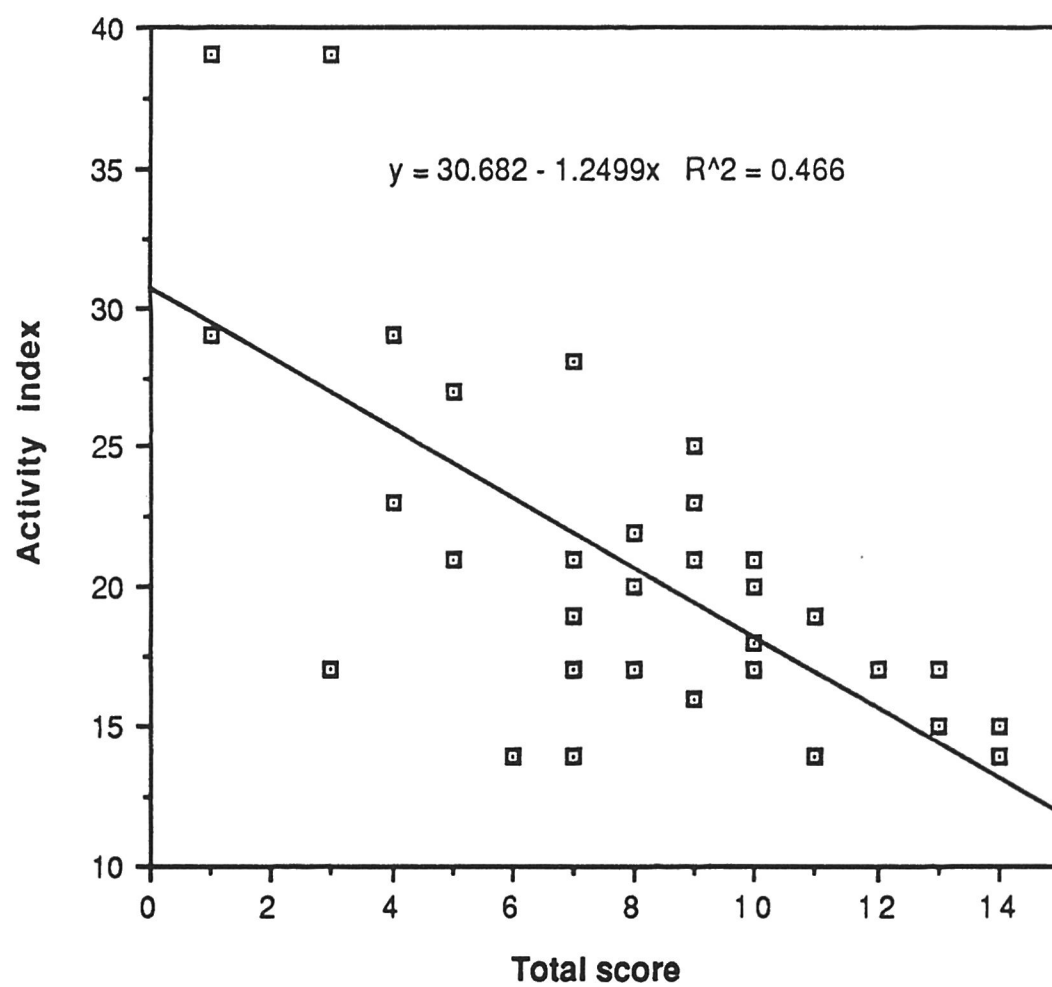


Figure 5. Relationship between patients' total score and their activity index.

between participants' total score and their health status value was 0.476. This relationship is shown in Figure 6.

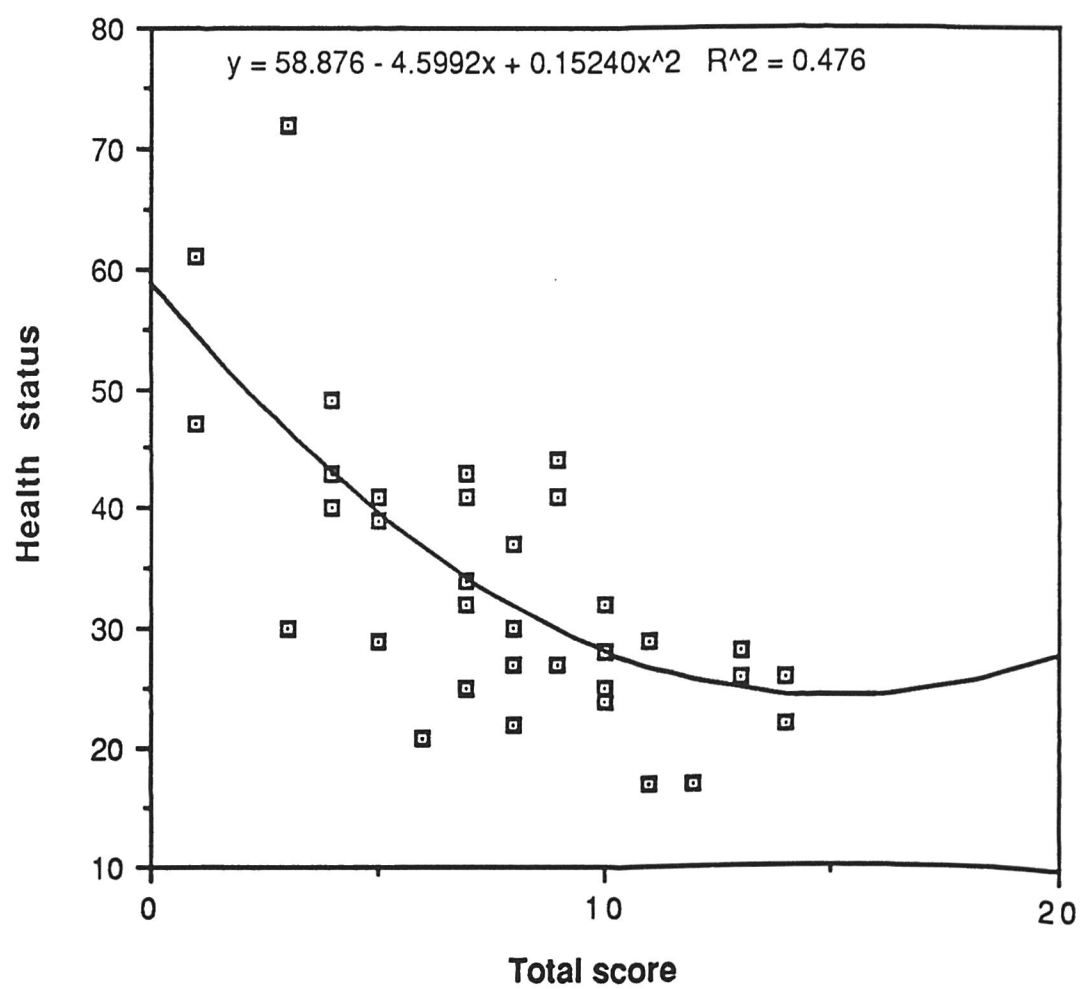
Finally, the highest correlation was found when total score was plotted against the activity index with a polynomial curve (Figure 7). For this relationship, a correlation of greater than fifty percent was seen ( $R^2=0.517$ ).

## **Discussion**

In this study, we looked at the relationship between patient understanding of self-care techniques and quality of life in individuals with non-insulin dependent diabetes mellitus. The results indicated that there is a significant correlation between level of patient understanding and health status.

The greatest correlation ( $R^2=0.517$ ) was found between total score on the diabetes knowledge portion and the patient activity index (Figure 7). A similar level of significance ( $R^2=0.476$ ) was found when the total knowledge score was plotted against activity index (Figure 6). When individual parts of the knowledge





**Figure 6. Relationship between patients' total score and their health status graphed with a polynomial curve.**

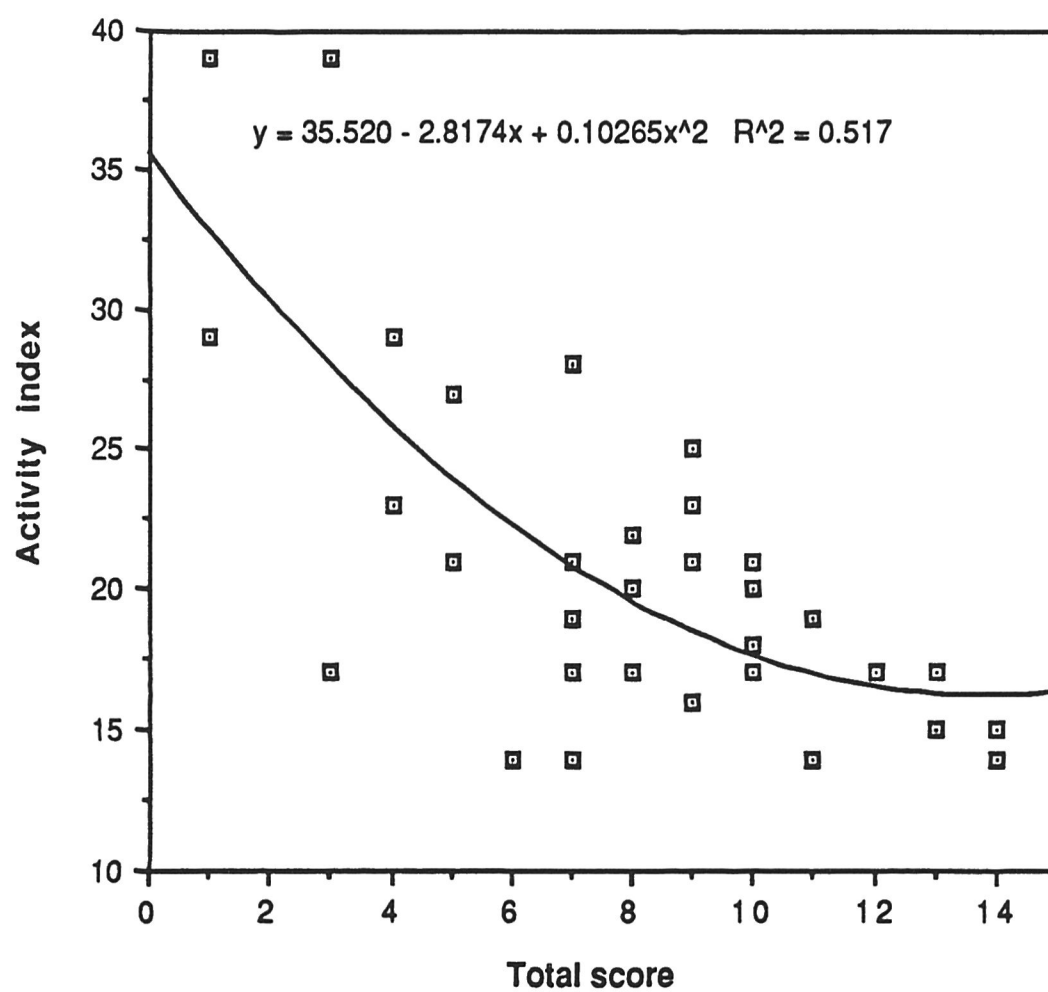


Figure 7. Relationship between patients' total score and their activity index graphed with a polynomial curve.

section were compared to health status and to the activity index, the correlations were much lower, as shown in Table 1.

These findings indicate that the diabetic patient benefits from having an understanding of all parts of self-care (food groups, medicine, and exchange system). While an understanding of each component improves health status, the ability to understand and utilize knowledge in all areas is more highly correlated with an increase in the quality of life of the patient than understanding of any individual area. This is consistent with the findings of the National Long Range Plan to Combat Diabetes sponsored by the National Diabetes Advisory Board (14). This report discusses the value of self-care, and states that self-care is possible only when the patient has a generalized understanding of all parts of diabetes self-management.

While nutrition management of diabetes is valuable, diet alone cannot determine the severity of the illness. Diabetes mellitus is a "complex interaction of multiple metabolic systems" (4). The severity of the disease varies from person to person due to genetic disposition, physical complications, and the onset of other diseases that are closely related to NIDDM (8). This explains

that, while knowledge of diabetes self-management is extremely important in predicting health status, it is not the only factor that determines the quality of life of the patient. These other influences must be taken into account when judging the value of knowledge in management of diabetes. With these influences in mind, the correlation values reported in this study may not be extremely high, but are statistically significant and indicate the importance of patient knowledge in their self-management of diabetes mellitus.

In comparing the data collected concerning resources of diabetes education with knowledge of self-care techniques, a discrepancy was seen between the participants' stated understanding (Figure 2) and actual understanding (Figure 3). This difference, the fact that the participants believe that they have a much higher understanding of the disease than they actually do, can be explained in two ways.

First, the participants may have overestimated their ability to understand the concepts of self-care so that they could maintain independence in their lifestyles. Lack of understanding could lead to further control of patient lifestyle by health care professionals. Reporting a high understanding of

information given on the treatment of diabetes can be associated with increased self-management of diabetes.

Second, patients may not be able to conceptualize the background knowledge necessary to assume complete understand. The individual might feel that he or she understands treatment of the disease because he or she understands the basic concepts behind healthy eating and exercise; however, our test of patient knowledge covers such a diverse collection of diabetes information, that knowing a few facts will not lead to a high score.

Regardless of the reasons, the participants in this survey were not able to correctly judge their own levels of understanding. This could lead to overconfidence in the ability to provide self-management and prevent the individual from continuing to learn more about the treatment techniques for diabetes mellitus.

In considering the responses to the questions concerning where and from whom the participants receive diet and self-care instructions (figure 1), it was noted that most patients receive information from a variety of resources. Therefore, it is important that the diabetic individual receive consistent information from all resources . If the individual receives conflicting information, the health care professionals could lose

credibility with the patient, and the patient compliance might decrease significantly. One way to assure that the information is indeed consistent is to stress the need for continuing education among all health-care providers.

Since the majority of the patients received diet instruction while hospitalized (51%), those providing the instruction must remember that stress of being severely ill greatly reduces the comprehension of the patient once he or she has returned home (14). It is recommended that the information provided for the patient while in the hospital be re-emphasized once he or she has gone home and has fewer distractions.

### **Application**

The findings of this study can be used in planning diabetic education. The results of the comparison between knowledge and health status show that the diabetic educator must provide information in all areas of diabetes management to successfully improve the quality of life. This means that, in planning educational programs, the health care professional must

create a balance, incorporating informational resources from every aspect of diabetes management. The diabetic educator must also be able to relate to the patient the value of incorporating all aspects of self-care into daily life.

Diabetes mellitus provides a great challenge for the health educator. While much research has already been done in the area of diabetes treatment, there is much more to learn. At the present time, one of the most valuable tools in treatment of non-insulin dependent diabetes mellitus is education. However, unless information on every aspect of self-management is given to the patient, the effort to treat the patient will not prove very effective. As with treatment of any disease or illness, the goal is improvement of the quality of life for the individual. This study shows that the key to improved health status for the patient with NIDDM may be tied directly to the ability to provide effective self-care. This self-care can only occur if the patient has received and demonstrated an ability to interpret all aspects of diabetes self-management.

**APPENDIX**

Dear Participant,

My name is Amy Bluntzer, and I am a senior Nutritional Sciences major at Texas A&M University. As a participant in the University Honors Program, I am currently working on a special project that will look at the benefits of nutrition education in the treatment of diabetes. Through this survey, I hope to be able to learn more about the strengths and weaknesses of current diabetes education so that people such as yourself can better learn to control diabetes in the future.

By completing the attached survey, which will only take ten minutes of your time, you will be helping me in reaching this goal. Please answer the questions to the best of your ability. Your name will not appear on any portion of the survey so your answers will all be anonymous.

If you would like a copy of the results of this project, I would be glad to send one as soon as it is ready next spring. There is a space at the bottom of this page for your address.

Once again, thank you for taking the time to help me.

Sincerely,

Amy C. Bluntzer

If you would like a copy of the results,  
write your name and address here:

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Date \_\_\_\_\_  
 Location \_\_\_\_\_

**Questionnaire**  
**Diabetes Education Study**

Please answer the following questions by circling your choice.

**Section One**

This section deals with diet instructions that you have received in order to control your diabetes.

1. How long has it been since you last received diet instructions?
 

a) 1-2 weeks	c) 1-2 months
b) 2-4 weeks	d) 2-6 months
e) over 6 months	f) I don't know
  
2. Does a friend or family member usually accompany you when you receive diet instructions?
 

a) always	c) seldom
b) most of the time	d) never
  
3. How well do you understand the diet that you were given to manage diabetes?
 

a) completely understand	c) somewhat understand
b) mostly understand	d) not at all
  
4. Are you willing to learn more about the treatment of diabetes?
 

a) Yes	b) No
--------	-------
  
5. How have you learned about your diet?  
**Circle all that apply:**

a) Doctor	e) Diabetes Center/ Seminar
b) Nurse	f) Diabetes Literature
c) Dietitian	g) Other _____
d) Support Group	
  
6. Where did you go to receive diet teaching?  
**Circle all that apply:**

a) Hospital-Inpatient	d) Dietitian's Office
b) Clinic- (Scott&White)	e) Public Health Clinic
c) Doctor's Office	f) Other _____

7. If you have meet with a dietitian, how many times in the past year?
- a) once
  - b) 2-3 times
  - c) 4-6 times
  - d) more than 6 times
8. If you have received diet instructions from a doctor or nurse, how many times in the past year?
- a) once
  - b) 2-3 times
  - c) 4-6 times
  - d) more than 6 times

### Section Two

This section tests your level of diabetes and nutrition knowledge. Circle the best answer.

9. The usual cause of diabetes is:
- a) Eating too much sugar and other sweet foods
  - b) Lack of effective insulin in the body
  - c) Failure of the kidneys to control sugar in the urine
  - d) I don't know
10. In untreated diabetes the blood sugar is usually:
- a) normal
  - b) increased
  - c) decreased
  - d) I don't know
11. Insulin causes blood sugar to:
- a) increase
  - b) decrease
  - c) stay the same
  - d) I don't know
12. Which of the following statements is correct?
- a) One cup of milk may be exchanged for four ounces of cheese.
  - b) One ounce of beef may be exchanged for one ounce of cream cheese.
  - c) One egg may be exchanged for one ounce of ground beef.
  - d) I don't know
13. How many grams of carbohydrates are in one bread exchange?
- a) 15
  - b) 10
  - c) 20
  - d) I don't know
14. Foods included on the lean meat list are:
- a) fish, poultry, center-sliced ham
  - b) ground beef, liver, eggs
  - c) cheddar cheese, bologna, wieners
  - d) I don't know

15. The bread exchange list contains food high in carbohydrate.  
One slice of bread may be exchanged for:  
a) 1/2 cup cornflakes      c) 1 small potato  
b) 6 graham crackers      d) I don't know
16. One ounce of a high fat meat may be exchanged for:  
a) 1/2 cup cottage cheese  
b) 1 slice of cheddar cheese (1 ounce)  
c) 1 ounce pork roast  
d) I don't know
17. One orange may be exchanged for:  
a) 1 medium banana      c) 1 small apple  
b) 1 cup orange juice      d) I don't know
18. The meal plan used in diabetes management:  
a) is unlike the ordinary American diet  
b) could be the basis for an excellent family meal plan  
c) is too high in fat for general use  
d) I don't know
19. The type of food highest in calories per gram is:  
a) carbohydrate      c) fat  
b) protein      d) I don't know
20. Foods which may be used "free" on a diabetes exchange meal plan are:  
a) foods labeled "diabetic" or "dietetic"  
b) foods which contain 20 calories or less per serving  
c) alcoholic beverages  
d) I don't know
21. The action of glucagon is to:  
a) raise the blood sugar  
b) lower the blood sugar  
c) neutralize insulin  
d) I don't know
22. Which of the following methods should be used by everyone with diabetes?  
a) meal planning      c) insulin  
b) oral tablets      d) I don't know

**Section Three**

Please answer the following questions about your medical history.

Height\_\_\_\_\_ Weight\_\_\_\_\_ Age\_\_\_\_\_ Sex\_\_\_\_\_

23. How long has it been since you were diagnosed as diabetic?
- |                       |                 |
|-----------------------|-----------------|
| a) less than 6 months | c) 1 to 3 years |
| b) 6 months to 1 year | d) over 3 years |
24. How would you rate your health at the present time?
- |              |                 |
|--------------|-----------------|
| a) very poor | d) good         |
| b) poor      | e) excellent    |
| c) fair      | f) I don't know |
25. Over the past year has your health caused you:
- |                          |                    |
|--------------------------|--------------------|
| a) a great deal of worry | d) no worry at all |
| b) some worry            | e) I don't know    |
| c) hardly any worry      |                    |
26. How has your weight changed over the last three months?
- |                          |                       |
|--------------------------|-----------------------|
| a) gained over 15 lbs.   | f) lost 1 to 5 lbs.   |
| b) gained 10 to 15 lbs.  | g) lost 5 to 10 lbs.  |
| c) gained 5 to 10 lbs.   | h) lost 10 to 15 lbs. |
| d) gained 1 to 5 lbs.    | i) lost over 15 lbs.  |
| e) stayed about the same | f) I don't know       |
27. What is the current form of treatment that you are following? **Circle all that apply:**
- |                       |                  |
|-----------------------|------------------|
| a) insulin injections | c) diabetic diet |
| b) diabetic pills     | d) other_____    |
| e) none of the above  |                  |
28. What health problems have you had in the past? **Circle all that apply:**
- |                               |                               |
|-------------------------------|-------------------------------|
| a) Kidney disease             | f) Poor eyesight or blind     |
| b) Heart problems             | g) loss of teeth or infection |
| c) High blood pressure        | h) foot infection             |
| d) Stroke                     | i) other_____                 |
| e) Lower extremity amputation | j) no health problems         |

29. Rate the degree of difficulty you have in performing each of the following tasks by circling 1 (none), 2 (some), or 3 (great):

Item	degree of difficulty		
	None	Some	Great
a) Difficulty standing for long periods	.....1	2	3 (a)
b) Difficulty lifting or carrying weights of approximately ten pounds	.....1	2	3 (b)
c) Difficulty going up and down stairs	.....1	2	3 (c)
d) Difficulty walking	.....1	2	3 (d)
e) Difficulty using hands and fingers	.....1	2	3 (e)
f) Difficulty reaching with either/or both arms	.....1	2	3 (f)
g) Nervousness, tension, anxiety, and depression	.....1	2	3 (g)
h) Trouble getting to sleep and staying asleep	.....1	2	3 (h)
i) Heart beating hard even when not exercising or working hard	.....1	2	3 (i)
j) Pains, aches, or swelling in parts of the body	.....1	2	3 (j)
k) Weakness, tiring easily, no energy	.....1	2	3 (k)
l) Shortness of breath, trouble breathing even when not exercising or working hard...	.....1	2	3 (l)
m) Difficulty chewing	.....1	2	3 (m)
n) Difficulty swallowing	.....1	2	3 (n)

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