THE EFFECTIVENESS OF A STANDARDIZED DIABETES EDUCATION PROGRAM ON BLOOD GLUCOSE AND GLYCOHESOLATED HEMOGLOBIN A₁C LEVELS

By

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To the Faculty of Washington State University:

The members of the Committee appointed to examine the clinical project of NANCY S. GREGORY find it satisfactory and recommend that it be accepted.

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Abstract

This study evaluated the effectiveness of a standardized diabetes education program in a rural primary care office on blood glucose and hemoglobin A\textsubscript{1C} levels. English speaking, non-pregnant adults with diabetes, able to perform self-care activities were used for the study. All individuals (n = 125) with diabetes who met the criteria, from a rural general internal medicine office were invited to participate in the study. The sample size was 19. The six month repeated measures study provided subjects with five 60 minute educational sessions. The sessions were conducted in the physician's office using an office nurse as instructor. The education program, Managing Your Diabetes, was designed and produced by Eli Lilly & Company (1994) for use in the office setting. Subjects were given a pre and post-test to determine level of knowledge before and after the education intervention. Fasting blood glucose and hemoglobin A\textsubscript{1C} levels were drawn prior to the education intervention and at three and six months.

The sessions were billed to Medicare and other insurance companies per Medicare guidelines. Reimbursement was approximately $80.00 per session, and other insurance reimbursement was approximately $105.00 per session.

At the conclusion of the study, blood glucose levels and Hgb A\textsubscript{1C} levels were compared and analyzed. The results showed that for those individuals with Hgb A\textsubscript{1C} levels greater than 7.0% there was a statistically significant improvement (p = .032) in their glycemic control. Mean fasting blood glucose
levels decreased from 188.89 mg/dl to 140.84 mg/dl.

The implications from this study are that providing diabetes education in the office is both effective and profitable.
# Table of Contents

Acknowledgements ................................................................. iii

Abstract ................................................................................. v

Table of Contents ................................................................. vii

Chapter I

Statement of the Problem ......................................................... 2

Statement of Purpose .............................................................. 3

Significance to Nursing ......................................................... 3

Literature Review .................................................................... 4

  Pathophysiology .................................................................. 4

  Incidence of Diabetes Mellitus ......................................... 5

  Risk Factors and Diagnosis ............................................. 6

  Complications of Diabetes ............................................... 7

  The Diabetes Control and Complications Trial (DCCT) .... 10

  Diabetes Education ............................................................ 11

  Summary ............................................................................. 13

Research Questions ............................................................... 15

Definition of Terms ............................................................... 16

Chapter II Methods

  Design .................................................................................. 17

  Target Population ............................................................. 18

  Sample ................................................................................ 18
<table>
<thead>
<tr>
<th></th>
<th>Section Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.</td>
<td>Patient Information Form</td>
<td>45</td>
</tr>
<tr>
<td>C.</td>
<td>Consent Form</td>
<td>48</td>
</tr>
<tr>
<td>D.</td>
<td>Diabetes Information Form</td>
<td>51</td>
</tr>
<tr>
<td>E.</td>
<td>Diabetes Knowledge Test</td>
<td>55</td>
</tr>
<tr>
<td>F.</td>
<td>Teaching Objectives</td>
<td>60</td>
</tr>
<tr>
<td>G.</td>
<td>Diabetes Education Record</td>
<td>66</td>
</tr>
<tr>
<td>H.</td>
<td>Community Resources</td>
<td>69</td>
</tr>
<tr>
<td>I.</td>
<td>Threats to Validity</td>
<td>71</td>
</tr>
</tbody>
</table>
Chapter I

By the year 2000, the number of individuals with diabetes mellitus in the United States is estimated to reach 20 million. Eighteen million of them will receive medical therapy from a primary care physician (Mazze, et al., 1994). Diabetes is the seventh leading cause of death in the United States (Fain, 1993). As many as 150,000 people die each year from diabetes and related complications. The goal of Healthy People 2000, (U.S. Dept. of Health and Human Services, 1991) is to reduce the incidence of diabetes to no more than 2.5 per 1,000 people, baseline being 2.9 per 1,000 in 1987. Common complications of diabetes include early development of cardiovascular disease, nephropathy, neuropathy, and retinopathy (Haas, 1993). Healthy People 2000 has established goals for end-stage renal disease of 1.4 per 1000 people (baseline 1.5 per 1000), blindness 1.4 per 1000 people (baseline of 2.2 per 1000), and lower extremity amputation to 4.9 per 1000 people (baseline 4.9 per 1000).

According to the American Diabetes Association the direct and indirect costs of diabetes were approximately $92 billion in 1992 (1993). Education programs to promote knowledge and skill development, appropriate eye and foot care are being directed at the primary care offices (Continuing Diabetes Care, Rhode Island, 1994), in an attempt to decrease such costs. Diabetes is the seventh most common diagnosis seen in primary care offices. Primary care physicians provide 97.5% of medical care for the 14 million individuals with
diabetes in the United States (Peterson, 1994).

Diabetes education programs, designed for hospitals and outpatient diabetes clinics are the standard method of educating patients with diabetes. A team approach to patient education, involving a certified diabetes educator, nurse, dietitian, diabetologist, pharmacist, and exercise physiotherapist is recommended (Hinnen, 1993). In many rural settings this approach is not available due to lack of specialty personnel. In these areas, the availability and participation in diabetic education programs are particularly low (Coonrod, Betschart & Harris, 1994). The nurse in the primary care provider's office, is in a crucial position to provide education to the patient with diabetes.

Statement of the Problem

Approximately 65% of individuals with diabetes have not participated in any diabetes education program. Ninety-five to ninety-seven percent of their knowledge of diabetes comes from their primary care provider. Yet, sixty-seven percent of primary care providers do not have a standardized diabetes education program in their offices for either insulin dependent or non-insulin dependent diabetes (Coonrod, Betschart & Harris, 1994). A lack of standardized education protocols, poor continuity of care, and lack of knowledge on the part of the office nurses and providers all contribute to ineffective control of diabetes.
Statement of Purpose

The purpose of this study was to determine the effect of a standardized diabetes education program on blood sugar and hemoglobin A1C levels of individuals with diabetes. The study was conducted in a rural primary care physician's office, utilizing the available office nurses.

Significance to Nursing

Some of the most important roles in nursing relate to educating patients, resulting in improved quality of care and assisting patients in improving and maintaining quality of life. Frequently, the patient is given technical help without the understanding of its importance and relevance to healthy outcomes (Wikblad, 1991). "Diabetes education has been shown to be effective to improve knowledge, life-style, and physical outcomes for patients with diabetes." (Comi, 1991, p. 442).

Rural areas specifically lack access to specialty care for the diabetic patient. Health care providers usually do not have office staff with expertise in diabetes, and there are few dietitians and educators in rural areas with the interest and credentials in this field. Medical centers are often a long distance away and many patients cannot afford these programs. Primary care providers are reluctant to spend the time necessary to provide diabetes education because they have not been reimbursed by Medicare or other insurance companies. With such a need for diabetes education and care in the office
setting, nurses need to respond with standardized diabetes education and relevant information. Office nurses have the responsibility and the opportunity to influence the direction and solutions to many of the problems associated with diabetes.

Literature Review

Pathophysiology

There are two types of diabetes mellitus, different in their onset and treatment, but similar in long term complications. Type I is a serious metabolic disease characterized by insulin insufficiency leading to hyperglycemic disorders (Fain, 1993). Usually, the loss in production of insulin is due to a problem with the beta cells of the Islets of Langerhans. Hereditary factors that increase the susceptibility of the beta cells to viruses, production of autoimmune antibodies against the beta cells, or degeneration of the beta cells have been implicated in causing diabetes (Guyton, 1991).

Obesity is a known contributor to the onset of type II diabetes mellitus. Obesity causes "the beta cells of the Islets of Langerhans to become less responsive to stimulation by increased blood glucose" (Guyton, 1991, p. 864). As a result, insulin does not increase when needed. Insulin receptors in the insulin target cells are fewer which leads to insulin resistance.

Physiology of Insulin and glucagon

Insulin is secreted by the beta cells of the Islets of Langerhans. These cells compose about 60% of the Islets of Langerhans. Alpha cells, 25% of the
Islets of Langerhans secrete glucagon. The remaining 10% are delta cells that secrete somatostatin. There is a close interrelationship between these hormones. Insulin will inhibit glucagon secretion and somatostatin inhibits both insulin and glucagon secretion (Guyton, 1991).

Insulin is required for carbohydrate and fat metabolism. It is essential for protein synthesis and cell building. Insulin is required for transport of glucose into almost all cells for production of energy. If insulin is not present, other sources of fuel, such as fats must be utilized. Insulin also causes excess carbohydrates to be stored in the liver as glycogen. Between meals, when blood glucose levels fall, insulin decreases and glucagon increases leading to breakdown of glycogen into glucose. This prevents the blood glucose levels from dropping too low (Guyton, 1991).

Insulin also has a very important role in the storage of fat. If insulin is not available there is an increase in fat breakdown and free fatty acids. This leads to ketosis and many of the lipid disorders that accompany diabetes (Guyton, 1991).

**Incidence of Diabetes Mellitus**

Insulin dependent diabetes mellitus (IDDM) typically has an abrupt onset and is characterized by severe insulin insufficiency. IDDM usually begins in childhood and requires treatment with exogenous insulin. This group accounts for approximately 10% of all diabetics in the United States (Fain, 1993). IDDM occurs equally in men and women, and is 1.5 to 2.0 times more common in
whites than in blacks (Nathan, 1993).

The remaining 90%, are considered to have non-insulin dependent diabetes mellitus (NIDDM). This usually occurs in middle-aged and elderly individuals and in the past has been called adult-onset diabetes, or maturity-onset diabetes. Obesity is considered to be a major factor in the onset of this type of diabetes. Approximately 60 to 70% of newly diagnosed NIDDM patients are obese (Fain, 1993). These patients are frequently treated initially with oral hypoglycemics. Insulin may be used if adequate control is not maintained with the hypoglycemics or in periods of illness or stress. Approximately 40% of those with NIDDM will need to use insulin to maintain good control.

Risk Factors and Diagnosis

Risk factors associated with IDDM include family history, autoimmune disease and viral infections. Risk factors for NIDDM include obesity, family history of diabetes, age over 40 years, gestational diabetes, giving birth to a baby weighing over 9 pounds, stress of injury or illness, hypertension, increased high fat diet, and decreased physical activity. Certain ethnic populations (Native American Indians, Mexican Americans and African American) are also at a higher risk of developing NIDDM (Fain, 1993).

The differentiation between IDDM or NIDDM is essential to proper treatment. IDDM usually occurs under the age of 35. The individual is not overweight, and may even be underweight. The patient is "ketosis-prone", meaning he/she has "recurrent ketoacidosis by history or fasting ketonuria" that
does not clear postprandially" (Rakel, 1996, p. 626). The two definitive laboratory tests are the Islet cell autoantibody test and serum peptide marker. The ICA is positive in about 80% of new-onset IDDM individuals. The serum peptide is positive if the amount of insulin produced is below normal five minutes after a 1 mg glucagon challenge.

Diagnosis of NIDDM is made on the basis of fasting plasma glucose levels. Fasting blood glucose levels of 140 mg/dl or greater on two separate occasions is diagnostic for NIDDM. Fasting blood glucose levels of 120 to 139 mg/dl should be evaluated with a glucose tolerance test. If any of the values are greater than 200 mg/dl, the test is positive for diabetes mellitus. Any values above normal (fasting: less than 115 mg/dl, 120 min: less than 140 mg/dl) but below 200 mg/dl are considered "impaired glucose tolerance" (Rakel, 1996).

Complications of Diabetes

Diabetes is associated with many chronic complications. "These complications include macroangiopathy, including cerebrovascular, heart and peripheral vascular disease; microangiopathy, including retinopathy, nephropathy, and peripheral capillaries; and neuropathy, including sensory, motor and autonomic dysfunction" (Haas, 1993, p. 71). There are several complex pathophysiologic reasons for these complications. Chronic elevated blood glucose leads to a malfunctioning of the normal lipid metabolism pathways, resulting in excess lipids. The excess lipids cause an increase in
plaque formation which results in macrovascular disease.

Chronic hyperglycemia causes a chemical process known as protein glycosolation. "Glycated proteins are the nonenzymatic product of glucose and the amino groups of circulating and membrane proteins" (Nathan, 1994, p. 10). The glycated protein, also known as glycosolated hemoglobin A1C, measures the average blood glucose concentration during the half-life of the circulating and membrane proteins. This is a measure of blood glucose control over 60 days, which is the half life of the average erythrocyte.

There is a strong positive correlation between glycosolated hemoglobin levels, hemoglobin A1C levels and development of diabetes complications (Diabetes Control and Complications Trial (DCCT) Research Group, 1993). The closer the glycosolated hemoglobin and A1C are to normal, the less likely complications are to develop and the longer they can be delayed. The goal of treatment in diabetes is to bring glycosolated hemoglobin levels and hemoglobin A1C levels to normal or near normal (Hirsch & Farkas-Hirsch, 1993). Glycohemoglobin levels should be checked three to four times yearly on all individuals with diabetes. There is some evidence to suggest that even checking patients more frequently improves control of their diabetes (Nathan, 1994).

Chronic complications are associated with an increased morbidity and mortality. The development of macrovascular complications are more diffuse and occur at an earlier age than the normal population. Forty to sixty percent
of deaths in those who have diabetes are due to these types of insidious complications. Interventions are aimed at keeping blood glucose levels and glycosolated hemoglobin levels at or near normal range, decreasing dietary fat, improving exercise and providing education.

Diabetic peripheral vascular disease is responsible for 50% of lower extremity amputations (Haas, 1993). Assessment of patient's lower extremities and feet is crucial to detection of vascular disease. It allows the clinician to evaluate sensation, temperature, circulation and integrity of the skin (Hass, 1993).

Retinopathy occurs as tissue becomes ischemic and dies. It occurs in about 95% of all diabetic patients. Microaneurysms are commonly seen on physical examination. For this reason, all IDDM individuals are recommended to have a thorough eye examination beginning five years after onset of diabetes and yearly thereafter. It is often difficult to determine how long an individual has had NIDDM. Therefore, they should have an examination yearly, beginning with diagnosis of diabetes.

Nephropathy occurs in less than 20% of individuals with NIDDM. Its onset is typically 5 to 10 years after onset of diabetes. In patients with IDDM, evidence of nephropathy usually does not occur for 10 to 15 years after the onset of diabetes (Haas, 1993). Nephropathy develops in about 35 to 45% of patients with IDDM. It is detected most commonly by positive protein on a urine dipstick or 24 hour urine for protein. A 24 hour urine protein immune
assay is done for earlier diagnosis of proteinuria. Nephropathy progresses over a period of 12 to 20 years, causing hypertension, decreased glomerular filtration rate and end-stage renal disease. Treatment focuses on intensive control of blood glucose and hemoglobin A\textsubscript{C} levels, following a low protein diet, and control of hypertension. End stage renal disease can be treated by transplantation, hemodialysis or peritoneal dialysis (Nathan, 1994).

Neuropathies commonly include peripheral sensorimotor losses, and diffuse autonomic neuropathies. They are a result of occlusive disease leading to nerve infarcts and demyelination (Hass, 1993; Nathan, 1994). Peripheral sensorimotor losses present as numbness, tingling and painful extremities. Autonomic neuropathies resulting from loss of capillary blood supply and denervation produce problems such as silent ischemia, gastroparesis, diarrhea, nausea, vomiting, impotency, and loss of sphincter control. Management of these complications has not been very successful (Tierney, McPhee & Papadakis, 1995).

**The Diabetes Control and Complications Trial (DCCT)**

The DCCT was a long term study of IDDM patients (mean 6.5 years, range 3-9 years) comparing the development of complications between an intensive therapy group and a conventional treatment group. Subjects were randomly assigned to groups. The study included a total of 1441 patients with IDDM. Those in the intensive therapy group were treated with a minimum of three injections of insulin daily or used an insulin pump. Insulin was given
based on the results of frequent self-blood glucose monitoring. The conventional group was treated with one to two insulin injections daily. The results of the study were so conclusive that the study was stopped one year early in June, 1993.

The results of the DCCT showed that intensive therapy slowed the progression and delayed the onset of diabetic retinopathy, nephropathy and neuropathy in patients with IDDM (DCCT Research Group, 1993). Results showed intensive therapy reduced the risk for development of retinopathy by 76%, reduced microalbuminuria by 39% and decreased development of clinical neuropathy by 60%.

The final recommendations from this study are that patients with IDDM should maintain blood glucose and glycosolated hemoglobin levels, as close to normal as possible. The investigators furthermore, extended their recommendations to patients with NIDDM, but with a caution to evaluate patients for age, capabilities and other co-existing disease processes (DCCT Research Group, 1993).

Diabetes Education

Diabetes education programs target improving self-care behaviors, knowledge and skills, attitudes about health promotion, and outcomes (Tobin, 1993). As diabetes education has developed over many years, its focus has been insulin dependent diabetes and has occurred in the hospital setting or in outpatient diabetes education clinics. Very little standardized diabetes
education has been done through the primary care provider's office (Peterson, 1994). Programs discussed in the literature use the American Diabetes Association standards for their programs. Programs vary from 8 to 35 hours in length. Some are completed in one session, others in many sessions, daily or weekly up to 12 weeks.

According to Redhead, Hussain, Gedling and McCulloch (1993), "it is now widely accepted that education of patients with diabetes is the cornerstone of successful diabetes management" (p. 672). In a study by Peterson (1994) of 27 physicians, (10 diabetic patients each) and their educational interventions, he found no significant difference in blood glucose control after one year. However, there was no standardized education program used by any of the physicians. "Ninety-five percent of physicians in this study were directly involved in the diabetes education of their patients, and 56% had no certified diabetes educator available" (p.361). Of these 27 physicians, 67% did not have a treatment protocol for either IDDM or NIDDM.

Coonrod, Betschart and Harris (1994) found that only 35.1% of diabetic patients have attended a diabetes education program. This 35.1% included 58.6% of IDDM patients, 48.9% of NIDDM patients being treated with insulin, and 23.7% of NIDDM patients not using insulin. Individuals living in an urban area and on insulin, had a greater chance than those living in rural areas of having had diabetes education. They also found "One or more visits per year to a diabetes physician was associated with a 57% lower probability of patient
education" (p. 856). The conclusion of this study is that diabetes education needs to be targeted at areas that have a particularly low rate of diabetes education such as rural areas and lower socioeconomic groups.

Participation in education programs is also dependent on age (Glasgow, Toobert, & Hampson, 1991). Patients over age 65 are less likely to participate in outpatient education programs. Reasons for lack of participation included, lack of transportation, scheduling conflicts, time commitment was too great, and too ill to participate.

The patient's view of diabetes care and how knowledge was obtained has become an area of concern. As patients are taught and encouraged to perform self-care activities, they are setting guidelines on what and how they want to be taught (Wikblad, 1991). Patients consider continuity and accessibility of medical care, consideration of patients as individuals, responsibility to care for self, good medical skills, and support from the medical team to be the most important aspects of their care (Wikblad, 1991; DeWeerdt, Visser, Kok & Van Der Veen, 1990).

Summary

Diabetes Mellitus is a very costly disease, in finances, morbidity and mortality, and quality of life. The risk of complications from diabetes can be determined by following glycosolated hemoglobin, hemoglobin A\textsubscript{1}C and blood glucose levels. By keeping those levels near normal, complications from nephropathy, neuropathy and retinopathy can be delayed and/or diminished.
Diabetes education has been shown to be an essential part of caring for individuals with diabetes. Education has been shown to positively affect patient outcomes. Results are mixed as to whether it has had any significant impact on blood glucose and glycosolated hemoglobin levels. However, it is difficult to evaluate the effect of patient education if standardized protocols were not used. At present, diabetes education is very inadequate. In rural areas especially, it reaches very few individuals because of lack of accessibility, cost, inadequately trained health care professionals and lack of follow-up. Rural primary care physicians lack resources and support for standardized diabetes education programs for implementation in their offices.

Patients with diabetes are concerned about accessibility and continuity of care, being treated as individuals and receiving education in short, frequent sessions (Johnson, 1991). The primary care provider's office is in a prime position to meet these needs. The major problems associated with this are the lack of standardized education programs appropriate for office use, lack of financial reimbursement for diabetes education and lack of time by office nurses, nurse practitioners and physicians to ensure adequate education occurs. In spite of these difficulties, the need still exists for patients to receive adequate education and management by their primary care providers.
Research Questions

1. What is the effect of a standardized education program on blood glucose levels in a single rural medical practice?

2. What is the effect of a standardized diabetes education program on hemoglobin A¹C levels in a single rural medical practice?

The independent variable in this study was a diabetes education program. It is a comprehensive, 14 chapter study guide designed by Eli Lilly and Company for individual or group instruction. Each chapter discusses a different aspect of diabetes. The study guide involves discussion of the types, symptoms, causes and management goals. Meal planning, medications, blood glucose monitoring, and complications are also discussed in further chapters.

The dependent variables were blood glucose and hemoglobin A¹C levels. Measurements were determined by venous blood levels and performed by the Pathologist's Regional Laboratory in Lewiston, Idaho. Improvement was determined by a statistically significant decrease between hemoglobin A¹C and blood glucose levels before and six months after the education intervention.
Definition of Terms

**Blood glucose**: A sugar used by cells for energy; breakdown product of carbohydrate and fat metabolism.

**Hemoglobin A1C**, glycohemoglobin; Glycosolated Hemoglobin a blood test that measures diabetic control over the previous two to three months.

**Rural Medical Practice**: As defined by Medicare Part B Washington, Aetna Life Insurance Co. Whitman County is considered a rural area for purposes of reimbursement.

**Standardized Diabetes Education Program**: consist of a manual, *Managing Your Diabetes* (1994) by Eli Lilly and Co., five 60 minute sessions with a nurse discussing diabetes management and care, to be given to each subject.
Chapter II

Methods

Diabetes education has been shown to affect behavioral outcomes in the individual with diabetes. The purpose of this study was to determine if, by providing a standardized educational program to diabetics, blood glucose and hemoglobin $A_1C$ levels could be lowered. Improving diabetic control, reducing risk of complications and decreasing the overall cost of diabetes are expected long-term benefits. The standard of care used in this study was the accepted standard of care for individuals with diabetes.

Design

A repeated measures design with a single group was used for this study. Subjects consisted of individuals with diabetes, both IDDM and NIDDM (number 20) in a single rural medical practice. All subjects participated in a standardized diabetes education program provided by Eli Lilly & Company. One subject dropped out after the second session. Individual instruction took place in the physician's office at one to two week intervals for a total of five sessions. Each session lasted approximately 60 minutes and was conducted by an office nurse, not a certified diabetes educator. This study used repeated measures to collect and monitor blood glucose levels and hemoglobin $A_1C$ levels. Comparisons within the test group included a pre and post-test of patient knowledge (Appendix E), and blood glucose and hemoglobin $A_1C$ levels before diabetes education and at three month intervals for six months.
following the education intervention.

Target Population

The target population included all adults with diabetes, living in rural areas, and receiving diabetes education from their primary care provider. This included individuals with IDDM and NIDDM, but did not include pregnant diabetics or those unable to perform self-care activities.

Sample

The study subjects consisted of 19 caucasian individuals, ages 35-85 years old with diabetes mellitus, type I or type II. Subjects who participated in the study were able to read and understand English, and perform self-blood glucose monitoring and other self-care activities. Self-care activities included the ability to make lifestyle and dietary choices, manage their medications, and perform appropriate skin and foot care.

Setting

Instruction, monitoring and follow up appointments were conducted in the rural health care provider's office. A private exam room was provided for individual instruction.

Instrumentation

Blood glucose and hemoglobin A1C levels were drawn in the office, and analyzed by Pathologist's Regional Laboratory, in Lewiston, Idaho.
1. A computer generated list of all patients with diabetes was obtained from the rural health care provider's office.

2. Subjects were contacted by letter and with a follow up phone call to determine if they would be willing to participate in the study and to confirm that they meet the inclusion criteria for the study.

3. Meeting times were arranged to discuss the study and inform the subject of the risks, benefits, and costs. The subject signed the consent form (Appendix C) at this time.

4. A pre-test consisting of a diabetes information sheet and education assessment questionnaire (Appendix D, E) were completed. Fasting hemoglobin A1C and blood glucose levels were drawn using standard venipuncture technique.

5. Each subject was given an Accu Chek Easy blood glucose monitor (donated by Boehringer Mannheim), instructed in its use, and asked to keep a diary of their home blood glucose results.

6. Instruction times were established with the subject.

7. At each session, the nurse reviewed the subject's blood glucose diary, medications and any problems. Instruction was given through discussion of material in *Managing Your Diabetes* (Eli Lilly, 1994). Demonstration of techniques by the nurse, with return demonstration by the subject were included.
8. Repeat blood glucose and glycosolated hemoglobin was done every three months for six months after the education intervention was begun.

When the subject completed all the instruction sessions, they were given follow up appointments for three months. A post test was given at six months to assess improvement in knowledge of diabetes and its care. Subjects also were instructed to call and talk with a nurse any time they had a question or concern. Subjects were instructed to call in or make an appointment to see the physician or nurse anytime their blood glucose levels at home were not in control or if they had questions.

Subjects were called and reminded of their three month and six month visits. The visits consisted of a lab draw for blood glucose and hemoglobin A1C levels, review of medications, review patient diary of home blood glucose measurements, and a brief physical assessment by the physician. Any questions or problems also were addressed. Subjects saw both the physician and nurse at each visit.

Data Analysis

Data was collected using a variety of written instruments. The blood glucose levels, hemoglobin A1C levels and demographic data were recorded using forms (Appendix I, D) designed for this study.

SPSS 6.1 for Windows was used for data analysis. Descriptive statistics was used to analyze demographic information. The blood glucose and
hemoglobin A1C levels were considered interval data, and were analyzed using the paired t-test.

Ethical Considerations

The study was presented to the Washington State University Institutional Review Board for approval before conducting the study. The Intercollegiate Center for Nursing Education, Spokane, Washington, follows the guidelines established by the IRB.

Subjects were given the option of participating in the study. Subjects were free to withdraw from the study at any time without affecting their care by their primary care provider. The names of subjects were held confidential. Only numbers were used to report out data. Information about their blood results and diabetes education were documented in the subjects' chart. The subjects' physicians have access to this information for purposes of treatment and continuity of patient care. Because this was the usual expected care recommended for individuals with diabetes, the subject and/or their insurance company were billed for the cost of the laboratory tests and office calls.
References


Eli Lilly & Company (1994), Managing your diabetes: A comprehensive study guide for patients and their health care professionals. Indianapolis, IN.


Chapter III

Effective Diabetes Education in the Office
Possible, Paid For and Practical

Article to be submitted to Diabetes Educator
Abstract

This study evaluated the effectiveness of a standardized diabetes education program in a rural primary care office on blood glucose and hemoglobin A1C levels. English speaking, non-pregnant adults with diabetes, able to perform self-care activities were used for the study. All individuals (n = 125) with diabetes who met the criteria, from a rural general internal medicine office were invited to participate in the study. The sample size was 19. The six month repeated measures study provided subjects with five 60 minute educational sessions. The sessions were conducted in the physician's office using an office nurse as instructor. The education program, Managing Your Diabetes, was designed and produced by Eli Lilly & Company (1994) for use in the office setting. Subjects were given a pre and post-test to determine level of knowledge before and after the education intervention. Fasting blood glucose and hemoglobin A1C levels were drawn prior to the education intervention and at three and six months.

The sessions were billed to Medicare and other insurance companies per Medicare guidelines. Reimbursement was approximately $80.00 per session, and other insurance reimbursement was approximately $105.00 per session.

At the conclusion of the study, blood glucose levels and Hgb A1C levels were compared and analyzed. The results showed that for those individuals with Hgb A1C levels greater than 7.0% there was a statistically significant improvement (p = .032) in their glycemic control. Mean fasting blood glucose
glucose levels decreased from 188.89 mg/dl to 140.84 mg/dl.

The implications from this study are that providing diabetes education in the office is both effective and profitable.
Introduction

The purpose of this study was to show that diabetes education is effective in improving glycemic control as evidenced by improved hemoglobin A1C levels. Effective diabetes education can be provided in the primary care setting at a reasonable cost and be reimbursed. Traditionally, individuals with diabetes have been sent to diabetes education programs at hospitals or outpatient diabetes clinics. However, statistically, 65% of those with diabetes have not participated in any form of diabetes education (Coonrod, Betschart & Harris, 1994). Ninety-five to ninety-seven percent of people with diabetes receive all their diabetes education from their primary care provider (Peterson, 1994). There have not been standardized education programs for diabetes education in the primary care office. Only one third of primary care offices have any form of diabetes education (Coonrod, Betschart & Harris, 1994).

Cost and time of providing education, and a lack of trained professionals in diabetes management are the major reasons why diabetes education has not been regarded as effective by primary care providers. Diabetes is the seventh most common diagnosis in primary care. Diabetes education is poorly reimbursed by most insurance companies.

Literature Review

Only 10% of individuals with diabetes have insulin dependent diabetes mellitus (IDDM). The other 90% have non-insulin dependent diabetes mellitus (Fain, 1993). IDDM usually begins in childhood and is characterized by a
severe lack of insulin production by the beta cells of the Islets of Langerhans. Risk factors include: family history, autoimmune antibody production against the beta cells, and viral infections (Guyton, 1991). NIDDM begins in adulthood and is a result of less responsiveness of the beta cells to increased blood glucose and fewer insulin receptors leading to insulin resistance (Guyton, 1991).

Frequently, the first sign of insulin dependent diabetes is a child in ketoacidosis who is seen in the emergency room. Individuals with Type II can have diabetes for many years and remain relatively asymptomatic. Consequently, the development of secondary complications may go unsuspected for a long time. It is estimated that there are 500,000 to 700,000 newly diagnosed NIDDM individuals and 11,000 to 12,000 individuals with IDDM, every year (American Diabetes Assn., 1995). Family practitioners and internists care for the majority of these people.

Diabetes mellitus is associated with many chronic and long-term complications and increased mortality and morbidity. The incidence of these problems can be directly correlated with hemoglobin A1C levels (Diabetes Control and Complications Trial (DCCT) Research Group, 1993), and include retinopathy, nephropathy, neuropathies and vascular disease. Metabolic control is best measured by Hgb A1C levels every three to six months.

According to the American Diabetes Association (1994), "The ideal management of an individual with diabetes would provide for the following: 1) no symptoms attributable to diabetes, 2) prevention of acute complications 3)
prevention of microvascular and neuropathic disease and 4) life expectancy equal to nondiabetic individuals."

Education is an integral part in the management and control of diabetes (Walker & Wylie-Rosett, 1995). It is well known that education affects behavioral outcomes. The Diabetes Control and Complications Trial and other studies (Redhead, Hussain, Gedling and McCulloch, 1993) have shown a positive correlation but it is very difficult to attribute the success of intensive glycemic control to educational services alone. A basic understanding of diabetes and management are essential components to glycemic control.

Research Design

A repeated measures design with a single group was used for this study. Letters of invitation were sent to 125 individuals with diabetes in a rural internal medicine practice. Twenty subjects agreed to participate in the study. Nineteen completed the study. Study subjects included both IDDM and NIDDM non-pregnant adults, ages 35-85 years old, capable of self-care activities. All subjects spoke and understood English. Each subject was given an Accu-chek Easy blood glucose monitor provided by Boehringer Mannheim at no charge. All subjects participated in a standardized diabetes education program provided by Eli Lilly & Company.

The program, Managing Your Diabetes, A comprehensive study guide for patients and their health care professionals contains basic diabetes information, including types, symptoms, management goals, meal planning, exercise,
medication information, and short and long-term complications. Skin and foot
care, how to manage sick days and traveling were also discussed. Each
individual received five one hour sessions, with teaching tailored to the
individual's needs and their specific lifestyle. Sessions occurred every one to
two weeks at the individual's convenience. A diabetes knowledge test was
given before education and at the completion of the study covering specific
information taught in the sessions. Blood glucose and Hgb A, C levels were
drawn prior to initiating the education sessions and at three and six months.
Blood glucose and Hgb A, C levels were drawn in the office using standard
venipuncture technique and analyzed by a local pathology lab.

Results
The hypothesis was that diabetes education would improve hemoglobin A, C
and blood glucose levels. SPSS for Windows 6.1 statistical software was used
to analyze the data collected. The sample (n = 19) included nine caucasian
females (47.4%), ten caucasian males (52.6%); two with IDDM (10.5%), and
17 with NIDDM (89.5%). Eleven subjects (57.9%) were diagnosed with
diabetes within the last five years. Five subjects (26.3%) had diabetes for
longer than 10 years. Ten subjects were less than age 65 (52.6%), nine were
older than age 65 (47.4%). Thirteen (68.4%) had no previous diabetic
education. Information about diabetes and maintaining glycemic control was
obtained exclusively from the primary care provider in 89.5% of the cases.
Only two of the subjects (10.5%) had seen another provider regarding the care
of their diabetes. All subjects monitored their blood glucose levels on a regular basis. Fifty-eight percent checked them one to two times a day. Thirty-six percent checked them at least four times a day. Only one subject checked their blood glucose two to three times weekly. Forty-two percent of the sample had never had a hemoglobin A1C done. Eight of the 19 subjects had initial Hgb A1C levels above 7.0% (Range: 7.1-14.2%). The remaining 11 subjects ranged from 5.6 to 6.8%. Paired T testing of those with Hgb A1C greater than 7.0% showed a significant difference between Hgb A1C levels before and six months after education (p = .032). The subjects with Hgb A1C levels below 7.0%, showed a decrease, but not a statistically significant difference. The entire sample showed a statistically significant decrease in fasting blood glucose levels (p = .027, mean 188.89 mg/dl baseline, 160.47 mg/dl at three months and 140.84 mg/dl at six months). The sample also showed a statistically significant difference in the knowledge test scores before and after education (p = .0005).

Discussion and Implications

The findings suggest that a standardized diabetes education program provided in the primary care setting has a strong effect on controlling diabetes, especially in individuals with elevated Hgb A1C levels. Those that had Hgb A1C levels below 7.0% are statistically at lower risk for development of complications (DCCT Research Group, 1993). This study suggests that those with levels above 7.0% will have the greatest benefit from education. This is important as
we try to target individuals with diabetes needing the primary care provider's time and expertise.

The sample group, had characteristics in common with the general population. Almost 90% were NIDDM. In the general population, 65% of people with diabetes have not participated in a diabetes education program (Coonrod, Betschart & Harris, 1994). This study found a slightly higher percentage (68.4%) had not had any previous diabetes education. Glasgow, Toobert, and Hampson (1991), found that individuals over age 65 were less likely to participate in diabetes education programs. This was not necessarily true of this sample. A topic for further research would be to investigate why those over 65 years are considered less likely to participate in diabetes education. It is possible that primary care providers have not felt it significant enough to inform their patients with NIDDM of the importance of diabetes education. Coonrod, Betschart and Harris (1994), found that 95-97% of patients receive their information from their primary care provider. In this study 89.5% got their information only from their primary provider. This may reflect a higher motivation in this group than in the normal population. However, it still speaks of the dependency patients have on their primary care provider to "provide care" and knowledge.

In a study of the effect of an integrated diabetes treatment and education program in 137 insulin-treated adults with diabetes, Abourizk et al., (1994) found that the mean Hgb A₁C decreased from 9.97% at enrollment to 7.46% at
8 months. These correlate well with the results of this study that showed a baseline Hgb A1C of 9.39% and a decrease at 6 months to 7.56%.

The cost of providing education is always an issue. The primary care office can bill for the entire cost of the educational visits, providing they submit it as counseling, not education. The office visit will be reimbursed at the usual rate office visits are paid. The justification for the charge is that not only is education occurring, but medications are being evaluated, as well as other coexisting conditions. Very few, if any patients with diabetes, have no coexisting disease. It is important to accurately code the billing forms to include not only counseling but the other conditions as well, such as hyperlipidemia, vascular disease, hypertension, etc..

The office visits were billed as "counseling" and coded as a 99215, which is the code for a complete physical, but when greater than 50% of the time is spent counseling, then the office call is billed based on time. This code is usually a 45 minute visit. If the visit exceeds 75 minutes then more can be charged. The diagnosis must be one for an established disease, not preventive care. Diabetes mellitus, hypertension, coronary artery disease, etc., are all established diseases. The nurse qualifies as a physician extender (Aetna Medicare Part B, 1995) and is under the auspices of the physician, and therefore the physician can bill as such. According to the Non-Physician Practitioner Billing Manual:

"Medicare pays for services rendered by employees of a physician or a physician directed clinic only when certain conditions exist. The
coverage of these services is based on the "incident to" provision. The services of a physician's employee are covered when:

* The services are furnished as an integral part of the physician's professional services in the course of the diagnosis or treatment of an injury or illness. The physician initiates treatment and sees the patient at a frequency that reflects his/her active involvement in the patient's case; and

* There is a valid employment arrangement between the physician (or the physician clinic) and the employee. Employment means that the auxiliary personnel are paid wages or salary by the physician practice and the individual is considered to be employed for Social Security and Federal and state income tax purposes. And

* The services are rendered under the direct supervision of the physician.

Direct Supervision (Office Setting)

Direct supervision in an office setting does not mean that the physician must be physically present in the same room as his/her employee. However, the physician must be physically present in the office suite and immediately available to provide assistance and direction throughout the time the employee is performing the services." (Aetna Medicare Part B, 1995, p. 1)

Reimbursement for each visit is approximately $80.00 from Medicare and $105.00 from other insurance companies. The cost of providing education for individuals with diabetes is minimal in comparison to the cost of complications from poor glycemic control.

The implication from this study is that effective diabetes education is possible to do in the office setting. Not only is it possible, but it can be profitable for both the patient and the provider.
Limitations

There were a number of limitations with this study. The sample was relatively small, using one internal medicine practice. The sample included one Native American, the rest were caucasian. Some of the subjects involved in the education process were quite motivated to control their blood glucose levels regardless of the education. Other considerations that may have influenced glycemic control were: relationship of the patient with the primary care provider, frequency of contacts, age of patient, and dexterity and cognitive ability of the individual.

Conclusion

Education is an essential part of empowering the individual with diabetes to determine their level of control over diabetes. There are other factors which must accompany the educational component. One of the most significant aspects is the relationship of the patient with diabetes with their primary care provider. Those with chronic disease states need more than education (Tillotson & Smith, 1996). They need a consistent support system. In rural areas where there may not be an entire diabetes management team, or patients do not have access to a team approach, the primary care provider can supply the education and support necessary to help the patient with diabetes. It is the primary care provider's responsibility to inform patients about their diseases and how to best treat them and keep them under control.

Blood glucose monitors should be encouraged for every patient with
diabetes, regardless of what type of diabetes they have. Blood glucose monitors allow individuals with diabetes to evaluate their own blood glucose levels and make decisions regarding their control.

Time for detailed education is a limiting factor. In a busy practice it may be difficult to handle all the educational and care needs of patients with diabetes. However, office nurses can assist in providing basic education. It is a primary role of the office nurse to do so. There are a number of educational materials supplied at no charge by Eli Lilly & Company and Boehringer Mannheim. This not only keeps costs down, but the materials are excellent for the patient who has had very little or no diabetes education, or needs a refresher course. In a primary care office, this is 70-80% of our patients with diabetes.

The conclusion of this study is that providing diabetes education in the office is an excellent way to teach patients about diabetes. It helps them bring their diabetes under control, decreasing their risk of complications and decreasing long term costs. Diabetes education also provides income for the office and puts the office nurse in a prime position to provide this valuable and necessary aspect of patient care.
Table 1

Demographic Characteristics of Sample Population

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Frequency</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>&lt; 65 years</td>
<td>10</td>
<td>52.6%</td>
</tr>
<tr>
<td></td>
<td>&gt;65 years</td>
<td>9</td>
<td>47.4%</td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>10</td>
<td>52.6%</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>9</td>
<td>47.4%</td>
</tr>
<tr>
<td>Type</td>
<td>IDDM</td>
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<td>10.5%</td>
</tr>
<tr>
<td></td>
<td>NIDDM</td>
<td>17</td>
<td>89.5%</td>
</tr>
<tr>
<td>Duration</td>
<td>1-5 years</td>
<td>11</td>
<td>57.9%</td>
</tr>
<tr>
<td></td>
<td>6-10 years</td>
<td>3</td>
<td>15.8%</td>
</tr>
<tr>
<td></td>
<td>11-15 years</td>
<td>2</td>
<td>10.5%</td>
</tr>
<tr>
<td></td>
<td>&gt;15 years</td>
<td>3</td>
<td>15.8%</td>
</tr>
<tr>
<td>Frequency of HBGM</td>
<td>1 X Daily</td>
<td>7</td>
<td>36.8%</td>
</tr>
<tr>
<td></td>
<td>2 X Daily</td>
<td>4</td>
<td>21.1%</td>
</tr>
<tr>
<td></td>
<td>4 X Daily or &gt;</td>
<td>7</td>
<td>36.8%</td>
</tr>
<tr>
<td></td>
<td>2-3 X Week</td>
<td>1</td>
<td>5.3%</td>
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<tr>
<td>Prior Diabetes</td>
<td>Yes</td>
<td>6</td>
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<tr>
<td>Education</td>
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<tr>
<td>Alternate Providers</td>
<td>Yes</td>
<td>2</td>
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<tr>
<td></td>
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<td>89.5%</td>
</tr>
<tr>
<td>Source of Diabetes info</td>
<td>PC Office</td>
<td>17</td>
<td>89.5%</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------</td>
<td>----</td>
<td>-------</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>2</td>
<td>10.5%</td>
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<tr>
<td>Frequency of office visits</td>
<td>Weekly</td>
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<td>5.3%</td>
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<tr>
<td>Monthly</td>
<td></td>
<td>4</td>
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</tr>
<tr>
<td>3 Months</td>
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<td>6</td>
<td>31.6%</td>
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<tr>
<td>6 Months</td>
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<td>3</td>
<td>15.8%</td>
</tr>
<tr>
<td>As Needed</td>
<td></td>
<td>5</td>
<td>26.3%</td>
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<td>Complications</td>
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<td></td>
<td>Hypertension</td>
<td>8</td>
<td>42.1%</td>
</tr>
<tr>
<td></td>
<td>Nephropathy</td>
<td>2</td>
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</tr>
<tr>
<td></td>
<td>Retinopathy</td>
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</tr>
<tr>
<td></td>
<td>Neuropathy</td>
<td>2</td>
<td>10.5%</td>
</tr>
<tr>
<td></td>
<td>Multiple</td>
<td>3</td>
<td>15.8%</td>
</tr>
<tr>
<td>Last Eye Exam</td>
<td>&lt; 1 Year</td>
<td>14</td>
<td>73.7%</td>
</tr>
<tr>
<td></td>
<td>&gt;1 Year</td>
<td>5</td>
<td>25.8%</td>
</tr>
<tr>
<td>Last Hgb A1C</td>
<td>&lt; 6 Months</td>
<td>9</td>
<td>47.4%</td>
</tr>
<tr>
<td></td>
<td>&gt; 1 Year</td>
<td>2</td>
<td>10.5%</td>
</tr>
<tr>
<td></td>
<td>Never</td>
<td>8</td>
<td>42.1%</td>
</tr>
</tbody>
</table>
Table 2

Mean Hemoglobin A1C levels over 6 Months

<table>
<thead>
<tr>
<th></th>
<th>Hgb A1C &gt; 7.0%</th>
<th>Entire Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N = 8</td>
<td>N = 19</td>
</tr>
<tr>
<td>Baseline</td>
<td>9.39%</td>
<td>7.56%</td>
</tr>
<tr>
<td>3 Months</td>
<td>7.39%</td>
<td>6.73%</td>
</tr>
<tr>
<td>6 Months</td>
<td>7.11%</td>
<td>6.73%</td>
</tr>
</tbody>
</table>

Table 3

Mean Blood Glucose levels over 6 Months

<table>
<thead>
<tr>
<th></th>
<th>Subsample N = 8</th>
<th>Entire Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hgb A1C &gt; 7.0%</td>
<td>N = 19</td>
</tr>
<tr>
<td>Baseline</td>
<td>249.89 mg/dl</td>
<td>188.89 mg/dl</td>
</tr>
<tr>
<td>3 Months</td>
<td>175.63 mg/dl</td>
<td>160.50 mg/dl</td>
</tr>
<tr>
<td>6 Months</td>
<td>130.12 mg/dl</td>
<td>140.84 mg/dl</td>
</tr>
</tbody>
</table>
References


Eli Lilly, & Company (1994), Managing your diabetes: A comprehensive study guide for patients and their health care professionals. Indianapolis, IN.


Appendix A

Institutional Review Board Approval Form
September 28, 1995

MEMORANDUM

TO: Nancy Gregory, ICNE (5291)
FROM: Dr. Paul Whitney, Chair, Institutional Review Board
SUBJECT: Review of Human Subjects Protocol

Your Human Subject Review Summary Form and additional information provided for the proposal entitled "The Effectiveness of a Standardized Diabetes Education Program On Blood Glucose and Glycosolated Hemoglobin," OGRD #NF was reviewed for the protection of the subjects participating in the study. Based on the information received from you, the IRB has approved your human subjects protocol on September 28, 1995.

The IRB approval indicates the IRB's belief that the Human Subjects protocol as presented in the Human Subjects Review Summary Form by the investigator, is designed to adequately protect the subjects participating in the study. This approval does not relieve the investigator from the responsibility of providing continuing attention to ethical considerations involved in the utilization of human subjects participating in the protocol. This approval is valid for one year from approval date. If any significant changes are anticipated in the study please notify the IRB before implementation.

In accordance with federal regulations, this approval must be kept by the researcher for THREE years after completion of the research.
Appendix B

Patient Information
Appendix B

The effectiveness of a standardized diabetes education program on blood glucose and glycosolated hemoglobin levels

INFORMATION SHEET

Nancy Gregory, R.N., B.S.N.
(509) 332-2519

Diabetes is a disease that causes an increase in your blood sugar level. This increase can be due to your body not producing enough insulin or not being able to use the insulin it has. Regardless of the cause (genetic, obesity, immunological), it is a very expensive disease both in personal costs and costs of complications.

The complications of diabetes include kidney damage, loss of vision, loss of feeling in hands and feet and an increased risk for heart disease and stroke. There is much evidence to show that by providing individuals with diabetes the education and tools to care for themselves, the risk of complications can be decreased substantially. Research has shown that most people with diabetes (95%) learn about their diabetes from their primary care provider. However, most provider's offices (73%) do not have standardized education for their patients with diabetes.

The purpose of this study is to determine if diabetes education can lower blood sugar and glycosolated hemoglobin levels. It will also give an indication if it can be done effectively in the office at a reasonable cost. The education program has been developed by Eli Lilly, a major contributor to the development of diabetes medications and educational materials. It will involve seven 45 minute sessions over a three month period. Your blood sugar and glycosolated hemoglobin levels will be drawn before starting the first session and then every three months for a year. At the three month visit you will see both the nurse and the doctor for a brief follow-up exam.

Having your glycosolated hemoglobin levels checked every three months is the recommended standard of care for individuals with diabetes. Glycosolated hemoglobin is a blood test that tells us how your well your blood sugar has been controlled over the last three months. By lowering your glycosolated hemoglobin to a normal or near normal level you can prevent or delay the development of kidney, eye and nerve damage. Seeing the doctor every three months will insure that any signs of complications are picked up early.
Lowering your blood sugar to normal or near normal levels has many advantages. There are a few problems associated with too low blood sugar such as sweatiness, hunger, irritability, fainting, shakiness and tiredness. This can be corrected by eating a small snack, drinking a glass of milk or orange juice. You will be given a blood sugar monitor to use at home to check your blood sugar levels. This is one way you can monitor your own blood sugar and control your diabetes.
Appendix C

Consent Form
Appendix C

The effectiveness of a standardized diabetes education program on blood glucose and glycosolated hemoglobin levels

CONSENT FORM

Nancy Gregory, R.N., B.S.N.
(509) 332-2519

You are invited to participate in a study on the effectiveness of a diabetes education program on diabetes control. I have worked for Dr. Leff as a nurse for almost 12 years and have returned to school to complete my Master's degree in Nursing and to be a Family Nurse Practitioner. I am a graduate student at the Washington State University Intercollegiate Center for Nursing Education. I am doing this study in part, to meet the criteria for a Master's degree in Nursing.

There is very little information on the effectiveness of a standardized diabetes education program used in an office setting. This information will be used to recommend standards of care for individuals with diabetes in the primary care setting. You were selected as a possible participant in this study because you have been diagnosed with diabetes.

If you decide to participate, you will be asked to complete a list of questions about yourself and diabetes. A fasting blood sugar and glycosolated hemoglobin level will be drawn. A glycosolated hemoglobin level is a blood test that measures blood sugar control over the last two to three months. You will be asked to participate in seven 45 minute sessions discussing diabetes, meal planning, medications, complications, and general care of diabetes. These sessions will be held at Drs. Leff and Hammond's office at an arranged time. You will be meeting with either myself or one of the other office nurses on an individual basis. The sessions will be held every two to three weeks and will be individually arranged. Every three months a blood test for blood sugar and glycosolated hemoglobin will be drawn. The study is expected to last for one year.

You will receive a home blood glucose monitor at no charge. You will be asked to check your blood sugars on a regular basis and bring your record in when you come for your routine visit. The monitor will be yours to keep, regardless of the outcome of the study. The goal of frequent monitoring is improved control of your blood sugar and glycosolated hemoglobin. By improving these levels, your risk of kidney disease, eye disease, and risk of lower leg circulatory problems can be lessened significantly. The possible risk is that your blood sugar could become too low. If it becomes too low you could experience shakiness, sweating, tiredness, become crabby or confused, have a rapid heartbeat, blurred vision or headaches. In extreme cases, fainting has occurred.
You will be asked only to participate in the normal standard of care that is recommended for individuals with diabetes. At three month intervals, you will meet with Dr. Leff or Dr. Hammond for a brief exam, as well as the office nurse for a review of your meal planning and any further questions. Because this is the usual expected care for a patient with diabetes you and/or your insurance company will be billed for the lab fees and office calls.

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission. Your physician will receive results of your lab work for appropriate continuity of care. If you have any questions regarding your patient rights you may contact your physician, Dr. Leff or Dr. Hammond, at (509) 332-2519. If you have further questions regarding your rights, you may contact the Institutional Review Board-Spokane at 456-2842.

Your decision whether or not to participate will not affect your future relations with Dr. Leff or Dr. Hammond. If you decide to participate, you are free to discontinue participation at any time without affecting your care.

If you have any questions, please contact me, Nancy Gregory. If you have any additional questions later, I can be reached at (509) 332-2519. You will be given a copy of this form to keep.

You are making a decision whether or not to participate. Your signature indicates that you have read the information provided above and have decided to participate. You may withdraw at any time without prejudice after signing this form.

Signature ____________________________ Date ____________

Wenzel A. Leff, M.D. ____________________________ Date ____________

Lawrence A. Hammond, M.D. ____________________________ Date ____________

Nancy Gregory, R.N. ____________________________ Date ____________
Appendix D

Diabetes Information Form
Appendix D

DIABETES INFORMATION FORM

Name ___________________________ Date ___________ ID Number ___________

Date of Birth ___________ Age ___________

Year Diabetes was discovered ___________

Medications: (Please give name and dosage of medication)

________________________________________
________________________________________
________________________________________
________________________________________
________________________________________
________________________________________

How often do you see your primary care provider? (Please circle)
Weekly
Monthly
Every 3 Months
Every 6 months
Yearly
Whenever you feel you are having problems

________________________

Do you see any other physicians or health care professionals about your diabetes? Yes No
If so, who? _______________________

________________________

When was the last time you visited an eye doctor? ___________

________________________

When was your last blood test for glycosolated hemoglobin?
3 months ago
6 months ago
1 year ago
Over 1 year ago
Never

________________________
Do you check your blood sugar regularly at home? Yes No
If so, how? Monitor
Visual Strips
Urine Strips

How often do you check your blood sugar?
Daily 2-3 times weekly
Twice daily Weekly
four or more times daily Monthly or less

Have you ever attended a diabetes class or received other diabetes education? Yes No
Where was this held? When

Do you routinely keep up with new information about diabetes? Yes No

How do you obtain the latest information about diabetes?
M.D.'s office
Newspaper
TV
Diabetes magazine

Do you feel you would benefit from learning more about diabetes and how you can take control of your diabetes? Yes No

Complications of Diabetes:

Do you have any known problems as a result of your diabetes?
(Please circle the areas you know of)
Heart disease Stroke High Cholesterol Eye damage
Kidney disease Pain in Extremities
Numbness in Extremities Other__________

How many times have you been hospitalized in the last 12 months due to low blood sugars, high blood sugars, or complications of diabetes?
None 1 2 3 4 5 6 7 8 9 10 >10
How many sick days have you had from work in the last 12 months due to low blood sugars, high blood sugars, or complications of diabetes?

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 days

2-3 weeks 4-5 weeks 6-8 weeks

ALL INFORMATION WILL BE HELD CONFIDENTIAL. THESE RESULTS WILL NOT BE RELEASED TO ANYONE OTHER THAN YOUR PRIMARY CARE PHYSICIAN.
Appendix E

Diabetes Knowledge Test
Appendix E

Name __________________________ Date ____________ Pre-test Post-test

Diabetes Knowledge Test
(Choose the single best answer)

1. The diabetes diet is:
   a. The way most American people eat
   b. A healthy diet for most people
   c. Too high in carbohydrate for most people
   d. Too high in protein for most people

2. Which of the following is highest in carbohydrate?
   a. Baked chicken
   b. Swiss cheese
   c. Baked potato
   d. Peanut butter

3. Which of the following is highest in fat?
   a. low-fat milk
   b. orange juice
   c. corn
   d. honey

4. Which of the following is a "free food"?
   a. Any unsweetened food
   b. Any dietetic food
   c. Any food that says "sugar free" on the label
   d. Any food that has less than 20 calories per serving

5. Glycosylated hemoglobin (HbA1C) is a test that is a measure of your average blood sugar for the past:
   a. Day
   b. Week
   c. 10-12 weeks
   d. 6 months

6. What is the best method for testing blood sugar?
   a. Urine testing
   b. Blood testing
   c. Both are equally good
7. What effect does unsweetened fruit juice have on blood sugar?
   a. Lowers it
   b. Raises it
   c. Has no effect

8. Which should not be used to treat low blood sugar?
   a. 3 hard candies
   b. 1/2 cup orange juice
   c. 1 cup diet soft drink
   d. 1 cup skim milk

9. For a person in good control, what effect does exercise have on blood sugar?
   a. Lowers it
   b. Raises it
   c. Has no effect

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

11. The best way to take care of your feet is to:
    a. Look at and wash them each day
    b. Massage them with alcohol each day
    c. Soak them for one hour each day
    d. Buy shoes a size larger than usual

12. Eating foods lower in saturated fat decreases your risk for:
    a. Nerve disease
    b. Kidney disease
    c. Heart disease
    d. Eye disease

13. Numbness and tingling may be symptoms of:
    a. Kidney disease
    b. Nerve disease
    c. Eye disease
    d. Liver disease

14. Which of the following is usually not associated with diabetes?
    a. Vision problems
    b. Kidney problems
    c. Nerve problems
    d. Lung problems
The general Knowledge section ends here: The rest of the questions will test your knowledge of insulin use.

15. Signs of ketoacidosis include:
   a. Shakiness
   b. Sweating
   c. Vomiting
   d. Low blood sugar

16. If you are sick with the flu, which of the following changes should you make?
   a. Take less insulin
   b. Drink less liquid
   c. Eat more protein
   d. Test for sugar and ketones more often

17. If you have taken intermediate acting insulin (NPH or Lente), you are most likely to have an insulin reaction in:
   a. 1-3 hours
   b. 6-12 hours
   c. 12-15 hours
   d. More than 15 hours

18. You realize just before lunch time that you forgot to take your insulin before breakfast. What should you do now?
   a. Skip lunch to lower your blood sugar
   b. Take the insulin that you usually take at breakfast
   c. Take twice as much insulin as you usually take at breakfast
   d. Check your blood sugar level to decide how much insulin to take

19. If you are beginning to have an insulin reaction, you should:
   a. Exercise
   b. Lie down and rest
   c. Drink some juice
   d. Take regular insulin

20. Low blood sugar may be caused by
   a. Too much insulin
   b. Too little insulin
   c. Too much food
   d. Too little exercise
21. If you take your morning insulin but skip breakfast, your blood sugar level will usually:
   a. Increase
   b. Decrease
   c. Remain the same

22. High blood sugar may be caused by:
   a. Not enough insulin
   b. Skipping meals
   c. Delaying you snack
   d. High levels of ketones in your urine

23. Which of the following will most likely cause an insulin reaction?
   a. Heavy exercise
   b. Infection
   c. Overeating
   d. Not taking your insulin

Diabetes Knowledge Test

Answer Key

1. b. 9. a. 17. b.
2. c. 10. a. 18. d.
3. a. 11. a. 19. c.
5. c. 13. b. 21. b.
7. b. 15. c. 23. a.
8. c. 16. d.
Appendix F

Teaching Objectives
Appendix F

Teaching Objectives for MANAGING YOUR DIABETES

Chapter 1: What is diabetes?

1. Individual will identify two types of diabetes, Type I and Type II.
2. Individual will identify the symptoms of both types of diabetes.
3. Individual will identify the type of diabetes they have.
4. Individual will identify causes of diabetes.
5. Individual will identify management goals for care of their diabetes.

Chapter 2: Taking charge of your diabetes

1. Identify the five tools for management of diabetes.
   
   - Education
   - Meal planning
   - Exercise
   - Medicines
   - Diabetes tests

2. Individual will understand the impact each of the five tools has on their diabetes management.

Chapter 3: Meal planning

1. Individual will identify their present lab values, (glucose, lipids, HbA1c), weight, blood pressure and set target goals.

2. Using the food pyramid, individuals will identify how they currently plan meals.

3. Individuals will identify food groups and their importance to a balanced meal plan.

4. Individuals will plan two days of menus using the food pyramid and meal planning guide.
Chapter 4: Exercise

1. Individual will be able to explain the impact of exercise on management of their diabetes.

2. Identify exercise options.

3. Set goals for exercising program.

Chapter 5: Diabetes Medicine: Insulin

1. Individual will identify species, brand, type and concentration of insulin used.

2. Individual will discuss types of insulin, length of action and duration.

3. Discuss how to maintain control of blood sugar with multiple injections.

4. Demonstrate mixing of insulin, administration of insulin and rotation of sites.

Chapter 6: Diabetes Medicine: Diabetes Pills

1. Explain what oral hypoglycemic medications are.

2. Explain how oral hypoglyciemics work.

3. Identify the goal of treatment with oral hypoglycemics.

4. Identify the oral hypoglycemic medication individual is taking, and the duration of it.

Chapter 7: Blood Sugar Testing

This lesson will be included in the first session due to the importance of testing blood sugars at home.

1. Individual will demonstrate proper method for testing blood sugar with home blood glucose monitor.

2. Individual will demonstrate how to keep a record of his/her blood sugar results.
3. Individual will have a written schedule of advised frequency of blood sugar testing.

Chapter 8: Ketone Testing

1. Individual be able to describe how and when the body uses sugars and fats.
2. Individual will demonstrate use of ketone strips.
3. Individual will identify when they should test for ketones and what to do if they are positive.

Chapter 9: Pattern Management

1. Individual will identify three things that affect the pattern of their blood sugars. (Food plan, activity, medication)
2. List five things to do to discover problem areas in controlling blood sugar.
   a. doses and times of medications
   b. times and results of blood sugar and urine ketone.
   c. what foods they have eaten and when
   d. times of exercise and how long
   e. other: stresses, illness, extra activity, change in meals

Chapter 10: Complications: Low blood sugar (Hypoglycemia)

1. Be able to identify four causes of low blood sugar:
   a. taking too much diabetes medication
   b. eating meals or snacks at the wrong time
   c. skipping or not finishing meals or snacks
   d. getting more exercise than usual
2. Identify symptoms of low blood sugar:
   shaky, sweaty, fatigue, hunger, feeling crabby or confused, rapid heartbeat, blurred vision or headaches numbness or tingling in mouth and lips
3. Identify ways of treating low blood sugar
   a. dietary
   b. glucagon
   c. how to use the glucagon kit
4. Identify ways of preventing low blood sugar
Chapter 11: Complications: Very high blood sugar (hyperglycemia)

1. Identify four causes of high blood sugar:
   a. don’t take enough insulin or diabetes pills
   b. get sick or have other kinds of stress
   c. eat too much
   d. don’t get your normal exercise

2. Identify symptoms of high blood sugar:
   increased thirst, increased hunger, urinary frequency, dry or itchy skin,
   more tired or sleepy than usual, more infections, cuts or sores that heal slowly.

3. Identify how to treat high blood sugar
   a. follow meal plan
   b. take right medication at the right time
   c. check blood sugar levels every day.
   d. get regular exercise
   e. deal with stresses, difficult situations, etc.

Chapter 12: Complications: Ketoacidosis

1. Identify what ketoacidosis is and why it occurs

2. Identify symptoms of ketoacidosis:
   Increased thirst and urination, weight loss, increased fatigue, nausea,
   vomiting, stomach pain, fruity smell to breath, breathing is fast and deep.

3. Individual will identify when to check urine for ketones: Blood Sugar over 240mg/dl
   *during times of illness or infection
   *when vomiting or nausea occurs
   *when individual has symptoms of high blood sugar
   *Call the doctor if ketone test results are moderate or large

Chapter 13: Long-Term Complications

1. Individuals will identify and list their personal risk factors for cardiovascular disease, kidney and eye disease, and neuropathies.

2. Individuals will discuss and identify at least 5 ways they can prevent or delay the onset of these long term complications.
Chapter 14: General Health Care Tips

1. Skin Care: Individual will list 4 ways of protecting their skin. ie: avoiding scratches and punctures, wearing gloves, using sunscreen and avoiding sunburn, cold weather precautions.

2. Foot Care: Individual will demonstrate how to inspect feet for scratches, cracks, blisters, etc., wash and care for them

*Individual will demonstrate how to cut toenails.

*Identify six ways to protect their feet: ie: wear good fitting shoes, break in new shoes 1-2 hours at a time, don't go barefoot, wear socks with their shoes, do not use sharp tools, chemicals or foot soaks to remove corns or calluses.

3. Dental Care: understand and discuss necessity of daily brushing and flossing, see dentist every six months. If individual has not seen dentist in six months will make appointment if possible to see the dentist.

4. Eye Care: Identify the last time they saw an eye doctor. If individual has not seen an optometrist or ophthalmologist in one year, appointment will be scheduled.

5. Sick Days: Individual will write out how to modify their medication during sick days, and how often to check their blood sugar.

*Identify and write down at least one over the counter cough preparation they could use.
Appendix G

Diabetes Education Record
<table>
<thead>
<tr>
<th>DATE</th>
<th>TOPIC</th>
<th>GOAL</th>
<th>OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>What is diabetes? Types Symptoms Causes Management goals</td>
<td>Identify types of diabetes</td>
<td>Blood sugar range</td>
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<tr>
<td>2.</td>
<td>Management tools Community resources (Handout resource lists)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Blood Sugar Testing How to test, Record keeping Testing schedule</td>
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<td></td>
</tr>
<tr>
<td>4.</td>
<td>Meal planning Goals of meal planning Choosing healthy foods Eating right amounts Timing meals</td>
<td>Identify appropriate amount of CHO Make up two day meal plan</td>
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<tr>
<td>5.</td>
<td>Exercise Benefits Goal setting</td>
<td>Exercise program Recording system</td>
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<tr>
<td>6.</td>
<td>Medication: Insulin What insulin does How much do you need? Species and types Mixing insulin Injecting insulin</td>
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<td></td>
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<tr>
<td>DATE</td>
<td>TOPIC</td>
<td>GOAL</td>
<td>OUTCOME</td>
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<td>8.</td>
<td>Ketone Testing</td>
<td>What are ketones</td>
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<td></td>
<td>When &amp; Why to test</td>
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<td>How to test</td>
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<td>9.</td>
<td>Pattern Management</td>
<td>What is it?</td>
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<td>Purpose</td>
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<td>How to use blood sugar diaries</td>
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<td>Complications of LOW B.S.</td>
<td>Warning signs</td>
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<td>Treatment</td>
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<td></td>
<td></td>
<td>How to avoid it</td>
<td></td>
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<tr>
<td>11.</td>
<td>Complications of HIGH B.S.</td>
<td>Warning signs</td>
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<td></td>
<td>Treatment</td>
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<td></td>
<td></td>
<td>How to avoid it</td>
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<td>12.</td>
<td>Complications KETOACIDOSIS</td>
<td>What is it</td>
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<td>Warning signs</td>
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<td>How to avoid it</td>
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<td>What to do</td>
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<td>13.</td>
<td>Long Term Complications</td>
<td>What are they?</td>
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<td></td>
<td>Causes</td>
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<td></td>
<td>How to prevent or reduce them</td>
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<td>14.</td>
<td>General Health Care</td>
<td>Skin &amp; Foot Care</td>
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<td>Sick days</td>
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<td>Travel tips</td>
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</tbody>
</table>
Appendix H

Community Resources
Appendix H

COMMUNITY RESOURCES
DIABETES MELLITUS

American Diabetes Association
1660 Duke Street
Alexandria, Virginia 22314
Tel: 703 549-1500
Fax: 703 836-7439

Diabetes Education Center
Deaconess Medical Center
Spokane, WA
509 458-7142

Gritman Medical Center
700 S. Main
Moscow, ID
208 882-4511
Nancy Kure, RD, Diabetes Educator

Pullman Memorial Hospital
NE 1125 Washington Ave.
Pullman, WA
509 332-2511
Diabetes Education Coordinator
Suzanne Lambeth, Diabetes Educator

St. Joseph's Regional Medical Center
415 Sixth Street
Lewiston, ID
208 743-2511
Diabetes Education Coordinator
Jeanne Laws, RN, Diabetes Educator
Appendix I

Threats to Validity
Appendix I

Threats to Validity

***Internal Threats:

History:
*Some subjects have received previous diabetes education.

Maturation:
*Subjects who have had diabetes and have performed self care activities may have done better because they are more comfortable with their disease and how to care for it.
*Reading and comprehension levels of subjects varied, due to age, level of education and cognitive ability

Testing:
*Results of study may have been affected due to frequency of contacts instead of education.

Instrumentation
* The knowledge test was a very simple basic test and did not fully test all aspects of diabetes care.

Mortality:
*Loss of subjects.

Method of Control

*Pre and post testing of knowledge gave indication of individual knowledge gain
*Individual instruction provided for each subject to learn and ask questions specifically related to themselves.

Time was included for demonstrations by subject of self care activities. Extra time for explanations and questions was given.

Repeated measures design and length of study decreased the effects of the frequent initial contacts.

Each question was evaluated to be sure it was covered by the educational material presented.

The importance of completing this study was discussed with each subject; reminder phone calls and follow up appointments also were done.
Threats to Validity

Causal Influences:
  * frequency of contacts with health care provider,
  * Medication adjustments
  * Change in life-style.
  * Difficult to measure if control is a result of education intervention or if the above are a result of education leading to improved glycemic control.

***External Threats

Subjects consist of all caucasian adults from one primary care medical practice.

Generalizability limited due to sample selection. There is only one medical practice represented.

Method of Control

Standardization of diabetes education program and contacts decrease this concern. However, it is also something that could not fully be excluded as education also influences all these other factors.