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The Impact Of An Education Program On Glycemic Control In Type 2 Diabetes Mellitus Patients

Norris Johnson Doss
Mississippi University for Women

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THE IMPACT OF AN EDUCATION PROGRAM ON
GLYCEMIC CONTROL IN TYPE 2 DIABETES MELLITUS PATIENTS

by

NORRIS JOHNSON DOSS

A Thesis
Submitted in Partial Fulfillment of the Requirements
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in the Division of Nursing
Mississippi University for Women

COLUMBUS, MISSISSIPPI

August 2000
The Impact of an Education Program on Glycemic Control in Type 2 Diabetes Mellitus Patients

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Abstract

Diabetes mellitus (DM) is a chronic, multifaceted disease process which can result in numerous long-term complications without proper management. Continuous education, medical care, and lifestyle modifications are required to effectively manage diabetes. Glycosylated hemoglobin (HgA₁c) measurement is a laboratory test utilized in monitoring long-term glycemic control. This quasi-experimental study examined the impact of an education class on glycemic control in Type 2 diabetes patients. The study was guided by one null hypothesis: There is no difference in the glycosylated hemoglobin (HgA₁c) levels of Type 2 diabetes patients before and after the attendance of an education program. Orem's Self-Care Deficit theory of nursing and Etzwiler's Chronic Care System Model provided the theoretical frameworks for the current research study. The sample (N = 25) consisted of Type 2 diabetes patients in a family medical clinic located in north Mississippi. Data were compiled utilizing a demographic questionnaire and HgA₁c testing obtained at
baseline and 3 months post-intervention. Data were analyzed using the dependent t test. A significant reduction in the post-intervention HgA1c levels (p < .001) in Type 2 diabetes patients emerged. Therefore, glycemic control was impacted by the education class, and the null hypothesis was rejected. One implication for nursing practice involves nurse practitioners emphasizing changes in the care of diabetes patients by embracing a new educational role of prevention and management of this chronic disease. A recommendation for future research involves replication of this study with a larger sample utilizing various geographical locations with different ethnic backgrounds. A further recommendation is the implementation of Orem’s theory as a base for practice to provide goals for nursing interventions such as the patient becoming his or her own self-care agent.
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understanding, support, and pride saw me through another educational endeavor. Much appreciation to my Momma, who, as my mentor, has shown me that the quest for knowledge and learning shall reap lifelong rewards.

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Chapter I
The Research Problem

Diabetes mellitus (DM) is a chronic lifelong illness that requires continuing education and medical care. DM is one of the most prevalent diseases in the United States. Public awareness concerning diabetes control is very low, despite the fact that this disease is one of the leading causes of death and disability in the United States (Centers for Disease Control and Prevention and the National Institute of Health [CDC], 1997).

According to current scientific evidence, often morbidity and mortality of diabetes can be eliminated by aggressive treatment with diet, exercise, and pharmacologic approaches to achieve normal ranges of blood glucose levels. The National Diabetes Education Program, a federally sponsored initiative, promotes increasing awareness among public and private partners to improve the treatment and outcomes of people with diabetes, to promote early diagnosis, and ultimately to prevent the onset of diabetes. Despite all the advances in diabetes treatment,
education remains the cornerstone of diabetes management (American Diabetes Association, 1997a). Patient education for self-management is essential for the ongoing success of diabetes therapy (Warren-Boulton, Gallivan, Greenberg, & Lising, 1999). The impact of an education program on the self-management of glycemic levels in patients with diabetes was evaluated by this study.

Establishment of the Problem

The National Institute of Diabetes and Digestive and Kidney Diseases (1993) and the Centers for Disease Control and Prevention (CDC) have estimated the prevalence of diabetes in the United States at approximately 16 million people. Of the 16 million Americans with diabetes, approximately 90% have Type 2 diabetes. Since 1958 the prevalence of diabetes has increased fivefold. The estimated annual cost of diabetes health care to the United States is a staggering $98.2 billion (Warren-Boulton et al., 1999). Almost 80% of the nation’s health care dollars have been spent on long-term illnesses, such as diabetes, and their associated complications (Etzwiler, 1997).

Diabetes is the fourth leading cause of death by illness in the United States. Diabetes is the leading
cause of new cases of blindness, kidney failure, and non-traumatic lower limb amputations (American Diabetes Association Review Criteria, 1997). The prevalence of diabetes in America is at its highest level, or approximately 6% of the population. According to the American Diabetes Association, the prevalence of diabetes has risen tremendously over the past four decades. In 1958 approximately 1.6 million Americans had diabetes; by 1998 the number had risen to almost 16 million. Eight million Americans have been diagnosed with diabetes, and another 8 million individuals remain undiagnosed. Each day approximately 1,700 people are diagnosed with diabetes, and an estimated 625,000 people are diagnosed with diabetes each year (American Diabetes Association, 1997b). The sharp increase in the number of people with diabetes has been attributed to Americans becoming more overweight and less active over the years, the aging of the American people, and decreased public awareness concerning diabetes (American Nurses Association, 1998).

In Healthy People 2000: National Health Promotion and Disease Prevention Objectives (U.S. Department of Health and Human Services, 1991), the targeted goal was to educate at least 75% of the people with diabetes by the
year 2000. Intervention by education was considered the key to preventing and treating diabetes as well as reducing the complications of the disease. This position has been supported by experts at the Centers for Disease Control and Prevention, who adhere to the promise that preventive action involves continuous education concerning diet, exercise, monitoring blood glucose levels, and regularly visiting a physician. The CDC promotes monitoring the disease to improve overall glycemic control and reduce the incidence of complications of diabetes by 50 to 60% (American Diabetes Association, 1997a).

Researchers of The Diabetes Control and Complications Trial (DCCT) (1993) study concluded that by maintaining blood glucose levels as near as possible to the normal range through the use of intensive therapy, patients could reduce their risk of retinopathy by 67% and macrovascular disease by 41%. DCCT (1993) researchers also concluded that intensive therapy with education effectively delays retinopathy, nephropathy, and neuropathy in insulin-dependent diabetes mellitus (IDDM) patients.

Diabetes education, treatment, and prevention strategies are the focus of health care providers today. Patient education for self-management is essential for
continuing success of diabetes therapy (Warren-Boulton et al., 1999). Training in self-management is vital to the treatment of diabetes. The emphasis on promoting health through health education reflects the relationship between chronic illnesses, such as diabetes and lifestyle changes, including diet, exercise, and tobacco use (Garrard, 1990). Garrard found that Type 1 patients who attended an education program significantly \((p = 0.02)\) reduced their glycemic levels by 11%. The impact of results on glycosylated hemoglobin \((\text{HgA}_1)\) levels is overpowered by Tilly, Belton, and McLachlan (1995). The effect of diet and exercise interventions on reducing the risk of developing diabetes was evaluated by Pan et al. (1997). After 6 years, the sample \((N = 577)\) who were diagnosed with impaired glucose tolerance had a significant decrease in the incidence of diabetes. In a collaborative effort, health educators promote positive changes in health behaviors by building active partnerships with their patients who in turn alter their lifestyles to manage their diabetes (American Diabetes Association, 1997b).

Significance to Nursing

The high occurrence rate of diabetes is an excellent indicator to nurse practitioners and other primary care
providers of the significance of intervention through education among diabetes patient. Education in diabetes self-management is necessary in the development of knowledge, skills, and positive attitudes related to self-care and health. Diabetes patients are the primary providers of chronic care with the point of service being the home (Etzwiler, 1997). As the most important member of the chronic care team, the patient needs adequate education and proper training to be effective in controlling his or her diabetes (Etzwiler, 1997). Family, friends, and significant others must be considered integral members of the health care team as daily support and encouragement are needed by these patients. Acknowledging the patient as a true member of the team with identified roles and responsibilities would motivate the desire for further education and management (Etzwiler, 1997). The need for new and innovative approaches to health education is evident. Today nurse practitioners need to reach out and focus on emerging community health care systems and patient education programs, such as the current research study.
Theoretical Framework

Orem’s Self-Care Deficit Theory. Effective education depends on the most appropriate theory and related interventions. Orem’s Self-Care Deficit Theory of Nursing provided the basic theoretical framework for this study. The concepts in this theory are the conceptual foundation for nursing intervention using a supportive-educative system to increase awareness and compliance in patients with diabetes. Orem views nurses as planners and providers of nursing (Orem, 1985).

Orem’s Theory of Nursing consists of three related theories: the Theory of Self-Care, the Theory of Self-Care Deficits, and the Theory of Nursing Systems. Four basic concepts within these theories have been identified: self-care agency, self-care requisites, therapeutic self-care demand, and nursing agency (Orem, 1985). Orem also developed five assumptions about self-evident characteristics of human beings. The one assumption tested in the current research is that “human beings require continuous deliberate input to themselves and their environment in order to function in accord with natural human endowments” (Orem, 1985, p. 33).
Orem’s Theory of Self-Care describes and explains self-care; the Theory of Self-Care Deficit describes and explains why people can be helped through nursing; and the Theory of Nursing Systems describes and explains relationships that must be brought about and maintained for nursing. Self-care is “the practice of activities that individuals initiate and perform on their own behalf in maintaining life, health, and well-being” (Orem, 1985, p. 24). The provider of self-care is considered a self-care agent (the patient with diabetes). Self-care agency has been identified as the ability to care for oneself as a result of learned behavior. Individuals may require assistance in identifying their self-care roles in order to determine their potential as self-care agents (the educational program on diabetes). Examining one’s self-care habits (diet, exercise, and tobacco use), recognizing a need for change, appraising the benefits (controlling diabetes and preventing complications), and becoming knowledgeable about new self-care requisites (self-management) are significant for maintaining the adequacy of the individual’s self-care agency (Tomey & Alligood, 1998).
According to Orem (1985), the purpose of self-care is to attain self-care requisites. Self-care requisites are the expression of the kinds of purposeful self-care (action) that individuals require. Orem identified two types of self-care requisites that are appropriate to this research: the universal self-care and the health-deviation self-care (Orem, 1985). Universal self-care requisites are common to all human beings and are associated with all life processes, maintenance of the integrity of human structure and functioning, and general well-being (Orem, 1985). Health deviation self-care requisites are associated with illness and disease (diabetes mellitus) and medical and diagnostic treatment measures plan for glycemic control (Orem, 1985).

Another major concept identified by Orem (1985) is therapeutic self-care demand which she defined as a humanly constructed entity, with an objective basis in information or education that describes an individual structurally, functionally, and developmentally. Therapeutic self-care demand is "the totality of self-care actions performed for some duration in order to meet self-care requisites by using valid methods and related sets of operations or actions" (Orem, 1985, p. 88). Self-care
activities are learned and involve making judgments and decisions. Individuals experience a self-care deficit when they are unable to manage their plan of care (elevated glycemic levels and diabetic complications). Self-care actions have therapeutic value only if they contribute to the achievement of the following: (a) support of life processes and promotion of normal functioning; (b) prevention, control or cure of disease processes and injuries; (c) prevention of or compensation for disability; and (d) promotion of well-being (Orem, 1985).

Nursing systems are formed when nurses use their abilities to prescribe, design, and administer nursing care to legitimate patients by performing discrete systems of action (nurse practitioners and diabetes educators). Nursing systems stand for all the actions and interactions of nurses and patients in nursing practice situations (Orem, 1985). Three basic variations of nursing systems have been recognized by Orem, but only the supportive-educative nursing system is germane to this study. In the supportive-educative nursing system, the patients should learn to perform required measures of therapeutic self-care with the assistance of a nurse, nurse educator, and diabetic patient-learner (Orem, 1985).
The concepts of Orem's theory provided the conceptual foundation for the current study using the supportive-educative system to increase awareness and compliance in diabetes mellitus patients. With the agreement that the diabetes patient will be responsible for the self-care activities required for diabetes treatment and management, the nursing systems utilized would be the supportive-educative system (Orem, 1985). Orem views nurses as planners and providers of nursing. The patients' requirements involve decision-making, behavior control, and acquiring knowledge and skills to maintain and lower glycemic control. The nurse's role entails a combination of support, guidance, provision of a developmental environment, teaching, and consulting in this study of a particular educational intervention (Orem, 1985).

In support of the concepts related to Orem's Self-Care Theory, Connelly (1987) stated that individuals with chronic illnesses are primarily responsible for daily management of health problems. Effective self-care is important for successful management of a chronic illness such as diabetes mellitus. Nurse practitioners, certified diabetes educators, and other primary care providers can assist individuals in identifying their self-care deficits.
and realizing their potential as self-care agents by using the supportive-educative nursing system. The nurse does not provide direct care but acts as a facilitator of self-care by performing the roles of educator, supporter, and guidance counselor. With the nurse’s assistance, individuals are then able to realize that their responsibility for self-care depends upon the individual’s self-care agency. By performing the tasks of decision-making, acquiring knowledge, and modifying behavior with the assistance of the nurse, compliance, responsible self-care, and successful management of diabetes mellitus can result (Connelly, 1987).

Etzwiler’s Chronic Care System Model. Etzwiler’s Chronic Care System Model served as an adjunct theoretical framework, since diabetes is a lifelong illness that requires continuing education in self-care management and medical care to reduce the risks of long-term complications. This Chronic Care System Model, evolved at the International Diabetes Center over the past 30 years, consists of a series of eight integrated, interdependent components that are unique to the needs of patients and providers. The eight facets outlined in Etzwiler’s Chronic Care System Model are as follows: team/community,
education/motivation, supplies/services,
guidelines/contracts, adaptation/implementation,
monitoring/support, assessment/feedback, and
recognition/rewards. The education program in the current
study emphasized each of the eight facets outlined in
Etzwiler's Chronic Care System Model with the goal of
improving overall glycemic control (HgA1c) levels of each
diabetes patient (Etzwiler, 1997).

One of the eight facets outlined in Etzwiler's
Chronic Care System Model involved supplies and services.
Without the accessibility of adequate supplies and
services, even the best educated care teams are doomed to
failure (Etzwiler, 1997). However, equipped with adequate
management supplies and service products, patients can and
will become strongly integrated into health provider
teams. The use of guidelines and contracts was one of the
facets of Etzwiler's Chronic Care System Model. Health
care teams seeking to achieve successful therapeutic
outcomes, such as improved glycemic control, should agree
upon a common treatment plan. Guidelines are intended to
be used as a general approach to management of chronic
diseases, such as diabetes (Etzwiler, 1997). Patient
education has always been an integral part of quality
nursing. Increasing awareness of health care issues and the role of education plays in health promotion mandates quality patient education.

Etzwiler (1997) utilized recognition and rewards as one of the facets of the Chronic Care System Model. Patients with a chronic disease, such as diabetes, seldom receive any recognition or reward for the numerous changes or efforts demanded of them. However, in this study, achieving and maintaining readily identified outcomes, such as HgA$_1c$, weight control, and cholesterol levels, are bases for short-term rewards for compliance with a negotiated contract (Etzwiler, 1997). This eight-facet Chronic Care System Model designed by Etzwiler as an outline for quality long-term management provided a systematic, comprehensive system of care that is unique to the diabetes patients and health care provider in this study.

Statement of the Problem

Research has identified the increased prevalence of persons with diabetes. Type 2 diabetes patients represent an estimated 90% of those people diagnosed with diabetes. Diabetes is a chronic, lifelong illness that requires continuing education in self-management and medical care.
to reduce the risks of long-term complications. Training in self-management is vital to the treatment of diabetes. A lack of effective glycemic control (HgA$_{1c}$) by diabetes patients is mainly due to inadequate education and ineffective self-management skills according to recent research. Patient education for self-management has been identified as being essential for the ongoing success of diabetes therapy (Warren-Boulton et al., 1999).

Research Hypothesis

This study sought to identify the impact of an education program on glycemic control in Type 2 diabetes patients. The study was guided by one null hypothesis: There is no difference in the glycosylated hemoglobin (HgA$_{1c}$) levels of Type 2 diabetes patients before and after attendance of an education program.

Definition of Terms

In order to clarify the key components within this study, relevant terms were defined, both theoretically and operationally.

1. Glycosylated hemoglobin level (HgA$_{1c}$): Theoretical: The HgA$_{1c}$ is a blood test that reflects the average blood glucose concentration over the preceding 60- to 90-day
period. Normal range of HgA$_{1c}$ levels is 4% to 6% (American Diabetes Association, 1997a; National Institute of Diabetes and Digestive and Kidney Diseases, 1993).

Operational: For this study, the HgA$_{1c}$ is the reflection of the average blood glucose concentration measurement over a period of 3 months for Type 2 diabetes patients as documented on their charts.

2. Patients with Type 2 diabetes: Theoretical:
Patients with Type 2 diabetes are individuals who have been diagnosed with non-insulin dependent diabetes mellitus or adult onset diabetes (American Diabetes Association, 1997a). Operational: Individuals, ages 20 to 80 years, who have been diagnosed with diabetes for at least one year, do not receive insulin therapy, and receive care at the designated clinic within a 60-mile radius area.

3. Education program: Theoretical: Education program is the product of a flexible policy based on the community it is intended to serve (American Diabetes Association Review Criteria, 1997). Operational: For this study, the education program is the product of learning offered in a professional care provider’s clinic to a community of patients with Type 2 diabetes by a qualified diabetes
educator. This offering concerns self-management of diet, exercise, blood glucose testing and monitoring, pharmacologic regimen, and complications associated with diabetes.

Assumptions

The following assumptions were made as underlying truths for the purpose of this study:

1. The in vitro laboratory testing of overall glycemic (HgA₁c) levels is accurate.

2. Human beings require continuous, deliberate inputs or education in order to remain alive and function in accordance with natural human endowments (Orem, 1985).

3. Diabetes patients need education and training to be effective in self-management of diabetes (Etzwiler, 1997).

Summary

Comprehensive diabetes education programs that stimulate self-management skills and glycemic control affect diabetes outcomes and are of major concern to health care providers today. Self-care efforts undertaken by this researcher were aimed toward the Type 2 diabetes population.
This chapter sought to establish a relevant research problem and relate its significance to nursing. By presenting a theoretical framework strongly based on self-care, self-care deficits, and utilization of a chronic care model, organization was provided by guide this research. Assumptions, the purpose of the study, the problem statement, the research question, and relevant terms were defined, both theoretically and operationally, and presented in order to clarify the key components within this study.
Chapter II
Review of Literature

Numerous studies have been conducted to investigate the impact of education on glycemic control and the development and progression of diabetes complications. A review of the literature revealed diabetes studies related to the effectiveness of patient education on glycemic control and the effectiveness of intensive treatment of diabetes on the development and progression of long-term complications. Further studies focused on personal beliefs and environmental barriers related to diabetes self-management. The following reviews represented selected research related specifically to the current study on the impact of an education program on glycemic control in Type 2 diabetes patients. The current study focuses on the impact of an education program on glycemic control in Type 2 diabetes patients.

The Garrard (1990) study sought to determine the effects of a 5-day patient education program on metabolic control in patients with diabetes. The researcher noted
that scientific evidence of patient education use in metabolic control had not been fully established. The focus of diabetes education programs had mainly been aimed toward outcomes, such as knowledge, skills, attitudes, and costs, used within a hospital setting, but seldom have clinical evaluation measures been included as an outcome or dependent variable (Garrard, 1990).

The research question tested was as follows: Does outpatient education in diabetes mellitus have a clinical impact? The hypothesis was as follows: There is no difference between patients with insulin-dependent diabetes mellitus (IDDM) or Type 1 diabetes in the extent of their diabetes knowledge prior to and immediately after a patient education program. The two variables underpinning this study were the independent variable (a 5-day patient education program) and the dependent variable (the effect on metabolic control as demonstrated by glycoslated hemoglobin [HgA₁c] levels or clinical measures).

The clinical evaluation or a resin method used for determining HgA₁c levels was deemed suitable for the assessment of clinical management of diabetes with the normal values ranging from 4% to 9%. The patient education
program was a 5-day outpatient, standardized education program that emphasized day-to-day management of diabetes (Garrard, 1990).

The program was conducted by health care professionals. Garrard (1990) believed that if patients and their families were provided the information, skills and attitudes or behavioral changes required to manage their diabetes mellitus in a structured, team-oriented, outpatient program they would incorporate these tools to control their blood glucose levels, thereby improving metabolic glycemic control.

A quasi-experimental design was used by Garrard (1990) consisting of a pretest, posttest, and a follow-up assessment approximately 6 months following the posttest. Garrard used a sample of 396 participants. The experimental group included 72 study participants, and the comparison group involved 324 participants. All subjects had been diagnosed with Type 1 diabetes (IDDM). They ranged in age from 14 to 78 years and had been diagnosed with diabetes from 1 to 20 years.

Appropriate data were collected from the medical records of all participants involved in the study. The experimental group attended a 5-day diabetes education
program, Learning to Live with Diabetes, and the control group "received diabetes education routinely upon diagnosis and during clinic visits" (Garrard, 1990, p. 395). Interpretation of major findings involved statistical analysis of the differences between pretest, posttest, and follow-up assessments.

Garrard (1990) found that groups did not differ significantly by duration of diabetes mellitus (p = .68), by gender (p = .44), or by age (p = .33). Subjects in the experimental group improved in the management of their diabetes from pretest to posttest (p = .029), but those in the comparison group did not (p = .575). When comparing the two groups, a significant difference in HgA1c levels emerged (p = .0440). After attending the education program, the experimental subjects had a decrease in levels (11.76%), as compared to the control group (12.49%). Statistical analysis results for the follow-up assessment comparing the two groups were not significant (p = .211).

Garrard (1990) concluded that the patient education program had a clinical impact on the Type 1 patients who attended, in terms of reducing, and thereby improving their HgA1c levels. This study was germane to the current
research in that the variables are very similar, the diabetes education program and the measurement and potential improvement of glycoslated hemoglobin levels. Both researchers' plan was to measure HgA\textsubscript{1c} levels prior to and following a diabetes education program. Both research studies included an experimental group and a control (comparison) group and the design involved in both studies involved a pre-experimental design without randomization.

Another research study indicated that previous clinical trials have not demonstrated consistent beneficial effects of intensive therapy on the long-term complications of diabetes mellitus. The Diabetes Control and Complications Trial (National Institute of Diabetes and Digestive and Kidney Diseases, 1993) research group investigated whether keeping blood glucose levels as close to normal as possible would delay or prevent the onset or development of diabetic complications. The problem statement identified the complications of diabetes related to the elevation of the plasma glucose concentration. Researchers planned to compare two cohorts of patients to answer two questions:
1. Will intensive therapy prevent the development of diabetic retinopathy in patients with no retinopathy (primary prevention)?

2. Will intensive therapy affect the progression of early retinopathy (secondary intervention)?

The researchers compared the effects of two different treatment regimens, standard therapy and intensive control therapy, on the long-term complications of diabetes.

The definitions underpinning the DCCT (1993) included intensive treatment regimen which involved three or more daily insulin injections or treatment with an insulin pump which was designed to achieved blood glucose values as close to normal range as possible. Conventional therapy regimen consisted of one or two injections of insulin per day.

DCCT researchers used quasi-experimental design for the 1,441 volunteers who were recruited from 29 medical centers in the United States and Canada and diagnosed with IDDM (Type 1) for at least one year but no longer than 15 years. There were 726 patients with no retinopathy at baseline (the primary prevention cohort) and 715 patients with mild retinopathy (the secondary intervention cohort) who were randomly assigned to either intensive therapy or
conventional therapy using stratified random sampling. The patients were followed for an average of 6.5 years (1983 to 1989), and the onset and progression of retinopathy and other complications were assessed regularly.

Outcomes of the DCCT (1993) study were analyzed on the basis of the original treatment assignments. In the primary prevention cohort, intensive therapy reduced the risk of retinopathy by 76% (95% confidence interval, 62 to 85%) as compared with conventional therapy. In the secondary intervention cohort, intensive therapy reduced the average risk of such progression by 54% (95% confidence interval, 39 to 66%) as compared with conventional therapy (DCCT, 1993).

Intensive therapy reduced the average adjusted risk of microalbuminuria by 34% (p = .04) in the primary prevention cohort and by 43% (p = .001 in the secondary intervention cohort. The risk of albuminuria was reduced by 56% (p = .01) in the secondary intervention cohort. In the primary prevention cohort, intensive therapy reduced the appearance of neuropathy by 69% (3% vs. 10% in the conventional therapy groups; p .006). In the secondary intervention cohort of the DCCT (1993) study, intensive
therapy reduced the appearance of clinical neuropathy by 57% (p < .001).

Researchers of the DCCT (1993) study concluded that by maintaining blood glucose levels as near as possible to the normal range and using intensive therapy, patients could reduce their risk of retinopathy by 67%, nephropathy by 56%, neuropathy by 60%, and macrovascular disease by 41%. DCCT researchers also concluded that intensive therapy effectively delayed the onset and slowed the progression of diabetic retinopathy, nephropathy, and neuropathy in the IDDM patient.

Because resources needed to provide intensive therapy are not available to all patients with diabetes, the researchers in the DCCT (1993) study recommended the need for new strategies to adapt methods of intensive treatment regimen for use in the general community at less cost and effect. The DCCT researchers also recommended that the health care system should provide support necessary to make intensive therapy available to any and all needed patients. The DCCT study is germane to the current study in that both studies sought to significantly decrease HgA₁c levels in diabetic patients.
As the focus of medical treatment shifts to chronic diseases, such as diabetes, it becomes apparent that traditional clinical indications are inadequate to determine fully the effectiveness of care. Evaluations of diabetes education programs have been criticized for focusing too little on knowledge and physiological outcomes. Therefore, Tilly, Belton, and McLachlan (1995) sought to determine whether data from a diabetes education program could be routinely used to monitor health status outcomes, such as glycemic control (HgA1c), diabetes-related quality of life, and general health-related quality of life.

The independent variables involved sociodemographic factors, type of diabetes, duration of diabetes, risk factors, comorbid conditions, and initial physiologic and health status. The dependent variables were the measurements of glycemic control (HgA1c), diabetes-related quality of life, and general health related quality of life. The data collection instruments were the Outcomes Management System (OSM) and a Type Specification (Technology of Patient Experience) for diabetes. Data were collected at the time of admission to the clinic and repeated in a 6-month follow-up.
The design was one-group, pretest-posttest design. The sample participants involved patients admitted to the Diabetes Day Care Program (DDCP) between October 1, 1991, and December 31, 1992. There were 1,155 new admissions to the clinic during the 15-month time period involved in this study. Children under 15 years of age, patients with gestational diabetes, patients beginning insulin therapy, inpatients and patients without a complete data set initially or a follow-up were excluded from the study, leaving a final sample of 355 participants. Of the 355 sample participants, 167 patients (47%) returned to the clinic for the 6-month follow-up and 188 patients (53%) completed the follow-up questionnaires by telephone.

Statistical analysis involved a standardized descriptive measure of the magnitude of change or the degree to which the null hypothesis was false. Tilly et al. (1995) findings revealed a significant decrease in the HgA_c levels from initial to follow-up from 9.6% to 8.4% (1.2%). The t test for paired samples was statistically significant (p < .001). The results of the diabetes-related quality-of-life data revealed a statistically significant improvement from 74.6 as the initial value to 84.1 as the 6-month value. General health-related
quality-of-life initial score was 57.3 and the 6-month follow-up score was 60.0, which was statistically significant ($p < .001$) paired t tests.

Tilly et al. (1995) concluded that despite the difficulties interpreting results from this one-group, pretest-posttest design, the study demonstrated the value of a multidimensional approach to an outcome assessment and program evaluation. A major conclusion of the Diabetes Day Care Program was that attendance would improve control of diabetes and health-related quality of life. The analysis of outcomes data supported this principle. This study by Tilly et al. (1995) was germane to the current research in that they both involved the use of a diabetes research program, a pretest-posttest administered to one group, and the measurement of glycosylated hemoglobin (HbA1c) levels prior to and following the intervention.

The effect of diet and exercise interventions in individuals with impaired glucose tolerance (IGT) was evaluated by Pan et al. (1997). A quasi-experimental design was utilized to determine if these interventions would delay the development of Type 2 diabetes and thereby reduce the overall incidence of diabetes complications. Participants involved 110,660 men and women from 33 health
clinics in the city of Da Qing, China, who were screened for IGT and Type 2 diabetes. Of these individuals, 577 were classified as having IGT. Subjects were randomly selected by clinic into a clinical trial either to a control group or to one of three active treatment groups: diet only, exercise only, or diet-plus-exercise. Follow-up evaluation examinations were conducted at 2-year intervals over a 6-year period to identify subjects who developed Type 2 diabetes. A proportional hazard analysis was utilized to determine whether the incidence of Type 2 diabetes varied by treatment assignment.

Pan et al. (1997) revealed that the cumulative incidence of diabetes at 6 years was 67.7% (95% CI, 59.8 - 75.2) in the control group compared with 43.8% (95% CI, 35.5 - 52.3) in the diet group, 41% (9.5% CI, 33.4 - 49.4) in the exercise group, and 46.0% (95% CI, 37.3 - 54.7) in the diet-plus-exercise group (p < .05). When analyzed by the clinic, each of the active intervention groups differed significantly from the control clinics (p < .05). The relative decrease in the rate of development of diabetes in the active treatment groups was similar when subjects were stratified as lean or overweight (BMI < or > 25 kg/m²). The diet, exercise, and diet-plus-exercise
interventions were associated with 31% (p < .03), 46% (p < .0005), and 42% (p < .005) reductions in risk of developing diabetes, respectively.

Researchers of the Pan et al. (1997) study concluded that diet and exercise interventions led to a significant decrease in the incidence of diabetes over a 6-year period among those with IGT. The Pan et al. (1997) study is related to the current research in that both investigations utilized educational interventions and follow-up evaluations to analyze results.

In another study, Nicolucci et al. (1996) conducted a comprehensive assessment to determine the avoidability of long-term complications of diabetes. The purpose of this investigation was to identify and quantify risk factors for the development of long-term complications, such as critical limb ischemia and amputation, chronic renal failure, dialysis treatment, proliferative retinopathy, and blindness with particular emphasis on variables related to quality of life and considered avoidable.

The research design involved a case-control study that included 886 patients with long-term diabetes complications and 1,888 control subjects without complications. Subjects were selected from 35 diabetes
outpatient clinics and 49 general practitioners’ offices during a 6-month period. Nicolucci et al. (1996) sought to determine whether the number of diabetes complications could be reduced by removing avoidable risk factors such as uncontrolled hypertension, poor compliance with visit scheduling, inadequate diabetes education, and no self-management of insulin treatment.

Results of Nicolucci et al. (1996) investigation revealed through a logistic regression analysis that several factors are related to the development of major diabetes complications. Among patient characteristics, male sex (odds ratio [OR] = 1.8, 95% CI, 1.4 - 2.3) and age (OR = 1.7, 95% CI, 1.2 - 2.4) for patients between 50 and 69 years of age as opposed to younger patients less than 50 years old were associated with an increased risk of complication. Among the variables identified in the clinics, the type and the duration of diabetes were the most important predictors of diabetic complications. Hypertension was associated with the development of complications of diabetes, especially when it was poorly controlled by treatment (OR = 3.1, 95% CI, 2.3 - 4.3). Patients who needed assistance to reach the health care facility and those who did not regularly visit such a
facility were at higher risk of developing complications (OR = 1.5, 95% CI, 1.2 - 1.9; OR = 1.7, 95% CI, 1.3 - 2.2, respectively).

The outcome of the Nicolucci et al. (1996) study was related to the impact of education on diabetes outcomes and warranted inclusion in the review of literature for the current research investigation. Individuals who had received no formal educational intervention had an increased risk of developing complications (OR = 4.1, 95% CI, 1.7 - 9.7), while self-management of insulin therapy revealed a protective effect (OR = 0.6, 95% CI, 0.5 - 0.8). The sum of all attributable risks related to avoidable risk factors was 0.39. The investigators concluded that by removing avoidable risk factors, the number of diabetes complications could be reduced by greater than one third.

A trial research study was conducted by Campbell, Redman, Moffitt, and Swanson-Fisher (1996) over a 12-month period to evaluate the relative efficacy of several diabetes education programs. The subjects were allocated to one of four programs that taught self-management skills to Type 2 diabetes patients who had no previous formal diabetes education. The four programs included a minimal
instruction program, an education program utilizing individual visits, an education program incorporating a group education course, and a behavioral program. The areas of focus in the teaching programs were diet and exercise, urine and blood glucose monitoring, medication regimen, foot care, and visiting health care professionals routinely. Of the four programs, three utilized an educational approach and the fourth program used individualized using cognitive-behavioral strategies.

The research design involved a randomized trial in which Type 2 patients were diagnosed with diabetes less than 5 years and were less than 80 years old. This study conducted by Campbell et al. (1996) took place in South Wales, Australia, but the subjects were obligated to be able to speak, read, and understand the English language. The recruitment criteria did not allow any of the subjects to have a terminal illness nor to take over 75% of the maximum dosage of oral hypoglycemic agents. There were 252 patients eligible to participate in the study, and 238 (94%) gave consent of approval and participated in this research study. The minimal instruction program involved 59 subjects, the group education program included 66 participants, the behavioral program involved 56 subjects,
and the individualized education program involved 57 participants. Variables used by Campbell et al. (1996) included HgA\textsubscript{lc} levels, BMI, cholesterol levels, and blood pressure monitoring.

The results of this randomized trial study conducted by Campbell et al. (1996) revealed no significant differences among the four program groups over the 3-, 6-, and 12-month intervals in total cholesterol, HDL-C, systolic blood pressure nor proportion of patients consulting an ophthalmologist. However, all four groups produced reductions in HgA\textsubscript{lc} levels and weight/BMI. The researchers' findings support previous reports that differences in knowledge between programs may not be as important as other outcomes. Campbell et al. (1996) also concluded that even though instruction programs appear to be beneficial for Type 2 diabetes patients, the understanding of cost-effective, self-management instruction approaches for various subgroups is limited.

Another study was conducted by Ho, Marger, Beart, Yip, and Shekelle (1997) to compare the quality of ambulatory diabetes care delivered by physicians in the diabetes medical clinic to that delivered in the general medical clinic. The general medical clinic was a
university-affiliated Veterans Administration medical clinic. This retrospective study involved 112 randomly selected male diabetes patients from a diabetes medical clinic and a general medical clinic. The outcomes that were examined involved compliance with individual criteria and the proportion of patient visits in each clinic that revealed at least one HgA\(_1c\) measurement within the past year.

The research design utilized in this study involved a 2- and 4-year retrospective investigation of medical records against predetermined process-of-care criteria. Fifty-six patients received care in a general medical clinic, and 56 received care in a diabetes medical clinic. Criteria were taken from the American Diabetes Association guidelines for standards of care and modified for local use by endocrinologists and general internists.

Ho et al. (1997) found that none of the records from either clinic passed with "good" quality-of-care criteria. When tested against "minimally acceptable" quality criteria, 52% of the general medical clinic and 73% of the diabetes medical clinic charts passed (p = .02). The diabetes medical clinic performed significantly better than the general medical clinic on the following criteria:
the self-monitoring of blood glucose levels, a foot examination, regular comprehensive eye exams, and a referral for diabetes education when glycemic control was poor \((\text{HgA}_{1c} > 10\%)\). The general medical clinic more often documented having asked about cardiac symptoms. The mean \(\text{HgA}_{1c}\) levels \((9.7\%)\) were nearly two percentage points above the upper limits of normal \((7.1\%)\).

Ho et al. (1997) concluded that patients cared for by the physicians in the diabetes clinic received better quality of diabetes care than the patients cared for by the physicians in the general clinic. They further concluded that if future trends allow patient care to be shifted from specialists to generalists, additional attention needs to be paid to ensure that generalists are equipped with the knowledge and proper resources necessary to deliver an acceptable quality of diabetes care. The Ho et al. (1997) study is related to the current study in that both investigators utilized criteria from the American Diabetes Association guidelines in the education programs. In the current study, special attention focused on knowledge base and proper resources in order to ensure effective quality of care for each diabetes patient.
Ruggiero et al. (1997) conducted a study to examine several questions concerning diabetes self-management in order to obtain basic information concerning levels of self-management. The four daily self-management behaviors included eating habits, physical activity, glucose self-monitoring, and medication regimen. The three questions proposed in this study were as follows:

1. What do individuals report being told to do?

2. What are the self-reported levels and patterns of self-care?

3. Are there differences on self-reported management recommendations and levels across various subgroups?

Ruggiero et al. (1997) mailed 2,800 surveys to individuals with diabetes. Of the 2,800 surveys mailed, 2,056 were returned by the individuals (73.4% response rate). Researchers sought to compare three subgroups of individuals with diabetes (Type 1, Type 2 using insulin, and Type 2 not using insulin).

The results of the Ruggiero et al. (1997) study revealed differences in a number of variables including age, marital status, working status, education, type of insurance coverage, method of glucose testing, time since diagnosis, and knowledge of the DCCT (1993) findings.
Descriptive statistical analysis revealed that the levels and patterns of self-management were consistent with findings from previous studies, but there were significant differences in reported self-management teachings among different subgroups. The individuals in this study most regularly adhered to their prescribed medications regimen and least regularly adhered to recommendations for lifestyle modification changes of diet and exercise.

Ruggiero et al. (1997) concluded that these findings provide important information on perceived self-management recommendations as well as the specific self-management levels and patterns in individuals with diabetes. These researchers further concluded that the findings of this study may assist future professionals to better understand the levels and correlations of diabetes self-management and direct future research. This study is related to the current research in that the researcher examined the three questions concerning diabetes self-management proposed by Ruggiero et al. (1997), and thereby sought to develop an education program that would enhance the self-management skills of the diabetes patients in the current study.

Glasgow, Hampton, Strycker, and Ruggiero (1997) conducted another study utilizing the same sample of
individuals (2,056) with diabetes in the previous study conducted by Ruggiero et al. (1997). The purpose of the Glasgow et al. (1997) study was to ascertain the levels of personal beliefs and perceived social and environmental barriers related to diabetes self-management. This investigation focused on several issues related to personal models or patients' representations of illness, such as disease related beliefs, emotions, knowledge, and experiences.

The method or research design was through a mailed survey sample of 2,056 heterogeneous adults in the United States. As in the previous study, researchers found differences in personal models and barriers among different patient groups, such as age, health insurance, and insulin-dependent status. Results of this survey revealed that respondents felt that diabetes was a serious disease and that their self-management activities would control their diabetes and decrease the likelihood of long-term complications. Dietary adherence was the most frequently reported barrier, followed by exercise and glucose testing barriers.

Glasgow et al. (1997) concluded that both personal models and barriers were significant predictors of the
level of self-management in all three regimen areas studied (diet, exercise, and glucose testing). They further concluded that the assessment of treatment effectiveness component of personal models may be adequate for the majority of clinical purposes. This study is related to the current study in that, because of the three most commonly reported barriers in the Glasgow et al. (1997) study, the current researcher placed special emphasis on these three areas (diet, exercise, and HgA<sub>c</sub> testing) in the education program.

Another study was conducted by Argus-Collins, Kumanyika, TenHave, and Adams-Campell (1997) to evaluate a weight loss and exercise program designed to improve diabetes management in older African Americans. The subjects in the study included a total of 198 patients who were prescreened. Of the 198 individuals who were prescreened, 87 were eligible to attend the baseline screening and 64 were ultimately eligible (HgA<sub>c</sub> levels > 8%) and willing to be randomized. The three basic components of the diabetes management study involved physical activity, nutrition knowledge, and dietary components. Lipid profile, LDL cholesterol, total cholesterol, triglyceride, HDL cholesterol, and HgA<sub>c</sub>
levels were obtained and analyzed prior and following 3- and 6-month interventions. In the 1976-1980 National Health and Nutrition Examination Survey statistical data indicated that the burden of diabetes among African Americans is significantly greater than the burden of diabetes among white Americans in almost all sociodemographic categories.

Argus-Collins et al. (1997) designed an intervention program especially for Type 2 diabetes individuals incorporating concepts and approaches geared specifically for the cultural appropriateness of older African Americans. The design of this study involved a randomized control clinical trial to assess the benefits of glycemic control attributable to participation in this program study. All participants were African-American men and women over the age of 55 years with a diagnosis of Type 2 diabetes by medical history and were > 120% of metropolitan weight standards. The targeted sample involved 40 subjects meeting the inclusion criteria requirements for the 3- and 6-month trial study. A one-tailed t test was used to analyze the data collected in this study. A blood sample was obtained after an overnight (12-hour) fasting episode and used for the determination
of HgA\textsubscript{1c} levels pre- and post-interventions. A lipid profile, LDL-C, HDL-C, total cholesterol, triglyceride, and HgA\textsubscript{1c} levels were also obtained and analyzed prior to and following 3- and 6-month interventions.

Argus-Collins et al. (1997) found that significant net differences in the intervention versus usual care were observed for weight (-2.0 kg, p = .006), physical activity and dietary intake of fat, saturated fats cholesterol, and nutrition knowledge at 3 months (all p < .005) and for weight at 6 months (-2.4 kg, p = .0006) and mean HgA\textsubscript{1c} values at 3 months and 6 months, respectively, (-1.6 and 2.4\%, both p < .01). Following the adjustment for changes in weight and activity, the intervention participants were approximately twice as likely to have a one-unit decrease in the HgA\textsubscript{1c} levels as those in usual care. Blood lipid profiles improved more in intervention than usual care participants, but not significantly. Researchers concluded that the intervention program utilized in the study was effective in improving glycemic levels as well as blood pressure control. The researchers further concluded that the decrease in HgA\textsubscript{1c} levels were generally independent of the relatively modest changes in the dietary intake,
weight, and activity and may reflect indirect program effects on other aspects of self-care.

This study conducted by Argus-Collins et al. (1997) has numerous similarities to the current research study. Both research studies utilized an education program as the intervention for a 3-month, Type 2 diabetes education program and pretest and posttest HgA$_{1c}$ levels drawn and analyzed by the use of a one-tailed $t$ test. The majority of the subjects were greater than 55 years old and were African-American individuals diagnosed with Type 2 diabetes. Both the proposed study and the current study sought to monitor glycosylated hemoglobin (HgA$_{1c}$) levels as a measure of glycemic control prior to and 3 months following the diabetes education program intervention.

Summary

Numerous studies were found to establish a relationship between diabetes education programs for self-management and glycemic control. Garrard (1990) concluded that patient education programs had a clinical impact on the Type 1 diabetes patients as evidenced by reducing and thereby improving their HgA$_{1c}$ levels. Tilly et al. (1995) concluded that attending a diabetes education program would improve control of diabetes and health-related
quality of life as evidenced by a statistically significant improvement or decrease in the glycosylated hemoglobin (HgA₁c) levels from initial to follow-up dates. Researchers of the DCCT (1993) study concluded that by utilizing intensive therapy they were able to maintain a near normal range of blood glucose levels and also reduce patients' risk of retinopathy, nephropathy, neuropathy, and macrovascular disease by delaying the onset and slowing progression. Pan et al. (1997) concluded that educative interventions of diet and exercise led to a significant decrease in the incidence of diabetes and reduction in the risk of developing diabetes.

Several previous study reports have documented a specific impact of education programs on HgA₁c levels. Nicolucci et al. (1996) was also related to the impact of education on diabetes outcomes as was the Campbell et al. (1996) study which evaluated the efficacy of several diabetes education programs. The results revealed no significant differences among the four program groups; however, all four groups produced reductions in glycosylated hemoglobin (HgA₁c) levels.

The study conducted by Argus-Collins et al. (1997) utilized an education program as the intervention and
obtained pre- and post-HgA$_{1c}$ levels from the African-American subjects diagnosed with Type 2 diabetes.

Researchers concluded that the educative intervention program utilized in the study was effective in improving glycemic (HgA$_{1c}$) levels.
Chapter III
The Method

The current study sought to determine the impact of a comprehensive diabetes education program on glycemic control in Type 2 diabetes patients. The research method utilized in this study included a chart review, personal administration of a demographic questionnaire, a post-survey questionnaire, a diabetes education program, and glycosylated hemoglobin (HgA\textsubscript{lc}) levels obtained pre-intervention and again 3 months post-intervention. The methods used to examine the major variables included in this study are described in this chapter.

Design of the Study

The purpose of this quantitative study was to determine the impact of education on glycemic control in diabetes patients as evidenced by reduced glycosylated hemoglobin levels. The research design was pre-experimental, one-group, pre-post intervention. No control group was involved, and the sample was not randomly
selected. The pre-experimental design was the most appropriate for the current study because of its essentially irreconcilable weaknesses, such as no randomization and no control group component (Polit & Hungler, 1999).

Variables

Controlled variables included the patient’s age, type of diagnoses, and length of illness. The independent variable was the educational program. The dependent variable was the patients’ HgA$_1c$ levels at baseline and post-intervention. Because of the pre-experimental design, the one group served as both the experimental and the control group. Extraneous variables may have included the patients’ educational level, type of insurance coverage, and socioeconomic status, and possibly the patients’ feelings toward their illness and their level of interest in participation in the classes and in the study.

Setting, Population, and Sample

The geographic setting for this study was a north Mississippi city. A family medical clinic of an established primary care physician served as the site for data collection. This clinic was chosen based on the
convenience of the researcher and the supportive nature of the staff which included the physician, a full-time family nurse practitioner (FNP), a registered nurse (RN), and a licensed practical nurse (LPN). This family medical clinic has a broad scope of patients representing all ages and a variety of medical diagnoses. The estimated number of patients receiving care each week is approximately 150, with the estimated percentage of patients with diabetes being nearly one third of the entire population of the clinic. The target population was patients with Type 2 diabetes who were at least 20 years of age. The target sample included prospective subjects who met the criteria and were being treated at the identified physician’s clinic for routine health care and follow-up of glycemic control. The subjects were selected by choosing the first 20 patients to present to the diabetes education classes who met the inclusion criteria. The final sample included 25.

Data Collection Procedure

Prior to the intervention of the education program and 3 months following, the researcher reviewed the patients’ charts to obtain HgA1c levels and to complete the demographic questionnaire in order to identify
characteristics of each patient (see Appendix A). The demographic data form was developed by the researcher to obtain information regarding each participant's age, sex, race, number of years since diagnosis of diabetes, type of insurance coverage, and educational status. A comprehensive diabetes education program served as the intervention for this research study (see Appendix B). Group educational sessions were conducted in the clinic setting with the use of audio, video, and other visual aids. Each session was conducted in an environment conducive to optimum content comprehension. Each individual was seated in chairs that faced the speaker. Following each of the four group sessions, time was allowed for each individual to ask questions and to verbalize their concerns.

Permission to conduct the current study was requested and granted by the Committee on the Use of Human Subjects in Experimentation at Mississippi University for Women (see Appendix C). Following approval of the Committee on the Use of Human Subjects in Experimentation, the researcher presented a formal letter to the physician requesting permission to review the records of all subjects involved in the study (see Appendix D).
Initially, a telephone call was made by the researcher in an attempt to contact each of the subjects to inform them of the upcoming research study and to request their participation. Posters were placed inside the clinic advertising the time and date of each class. The physician and staff personally encouraged all diabetes patients to attend at least one diabetes education class. Later, a formal written request was mailed by the researcher to each prospective subject requesting their participation in the research study (see Appendix E). Respondents were encouraged by the researcher to bring the signed consent to the clinic with them on the day that they attended the class or they could sign another consent form upon arrival to the class. Data were collected upon approval by the facility and the physician. Follow-up data were collected 90 days or 3 months following the intervention of the diabetes education program. Data were collected from March 2000 to June 2000.

Data Analysis

Demographic questionnaire data were obtained by the researcher from each participant prior to the intervention class. Post-survey questionnaire data were completed by each subject following the intervention of the diabetes class.
education program (see Appendix E). Descriptive techniques including frequencies and percentiles were utilized in examining the characteristics of the demographic and post-survey questionnaires. To determine the impact of the education program on self-management, the researcher examined the HgA\textsubscript{1c} levels using the dependent one-tailed t test. Significance was set at a probability level of .05. The gold standard for determining patient compliance has been set at < 7.5% of HgA\textsubscript{1c} (Uphold & Graham, 1998). However, for this research, compliance was determined by a comparison of pre- to post-HgA\textsubscript{1c} readings by individuals and by total group. The research sought to determine if compliance improved by a reduction in HgA\textsubscript{1c} levels after attending the education class.
Chapter IV

The Findings

This chapter contains a description of the sample and analysis of data in relation to the hypothesis. A quasi-experimental one-group study was conducted to determine whether there was a difference in glycosylated hemoglobin levels in adult diabetes patients following an education class. The purpose of the study was to determine if education had an impact on glycemic control as measured by an improved glycosylated hemoglobin (HgA$_1c$) level prior to and 3 months after a baseline hemoglobin was obtained and an education program was implemented.

Description of the Sample

The setting for this study was a family medical clinic in a north Mississippi city. Clinic staff compiled a list of patients diagnosed with diabetes. Eligibility criteria were verified by chart review through the completion of the demographic data form. All patients with diabetes were encouraged by the physician and staff to
### Table 1 (continued)

<table>
<thead>
<tr>
<th>Variable</th>
<th>( f^a )</th>
<th>( % )</th>
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</thead>
<tbody>
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<td><strong>Race</strong></td>
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<td>Caucasian</td>
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<td><strong>Educational level</strong></td>
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<td>Graduate</td>
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<tr>
<td><strong>Years since diagnosed</strong></td>
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<tr>
<td>with diabetes</td>
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<td></td>
</tr>
<tr>
<td>1 to 5 years</td>
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<td>28.0</td>
</tr>
<tr>
<td>6 to 10 years</td>
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<td>More than 10 years</td>
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<tr>
<td><strong>Type of insurance coverage</strong></td>
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<td>Medicare/Medicaid</td>
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<td>52.0</td>
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<tr>
<td>Private insurance</td>
<td>12</td>
<td>48.0</td>
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</table>

\(^aN = 25.\)

#### Results of Data Analysis

The null hypothesis tested was as follows: There is no difference in the glycosylated hemoglobin levels of Type 2 diabetes patients before and after attendance at an education program. For the 25 participants, initial HgA\(_{1c}\) levels ranged from 6% to 14% with a mean pre-HgA\(_{1c}\) level slightly above 9%. The post-HgA\(_{1c}\) levels ranged from 7% to 9% with a mean post-HgA\(_{1c}\) slightly above 7% (see Figure 1).
Figure 1. Mean glycosylated hemoglobin levels pre- and post-intervention.
Mean levels were subjected to dependent t test analysis. Since \( t(25) = 6.291, p < 0.05 \), the hypothesis was rejected. Attendance at the educational program had a significant impact on the subjects' self-management of their glycemic levels (see Table 2).

Table 2

Comparison of Glycosylated Hemoglobin Levels Before and After Teaching Intervention Using a Dependent t Test

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>M</th>
<th>SD</th>
<th>t</th>
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<tbody>
<tr>
<td>Post-intervention</td>
<td>25</td>
<td>7.0560</td>
<td>2.0427</td>
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</tbody>
</table>

Note. \( p < 0.001 \).

Additional Findings

The researcher administered a post-educational program evaluation. All participants in the study agreed that the diabetes education program was beneficial to them and felt would benefit other individuals with Type 2 diabetes. However, there were some notable differences among subjects in response to the question that analyzed which section of the program was most beneficial. The
majority (76%) of the participants indicated that the lecture review and question-and-answer section were the most beneficial. Twelve percent of the participants indicated that they enjoyed the visual aids with pamphlets and handouts most, and another 12% indicated that they enjoyed the audio and video section the most. Small tokens were awarded to each participant who responded correctly during the question-and-answer section.

Summary

This chapter contains a description of the sample of participants used in the current study and explained the statistical methods utilized to test the null hypothesis: There is no difference in the glycosylated hemoglobin levels of Type 2 patients before and after attendance of an education program. Since $t(25) = 6.291$, $p < .05$, the null hypothesis was rejected. Attendance at the educational program had a significant positive impact on the subjects' self-management of their glycemic levels.
Chapter V

The Outcomes

Diabetes mellitus is a chronic, multifaceted disease process which can result in numerous long-term complications without proper management. Continuous education, medical care, and lifestyle modifications are required to effectively manage diabetes and to decrease the risk of debilitating complications. Glycosylated hemoglobin (HgA\textsubscript{lc}) measurement is a laboratory test utilized in monitoring long-term glycemic control.

The purpose of this experimental study was to determine the impact of an education class on glycemic control in Type 2 diabetes patients. The study was guided by one null hypothesis: There is no difference in the glycosylated hemoglobin (HgA\textsubscript{lc}) levels of Type 2 diabetes patients before and after the attendance at an education program. The theoretical frameworks were Orem’s Self-Care Deficit Theory and Etzwiler’s Chronic Care Model. Type 2 diabetes mellitus patients served by a primary care facility in a Mississippi city comprised the sample of 25 patients.
subjects. The intervention involved group session classes utilizing a comprehensive diabetes education program. Each class was divided into four teaching sessions that involved lesson plans for diet, exercise, weight control, diabetic foot care, and long-term complications of diabetes. Presentations involved the use of visual aids (handouts/pamphlets), audio, and video material. Teaching materials were centered around the American Diabetes Association guideline recommendations and the patient’s educational level. The impact of the education intervention was evaluated by obtaining HgA₁c levels drawn at baseline and 3 months post-intervention. HgA₁c levels were reflective of the average pre- and post-intervention blood glucose levels which provided data for inferential statistics comparing the differences between the sample groups. A demographic data survey provided personal information that was required to fulfill the education needs of the sample.

Summary of Significant Findings

The dependent t test was utilized to measure differences in HgA₁c levels. A significant reduction in the mean differences of the pre-intervention and post-intervention of HgA₁c levels for the subjects emerged,
The comprehensive diabetes education content guided participants in their self-management. Glycemic control had improved as evidenced by a reduction in HgA₁c levels in Type 2 diabetes patients.

Discussion

Several prior studies support the findings of the current research. Campbell et al.'s (1996) study revealed that education programs are beneficial for Type 2 diabetes patients. Campbell et al.'s (1996) subjects significantly reduced their HgA₁c levels as did the participants in the current study. Argus-Collins et al.'s (1997) study had numerous similarities to the current research study. These researchers sought to monitor glycosylated hemoglobin (HgA₁c) levels prior to and 3 months following the educational intervention. Argus-Collins et al. (1997) and the current researcher concluded that the intervention program utilized in both studies was effective in improving self-care management of Type 2 diabetes individuals as evidenced by a significant decrease in HgA₁c levels. A majority of the subjects in both studies were African American.

Additionally, Tilly et al. (1995) determined a significant (p < .001) decrease in HgA₁c levels from
initial to follow-up from 9.6% to 8.4% (1.2%). In a parallel study by Garrard (1990) the experimental group improved in the management of their diabetes from pretest to posttest, but those in the comparison group did not improve. After attending the education program, the experimental subjects had a decrease in HgA1c levels (11.76%) as compared to the control group (12.49%). Post-survey data also support the researcher’s premise that the subjects felt that this education program was a stimulus to which they responded to improve self-care of persons with Type 2 diabetes.

The current sample was comprised mostly of African-American elderly clients. This sample represented the parameters of Type 2 diabetes population. Additionally, all subjects had completed at least a high school education. Keeping these variables in mind, the researcher presented content that appealed to the audience which may have impacted their understanding. Being rewarded with small tokens for correct responses also may have contributed to their attention span and success and resultant improvement in glycemic control. The instructor also believes that being of the same race and ethnic background as the sample may have stimulated positive
interest and participation. The instructor sought to passionately relate to the need to change self-care by the group in order to enhance participants' quality of life. The significance of lifestyle changes as related to diabetes was strongly emphasized throughout the class by the instructor. Thus, the author acknowledges that researcher bias may have affected the significant results.

Another explanation for the results may be that participants have witnessed some of the negative outcomes, such as lower extremity amputations, dialysis, and blindness in some of their fellow diabetic friends and family. This supposition may have spurred them to believe that they must change their lifestyle and their self-management habits in order to have hope for a quality future without complications.

Analysis of the initial elevated HgA\textsubscript{1c} levels of participants indicated a self-care deficit. The researcher utilized the supportive-educative system to increase awareness and encourage compliance among diabetes patients. The current outcome of significant reductions in HgA\textsubscript{1c} levels supports the concepts of Orem's (1985) Theory of Nursing. Through the education program intervention, participants were taught to initiate and perform self-care
in order to maintain self-management of life, health, and well-being as Type 2 diabetes patients. The education program allowed participants to become knowledgeable about self-care requisites which are significant for maintaining the adequacy of the individual self-care agency (Marriner-Tomey, 1994).

One self-care requisite identified by Orem involved developmental self-care which is associated with human developmental processes, events occurring during various stages of the life cycle, and events that adversely affect development (1985). The diabetes educator in the current study attempted to allow the participants to analyze their developmental processes by focusing on their individual self-care habits, recognizing a need for change, and appraising the benefits through knowledge or education.

Orem (1985) identified another self-care requisite known as the health-deviation self-care associated with illness and disease such as diabetes. The education program was utilized to emphasize the significance of self-management as a treatment measure for diabetes to promote well-being. Etzwiler’s Chronic Care Model (1997) served as an adjunct theoretical framework in that diabetes is a chronic lifelong illness that requires
continuing education in self-management and medical care to reduce the risk of long-term complications. Etzwiler outlined a series of eight facets in the Chronic Care System Model that are unique to the needs of the patients and providers. The education program in the current study emphasized each of Etzwiler’s facets with the overall goal of improving glycemic levels of the diabetes patients.

Education and motivation were the most focused areas of the Chronic Care System Model. Education in self-management is necessary in the development of knowledge, skills, and positive attitudes related to self-care and health. Patient education has always been an integral part of quality nursing. Increasing awareness of health care issues and the role education plays in health promotion mandates quality patient education (Etzwiler, 1997). This eight-facet Chronic Care System Model designed by Etzwiler to serve as a guide for quality, long-term management provided a systematic, comprehensive level of care that was unique to the diabetes patients and health care providers in this study. The current research substantiated the values of both Orem’s theory and Etzwiler’s model and provided a stimulus for conducting future research.
There is no way to predict whether or not the participants intend to continue to be compliant with the information they received in the diabetes education classes, but the significant decrease in the post HgA\(_1c\) levels indicated that they have made a strong effort thus far. The physician has spoken of his plans for the future which will involve regular diabetes classes featuring different topics each session to be held in the clinic. This effort will help the diabetes patients adhere to being self-regulated and will enhance their level of interest and knowledge.

Conclusion

The researcher determined that education did indeed impact the glycemic control of Type 2 diabetes patients as evidenced by a statistically significant decrease in the post-glycosylated hemoglobin levels. This finding was supported by other researchers (Argus-Collins et al., 1997; Campbell et al., 1996; Tilly et al., 1995). Factors that may have contributed to the results include the level of education, age, and ethnic affiliation.

Orem’s Self-Care Theory of Nursing provided the theoretical framework in interpreting the impact that self-care management education had on glycemic control of
Type 2 diabetes patients. Etzwiler’s Chronic Care Model served as an adjunct theoretical framework in that diabetes is a chronic lifelong illness that requires continuous education in self-management of diabetes.

Implications for Nursing

This study has implications for nursing practice, nursing education, nursing theory, and nursing research.

Nursing practice. The results of this study indicate a relationship between diabetes education and glycemic control. Nurse practitioners could act as the change agent in fostering through education the diabetes patient’s development of self-efficacy, self-management, and self-evaluation. Examining the future in the practice of nurse practitioners’ demands emphasizing changes in the care of diabetes patients by embracing a new educational role of prevention and management of this chronic disease. Though no patient barriers were assessed in the current study, the advanced practice nurse must be aware of the various perceived barriers to compliance in order to appropriately educate those patients.

Nursing education. The need for new and innovative approaches to health education is evident (Etzwiler, 1997). Diabetes is manageable by implementing an
appropriate diet, exercise and drug program, and healthy lifestyle modifications. A cost-effective preventive education program has significant implications for the achievement of a more healthy society. A growing concern of consumers of health care and health care professionals is effective patient education. Advanced practice nurses must continue to develop innovative means to communicate this complex disease information to the increasing diabetes population. By providing continuous, comprehensive diabetes education, nurse practitioners can assist the patient to enhance knowledge and thereby comply with diet, exercise, and medication regimens. Patient education in self-management is considered to be the cornerstone of the overall management of diabetes. Long-term goals should be established between the patient and the provider to include not only glycemic control but weight exercise, diet, and other factors related to diabetes self-management.

Nursing theory. The current study added validity to the use of Orem's Self-Care Theory of Nursing through the impact that self-care management education had on glycemic control of Type 2 diabetes patients. Additionally, this study may instigate further utilization of the theory in
research involving continuing educational interventions and the effect on diet, exercise, weight, and health care as well as glycemic control. A theory-based practice provides goals for nursing interventions, such as a patient becoming his or her own self-care agent. Theory guides practice and generates new ideals. Theory provides direction for practice and practice validates theory.

Nursing research. Numerous research investigations were found on the impact of education on glycemic control. Because the findings of the current study were significant, further nursing research should be the focus of advanced practice nurses.

Recommendations for Further Research

The following recommendations were based on the results of the current study and the limitations identified:

1. Replication of the study over an extended period of time.

2. Replication of the study with a larger sample utilizing various geographical locations with different ethnic backgrounds.
3. Incorporation of the nurse practitioners' educational role of prevention and management of diabetes and other chronic illnesses in practice.

4. Implementation of theory-based practice that provides goals for nursing interventions such as the patient becoming his or her own self-care agent.

Summary

Presented in Chapter V was a discussion of the impact of education on glycemic control in Type 2 diabetes patients as measured by HgA\textsubscript{1c} levels. The setting involved a sample of participants in a family medical clinic in a north Mississippi city. A brief summary of significant findings was presented followed by a discussion of the demographic and post-survey characteristics. Relevant research studies with significant results also were presented. Orem's Self-Care Theory of Nursing provided support as an appropriate framework, and Etzwiler's Chronic Care System Model served as an adjunct theoretical framework for the current study. Conclusions of the researcher regarding the significant findings, implications for nursing, and recommendations for further study concluded the chapter.
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APPENDIX A

DEMOGRAPHIC RESEARCH QUESTIONNAIRE
Demographic Research Questionnaire

1. What is your age? ________________
   Please place a check (✓) by the answer that applies to you.

2. What is your gender?
   a. Male
   b. Female

3. What is your race?
   a. African American
   b. Caucasian
   c. Hispanic
   d. Asian
   e. Other. Please list: ________________________________

4. What was the last grade of school you completed?
   a. Grade 6 or less. Please list grade completed: __________
   b. Junior high school. Please list grade completed: __________
   c. High school. Please list grade completed: __________
   d. Technical school. Please list years completed: __________
   e. College. Please list years completed: __________
   f. Graduate school. Please list years completed: __________

5. What type diabetes do you have?
   a. Type 1
   b. Type 2

6. How long have you had diabetes?
   a. < 1 year
   b. 1 to 5 years
   c. 6 to 10 years
   d. > 10 years

7. What type of insurance coverage do you have?
   a. Medicaid/Medicare
   b. Private insurance
   c. No insurance coverage
   d. Other. Please list: ________________________________
APPENDIX B

DIABETES EDUCATION PROGRAM
Diabetes Education Program

The diabetes education program will be divided into four one-hour sessions. The last 10 to 15 minutes of each session will be designated for questions and answers, bathroom privileges, fun and games, and awarding of small gifts and door prizes by the researcher.

Session 1

Each class will begin with the formal introduction of the researcher/instructor, a brief description of the research investigation, and signing of the consent forms.

I. What is diabetes mellitus?
   A. Type 1 diabetes (insulin dependent)
   B. Type 2 diabetes (noninsulin dependent)
   C. Insulin production
   D. Blood glucose levels

Session 2

II. Self-management of diabetes (pamphlets and visual aids provided)
   A. Meal planning, exercise, weight control, medication regimen, and smoking cessation
   B. Monitoring and recording of blood glucose levels
   C. Regular exams by ophthalmologist, dentist, and primary care provider

III. Recognizing signs and symptoms of diabetes (handouts/visual aids)
   A. Changes in vision, wounds, appetite, and weight
   B. Fatigue, increased urination, increased thirst, and itching
IV. Causes of high- and low-blood sugars
   A. Hyperglycemia
   B. Hypoglycemia

V. Measures to take for symptoms of hyperglycemia/hypoglycemia
   A. Hypoglycemia: food intake, glucose, carbohydrate snack, drink
   B. Notification of physician
   C. Emergency room visit

Session 3

VI. Foot care of the diabetes patient (videotape)
   A. Daily inspection of the feet
   B. Proper washing and drying of the feet
   C. Clipping of nails—podiatrist
   D. Properly fitted shoes and socks
   E. Avoidance of extreme temperatures to lower extremities

Session 4

VII. Awareness of complications of diabetes
   A. Hypertension
   B. Retinopathy
   C. Nephropathy
   D. Peripheral neuropathy
   E. Cardiovascular disease

VIII. Understanding glycosylated hemoglobin (HgA$_1c$) levels (picture booklet provided)
   A. HgA$_1c$ levels
   B. Blood glucose levels
   C. Maintenance of normal ranges
   D. Significance of lifestyle changes for self-management of diabetes

At the end of each class, a three-question post-survey will be administered to each individual attending the class. Researcher will remind participants that they will be contacted by telephone and a follow-up postcard of the date to return to clinic for 3-month HgA$_1c$ levels to be drawn.
Diabetes Teaching Guidelines

I. The patient can define diabetes mellitus.
   A. It is a syndrome in which insulin production is decreased or absent.
   B. Lack of insulin leads to elevated blood glucose levels.
   C. There are two classifications.
      1. Insulin dependent diabetes (Type 1)
      2. Noninsulin dependent diabetes (Type 2)

II. The patient can recognize signs and symptoms of diabetes.
   A. Excessive thirst
   B. Fatigue
   C. Increased urination
   D. Increased appetite
   E. Slow healing wounds
   F. Itching
   G. Changes in vision
   H. Weight loss

III. The patient can list measures important in management of diabetes.
   A. Follow prescribed diabetic diet.
   B. Monitor blood sugars.
   C. See physician, dentist, and ophthalmologist regularly.
   D. Take medications as ordered.
   E. Achieve and maintain ideal weight.
   F. Exercise regularly.
      1. Stop immediately if any chest pain, shortness of breath, or nausea occurs.
      2. Always carry a carbohydrate snack when exercising.
IV. The patient can recognize signs and symptoms of high- and low-blood sugar.

A. Hyperglycemia
1. Frequent urination
2. Excessive thirst
3. Headache
4. Weakness
5. Fatigue
6. Dizziness
7. Dry, flushed skin
8. Nausea
9. Vomiting
10. Abdominal cramps

B. Hypoglycemia
1. Fatigue
2. Headache
3. Drowsiness
4. Tremors
5. Pale, moist skin
6. Hunger
7. Anxiety
8. Impaired vision

V. The client can list possible causes of hypoglycemia and hyperglycemia.

A. Hyperglycemia
1. Excessive food
2. Insufficient insulin
3. Lack of exercise
4. Stress
5. Infection or fever

B. Hypoglycemia
1. Lack of food
2. Excessive insulin
3. Unusual exercise

VI. The client will know what to do if symptoms of high- or low-blood sugar occur.

A. Hyperglycemia
1. Contact physician.
2. Go to emergency room.
B. Hypoglycemia
1. Eat some form of glucose or carbohydrate.
2. If symptoms persist, notify physician or go to the emergency room.

VII. The patient can list measures important in foot care of the diabetic.

A. Inspect feet daily.
B. Report any foot problems to podiatrist or physician.
C. Wash feet daily with warm water and soap and pat dry, especially between toes.
D. Clip nails straight across and gently file with an emery board.
E. Wear shoes that support and fit properly.
F. Wear socks that are clean and fit properly.
G. Avoid exposing feet to extreme temperatures.

VIII. The patient is aware of complications of diabetes.

A. Kidney and bladder disorders (nephropathy)
B. High blood pressure (hypertension)
C. Eye complications (retinopathy)
D. Lower limb amputations (peripheral vascular disorders)
E. Cardiac disorders (cardiovascular complications)

IX. The patient can understand glycosylated hemoglobin (HgA$_{1c}$)

A. Laboratory testing of HgA$_{1c}$
B. Blood glucose levels
C. Maintaining normal ranges of blood glucose and HgA$_{1c}$ levels
D. Significance of education and lifestyle changes for self-management of diabetes
APPENDIX C

APPROVAL OF THE COMMITTEE ON USE OF HUMAN SUBJECTS IN EXPERIMENTATION OF MISSISSIPPI UNIVERSITY FOR WOMEN
April 26, 2000

Ms. Norris Doss
F. C. Box W-911
Campus

Dear Ms. Doss:

I am pleased to inform you that the members of the Committee on Human Subjects in Experimentation have approved your proposed research with the recommendation that a portion of the proposal be changed to read grade 6 or less rather than grade 8 or less. They also required that no names be used on any of the materials gathered.

I wish you much success in your research.

Sincerely,

Sheila V. Adams
Sheila V. Adams, Ed.D.
Interim Vice President
for Academic Affairs

SA: wr

tt: Mr. Jim Davidson
Dr. Mary Pat Curtis
Dear Physician,

My name is Norris Doss. I am a registered nurse and a graduate student enrolled in the Master of Science Nursing program at Mississippi University for Women. We have previously discussed in person the details surrounding the current research investigation. I am conducting a research study to determine the impact of education on glycemic control in Type 2 diabetes patients. The researcher hypothesizes that there is no difference in the glycosylated hemoglobin (HgA1c) levels of Type 2 diabetes patients who attend an education program and those who do not attend an education program.

I am requesting your permission to conduct the diabetes education classes in your facility. I will need to review the medical records, administer a demographic questionnaire and a post-survey to qualified individuals receiving health care through your clinic. As previously discussed, you will be expected to obtain pretest and posttest lab work from the subjects prior to and 3 months following the diabetes education classes. The patients' confidentiality will be maintained throughout this investigation. We will decide on the exact dates of the education classes pending approval of this research study by the Institution’s Review Board. I have included a copy of the demographic questionnaire and the post-survey for you to review.

If you need further information, please feel free to contact me at home or work. Thank you for your cooperation and assistance in this research investigation. I look
forward to working with you, your staff, and your patients for the purpose of this research study.

Sincerely,

Norris Doss

I, ___________________________________________________________________, have been given information regarding this research study by Norris Doss, RN, a graduate nursing student at Mississippi University for Women. I grant permission for Norris Doss to use this facility, patients, and medical records for the completion of this research study. I agree to obtain the necessary lab work at no cost to the patients.

______ Date ____________ Signature of Physician
APPENDIX E

LETTER TO PARTICIPANT AND
INFORMED CONSENT
Dear Potential Participant,

My name is Norris Doss. I am a registered nurse and a graduate student enrolled in the Master of Science Nursing Program at Mississippi University for Women. I am conducting a research study to determine the impact of a diabetes education program on glycemic control. In view of the fact that you have been diagnosed with Type 2 diabetes, I would like for you to become involved as one of the subjects (persons) in this research study.

I would like for you to attend a one-day diabetes education class at the identified physician’s clinic. There will be three classes held on three different dates of the same week. You will need to attend at least one of the three classes on the date that is most convenient for you. All three classes will be taught by the same instructor utilizing the same material. Each class will last approximately 4 hours from 8:00 a.m. to 12:00 noon on Day 1, 10:00 a.m. to 2:00 p.m. on Day 2, and from 12:00 noon to 4:00 p.m. on Day 3. There will be games played, door prizes awarded, and a small gift presented to everyone who attends the class. Your physician will obtain a blood specimen (HgA₁c) from you prior to and 3 months following your attendance of the diabetes education class.

If you need further information, please feel free to contact me at home or work. Thank you for your cooperation and assistance in this research investigation. I look
forward to working with you, your staff, and your patients for the purpose of this research study.

Sincerely,

Norris Doss

I, __________________________, have been given information regarding this research study by Norris Doss, RN, a graduate nursing student at Mississippi University for Women. I agree to participate in this research study.

_________________________  __________________________
Date                      Signature of Participant
APPENDIX F

POST-SURVEY QUESTIONNAIRE
Post-Survey Questionnaire

Please place a check (✓) by the answer that applies to you.

1. Did this education program benefit you as a Type 2 diabetes person?
   □ a. Yes
   □ b. No

2. Do you think this program would benefit other persons with Type 2 diabetes?
   □ a. Yes
   □ b. No

3. What part of this program do you feel was the most beneficial to you?
   □ a. Visual aids (pamphlets/handouts)
   □ b. Audio/video
   □ c. Other. Please specify which category: