The perceived and actual diabetes knowledge of registered nurses in Montana's critical access hospitals
by Connie Sue Reichelt

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Nursing
Montana State University
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Abstract:
Critical Access Hospitals dot the landscape of Montana. A large percent of the 53,000 diagnosed
diabetics, in the State, utilize these small facilities that are miles from large full-service medical
centers. The registered nurses that work in these small hospitals are responsible for providing diabetes
education among all their other complex duties. A non-experimental descriptive study utilizing the
survey method of acquiring data investigated the perceived and actual diabetes knowledge of registered
nurses working in Montana’s Critical Access Hospitals.

The study examined the relationship between the rural nurses perceived and actual diabetes knowledge.
The Diabetes Self Report Tool measured the perceived knowledge while the Diabetes Basic
Knowledge Test explored actual knowledge of the registered nurses. A sample of 41 nurses from 12
Critical Access Hospitals comprised the study group. A moderately positive linear correlation between
the mean scores of the two testing tools was revealed. The nurses also provided answers to a
demographic sheet that helped increase awareness of possible reasons for low mean scores on the two
testing tools. The Diabetes Self Report Tool mean score was 78.9 percent while the Diabetes Basic
Knowledge Test mean score was 74.41 percent.

Rural registered nurses in Montana’s Critical Access Hospitals perceive themselves as inadequate to
provide diabetes education. Mean scores on the actual knowledge test revealed insufficient knowledge
to provide diabetes education. A number of reasons exist for why these nurses perceived themselves as
possessing inadequate knowledge and why the actual knowledge scores were low. The utilization of
inexperienced nurses in the rural setting and the lack of diabetes continuing education are just two of
the reasons. Regardless the cause for poor knowledge levels, Critical Access Hospitals must make
continuing education a priority to ensure quality care and selfmanagement skills for Montana’s diabetic
population.
THE PERCEIVED AND ACTUAL DIABETES KNOWLEDGE OF REGISTERED NURSES IN MONTANA'S CRITICAL ACCESS HOSPITALS

by

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A thesis submitted in partial fulfillment of the requirements for the degree of Master of Nursing

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Bozeman, Montana

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APPROVAL

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This thesis has been read by each member of the thesis committee and has been found to be satisfactory regarding content, English usage, format, citations, bibliographic style, and consistency, and is ready for submission to the College of Graduate Studies.

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The study examined the relationship between the rural nurses perceived and actual diabetes knowledge. The Diabetes Self Report Tool measured the perceived knowledge while the Diabetes Basic Knowledge Test explored actual knowledge of the registered nurses. A sample of 41 nurses from 12 Critical Access Hospitals comprised the study group. A moderately positive linear correlation between the mean scores of the two testing tools was revealed. The nurses also provided answers to a demographic sheet that helped increase awareness of possible reasons for low mean scores on the two testing tools. The Diabetes Self Report Tool mean score was 78.9 percent while the Diabetes Basic Knowledge Test mean score was 74.41 percent.

Rural registered nurses in Montana’s Critical Access Hospitals perceive themselves as inadequate to provide diabetes education. Mean scores on the actual knowledge test revealed insufficient knowledge to provide diabetes education. A number of reasons exist for why these nurses perceived themselves as possessing inadequate knowledge and why the actual knowledge scores were low. The utilization of inexperienced nurses in the rural setting and the lack of diabetes continuing education are just two of the reasons. Regardless the cause for poor knowledge levels, Critical Access Hospitals must make continuing education a priority to ensure quality care and self-management skills for Montana’s diabetic population.
CHAPTER I

INTRODUCTION TO STUDY

Montana is the fourth largest state and has more than 53,000 people with diagnosed diabetes (Montana Department of Public Health and Human Services, 2000). This number is intended to represent just half of Montana's diabetic population with the remaining diabetics being unaware of their condition. Diabetics, in Montana, face many challenges including distance to healthcare providers and healthcare supplies. Montana's access to resources for diabetics is ranked by the American Diabetes Association (ADA) as 38th out of the 50 states (Montana Department of Public Health and Human Services, 2002).

In Montana, the rural nurse is most likely to provide diabetes information when the patient has concerns about his or her condition. Certified diabetic educators are rare in the State. In 2002, the ADA recognized 55 Certified Diabetes Educators, primarily clustered in the western half of Montana (Montana Department of Public Health and Human Services, 2000). This leaves thousands of miles without certified educators. Accordingly, rural Montana nurses possess a unique opportunity to facilitate and improve the health and quality of life outcomes for patients with diabetes. Yet, nurses working in the Medicare designated Critical Access Hospitals throughout Montana live the same isolated lives as their diabetic clients.
Problem

Registered nurses in these small facilities cover every aspect of the life continuum including emergency, clinic, acute care and long term care. Yet, little is known about the diabetic education of these nurses.

Purpose

The purpose of this study was to examine the relationship between the self-perceived and actual knowledge of diabetes in rural nurses working in Critical Access Hospitals across Montana. Two specific aims were addressed in this study. Aim 1 focused on determining if a correlation relationship exists between perceived diabetes knowledge and actual diabetes knowledge. Aim 2 inspected the demographic profile of Montana rural registered nurses and how the rural environment affects perceived and actual diabetes knowledge.

Background

Forty-six percent of Montana’s population lives in rural areas (Montana Census 2000). Movies and magazines romanticize the rural lifestyle and the winter weather that encompasses Montana. Residents of this sparsely populated state, coping with diabetes, find no romance in maintaining their illness in isolation. Many of these individuals live miles from a full service medical center and utilize small rural facilities known as Critical Access Hospitals for their care. These hospitals were established under the Balanced Budget Act of
1997 (Montana Health Research and Education Foundation, 2002). The Medicare Rural Hospital Flexibility Program created under this Act, supplies grants to States that designate rural hospitals as Critical Access Hospitals (Montana Health Research and Education Foundation, 2002). These small medical centers must meet criteria including not providing inpatient care for a period exceeding 96 hours, “as determined on an average, annual basis for each patient” (Montana Health Research and Education Foundation, 2002, p. 1). These facilities also provide 24-hour emergency care and the nurses covering these shifts will often encounter the rural diabetic through the emergency room setting. This initial contact between the rural nurse and the diabetic often becomes a life long relationship.

Diabetes accounts for approximately 7,504 hospitalizations annually in Montana (Montana Diabetes Project, 2002). Each year almost 500 Montanans die from diabetes related complications (Montana Diabetes Project, 2002). According to the needs assessment survey conducted for the Montana Diabetes Project (2002), Montanans view diabetes as the least serious illness among seven major diseases. Yet, diabetes is the seventh leading cause of death among all Montanans and the fourth leading cause of death among Montana Native Americans (Montana Diabetes Project, 2002). Diabetes, without proper management, leads to cardio and cerebro vascular disease, retinal disease, neuropathy and renal disease. Scientific data show that these complications can be greatly reduced with proper treatment and management. Large randomized controlled studies, investigating Type I diabetes therapy, found tight glucose control and frequent clinical follow up to reduce or prevent retinopathy by 76% and nephropathy by 54 percent (Montana Diabetes Project, 2002).
In Montana, diabetes is responsible for medical costs and indirect costs totaling more than $335 million annually (Montana Diabetes Project, 2002). Diabetes accounts for 27 percent of the United States’ entire Medicare budget and Montanans 65 years of age and older are a population highly affected by diabetes (Montana Diabetes Project, 2002). Thus the rural nurse, working in the Critical Access Hospital surviving on Medicare and Montana Medicaid reimbursement, will undoubtedly encounter numerous diabetic patients. These encounters can positively or negatively impact the physical and financial outcomes of diabetes depending on the knowledge level of the rural nurse.

Conceptual Framework

Figure 1. Prescriptive Theory Framework

Weidenbach’s Prescriptive Theory, (George, 1995, p. 181). Adapted for this study.
A conceptual framework must be established in order to investigate rural nurses’ knowledge of diabetes mellitus. Ernestine Weidenbach’s prescriptive theory exemplifies this interaction between knowledge and patient care.

Three major concepts comprise Weidenbach’s prescriptive theory. These concepts are:

1. The central purpose which the practitioner recognizes as essential to the particular discipline.
2. The prescription for the fulfillment of the central purpose.
3. The realities in the immediate situation that influence the fulfillment of the central purpose (George, 1995, p. 181).

The central purpose, as outlined by Wiedenbach, revolves around the nurse’s philosophy and goals of accomplishment (George, 1995). The nurse’s purpose is his or “her reason for being and doing...Philosophy, an attitude toward life and reality that evolves from each nurse’s beliefs and code of conduct, motivates the nurse to act, guides her thinking about what she is to do and influences her decisions (George, 1995, p. 182).” Wiedenbach goes on to illustrate that philosophy and purpose stem from the nurse’s culture and or subculture and both are unique to each nurse (George, 1995). The rural nurse’s central purpose centers on the culture or subculture of the rural and or frontier environment of Montana. The rural Montana nurse’s perceived knowledge of diabetes reflects not only the nurse’s environment but his or her purpose for providing diabetes care. The actual diabetes knowledge each rural nurse possesses is shaped by the environment and access to continuing education. The nurse working in the rural and frontier environment of Montana often works
alone due to the size of the rural facility. Self direction and independence are essential qualities in a rural nurse. He or she must develop a personal philosophy or standard in order to direct patient care. Continuing education for the rural nurse often relies on the philosophy to better one’s self. Without an individual desire to further his or her knowledge, rural nursing could easily become stagnant and antiquated.

Wiedenbach describes the prescription as the mutually agreed upon plan of care between the nurse and the patient (George, 1995). The prescription must be based on solid knowledge and evidence based practice. The rural nurse utilizes his or her unique perspective and know-how to formulate a plan of care. Diabetes education and management rests on established ADA guidelines and always advancing technology. The rural nurse must know and understand the guidelines and current advancements when caring for and treating the diabetic patient. According to Wiedenbach, “when the nurse has determined her central purpose and has developed the prescription, she must then consider the realities of the situation in which she is to provide nursing care” (George, 1995, p.183). Wiedenbach goes on to describe the realities as the agent, the recipient, the goal, the means and the framework (George, 1995).

The rural nurse or agent must focus on isolation and adapt to the challenges of progression through distance and limited technology. The nurse must examine his or her hours of continuing education. The nurse must also be able to recognize the need for self-improvement and better nursing practice through further education. As diabetes management improves through pharmacology and technology, rural nurses must receive continuing education in order to provide solid clinical practice and adequate patient education.
The recipient, or diabetic patient, relies on the nurse’s knowledge to guide them in self-care and problem solving. Wiedenbach states “the patient is the recipient of the nurse’s actions or the one on whose behalf the action is taken (George, 1995, p. 184).” The nurse who possesses strong diabetes knowledge assists and guides the patient in self care practices.

“The goal is the outcome the nurse hopes to achieve through nursing practice in conjunction with the patient’s ability to retain autonomy” (George, 1995, p.184). The goal of diabetic education rests on the rural nurse’s ability to develop a course of action and assist the patient in self realization, direction and management of his or her diabetic condition.

“The means comprise the activities and devices through which the practitioner is enabled to attain her goal”(George, 1995, p.184). The rural nurse may or may not have access to the means to provide safe clinical diabetes care and education. The commitment to continuing education and access to learning are key factors in determining the actual level of diabetes knowledge of the rural registered nurse.

“The framework consists of the human, environmental, professional and organizational facilities that not only make up the context within which nursing is practiced but also constitute its currently existing limits” (George, 1995, p.184). The framework consists of all the outlying factors that affect the nurse’s ability to provide sound nursing care and judgment (George, 1995).

The prescriptive theory is described as a situation-producing theory, one that visualizes a situation and formulates a prescription to achieve the situation (George, 1995). The framework of this study mimics the prescriptive theory. Rural diabetics and the nurses that care for them in the Critical Access Hospitals face challenges related to isolation.
Critical Access Hospitals function on state and federal reimbursement; generally funds to provide basic patient care but whether or not funding exists for continuing education remains unknown. In examining the diabetes knowledge of Critical Access Hospital registered nurses, this study formulates a prescription on whether or not sufficient continuing diabetic education exists in the rural environment.

**Definitions**

For the purpose of this study, the following terms are defined as follows:

1. **Diabetes Mellitus**: “A variable disorder of carbohydrate metabolism caused by a combination of hereditary and environmental factors and characterized by inadequate secretion or utilization of insulin (Merriam-Webster’s Medical Dictionary, 1995, p. 173). For this study, rural nurses’ diabetes knowledge is tested with the Diabetes Basic Knowledge Test.

2. **Rural nurse**: For this study, this is a registered nurse working full time at a Critical Access Hospital, (a facility, as defined by the Montana Health Research and Education Foundation, 2002, “located more than 35 road miles or, in the case of a facility located in mountainous terrain or where only secondary roads exist, more than 15 road miles from a hospital or another critical access hospital; or be certified by the State as a necessary provider of health care services to residents in the area (in Montana, this includes all hospitals located in a frontier county)” (p.1).
Assumptions

The wide open spaces of Montana provide long car rides between home and health care for many Montanans. These spaces also leave a vacant field for much needed continuing education in Critical Access Hospitals. The nurses that work in these small facilities are dedicated and hard working but whether or not they stay atop the current treatments and technology of diabetes care is doubtful. In the planning of this study it is assumed:

1. Registered nurses in Critical Access Hospitals are primarily responsible for diabetic education in the rural environment of Montana.

2. Due to lack of resources and access to the most recent information, Critical Access Hospital staff nurses are likely to be deficient in the knowledge needed for effective management and education of the diabetes patient.

3. The Diabetes Basic Knowledge Test and the Diabetes Self Report Tool are reliable and accurate measurement tools for the basic concepts and knowledge needed for nurses to educate and provide safe clinical care for diabetic patients.

Summary

Diabetes plays a significant role in the health of rural Montanans. Without proper management and education, this disease can lead to numerous healthcare visits and hospital stays. Access to healthcare for many rural diabetics is part of the continuing struggle to manage the disease.
The rural nurse working in Montana's Critical Access Hospitals provides basic education and acute diabetes care. The rural diabetic relies heavily on these nurses to provide accurate and current information. However, little was known about the level of diabetes knowledge these nurses possessed. Rural isolation along with access to, or the lack there of, continuing education possibly influenced the basic diabetes knowledge. This study examined the actual and perceived diabetes knowledge of Montana's Critical Access Hospitals' registered nurses. Ernestine Weidenbach's Prescriptive Theory formed the foundation of this study through the connection of the nurse's perceived knowledge of diabetes care with actual knowledge and the influences the environment interjects.
CHAPTER II

LITERATURE REVIEW

The education and instruction provided to Montana diabetics relies heavily on the staff nurse working in the rural facility. The concept of studying nurses’ diabetes knowledge is not a new one. Numerous studies have focused on nursing students, staff nurses in university hospitals, metropolitan hospitals and long term care facilities. One study also examined rural nurses’ knowledge but the facilities in which these nurses worked were much larger than the Critical Access Hospitals found in Montana. Understanding rural nurses’ diabetic knowledge is the reason for this study. However, to understand the outcomes of this study a review or comparison of similar studies is essential.

Diabetes today compared to twenty years ago varies greatly due to the advances in medicine and technology. Nurses working in today’s medical setting must possess a different level of knowledge than those nurses in earlier studies. Despite medical progress, history indicates a diabetes knowledge deficit in nurses throughout the years.

Diabetes Education

The quality of life for a diabetic patient relies heavily on his or her ability to perform self care and treatment. Diabetics require continuing medical care and patient self-management education to prevent both acute and long term complications. The American
Diabetes Association’s Standards of Care 2002 recommend implementation of diabetes self-management education as a means to improving the patient’s overall health and well being. At the time of initial diagnosis, self-management education is critical in helping both the diabetic and his or her family adapt to the changes necessary to manage and maintain diabetes (American Diabetes Association, 1998). Two hundred and one insulin-treated diabetic patients were followed over a one year period after completing an intensive 5 day diabetes education program (Tankova, Dakovska, & Koev, 2001). The patients’ diabetes conditions improved with HbA1c levels falling from 9.1 (SD = 1.5) to 8.0 (SD = 1.1) after six months and 7.8 (SD = 1.3) after one year following the education program (Tankova, Dakovska, & Koev, 2001). A statistically significant drop in overall depression, anxiety and increase in well being were also measured in the same study (Tankova, Dakovska, & Koev, 2001). Diabetics receiving education in self-management techniques experience an improvement in overall well-being. The majority of the diabetics in this study received education from certified diabetes educators. Therefore, staff nurses ability to instruct diabetics remains a mystery.

Nursing Education

The diabetes education received by the nurse determines the ability of the nurse to pass on adequate knowledge to the diabetic. In 1974, one of the first studies measuring diabetes knowledge was conducted with nursing students. When 144 volunteer, senior nursing students from five separate baccalaureate programs were tested on the subject of diabetes mellitus in 1974 the results were dismal (Fuestal, 1976). The Diabetes Knowledge
Test was utilized to determine if these students, who were within two months of graduation, had sufficient diabetes knowledge to teach diabetic patients and their families (Fuestal, 1976). The original tool of 34 questions, plus three demographic inquiries added by Fuestal, examined the areas of insulin effects, diabetes control, symptoms and nutrition to name a few (Fuestal, 1976). None of the study participants were able to answer all 34 questions about diabetes correctly and the researcher therefore determined these students as unable to effectively teach diabetic patients and their families. Despite the fact that this study is more than 25 years old, the registered nurses' diabetes knowledge does not appear to substantially improve overtime.

In 1999 nursing students in their junior and senior levels of nursing courses along with registered nurses from two hospitals specializing in pediatrics were tested for diabetes knowledge (Lipman & Mahon, 1999). A 20-item questionnaire was developed by the authors to test the knowledge of the nursing participants about the care and self-care of children diagnosed with diabetes (Lipman & Mahon, 1999). The mean score of the nurses was 65.3 percent while the nursing students scored 57.4 percent (Lipman & Mahon, 1999). These researchers found nurses and nursing students to be ill prepared in educating diabetics about their disease. The authors also suggested that their findings raise a concern for institutions hiring new nursing graduates if these new nurses are expected to instruct diabetic patients in self management (Lipman & Mahon, 1999). The study results indicated a need for continuing education of the staff nurse and also a need for more diabetes instruction in nursing school.
Knowledge in the Workplace

Although nursing students appear unprepared to work with diabetics, the knowledge base of the working registered nurse requires further examination. These nurses are at the forefront of diabetes education, management and treatment. In 1983, a study was conducted to measure diabetes mellitus knowledge in working registered nurses (Scheiderich, Freibaum and Peterson, 1983). The researchers utilized a 34-item multiple choice Diabetes Knowledge Test developed by Scheiderich and a panel of expert nurse diabetes educators (Scheiderich, Freibaum & Peterson, 1983). The test implemented is somewhat similar to that used by Fuestal (1976) but due to advancements in diabetes care, the subjects of foot care, exercise, effects of sulfonylureas and a definition of diabetes were added to the test (Scheiderich, Freibaum and Peterson, 1983). The targeted staff nurses were employed on either a medical or a surgical unit or a combined medical-surgical unit in which diabetic patients were often admitted (Scheiderich, Freibaum, & Peterson, 1983). The 137 nurses who completed the exam worked in one of three large hospitals in the Midwest (Scheiderich, Freibaum, & Peterson, 1983, p. 58). The completed exams were calculated with a mean average of 74 percent with 30 percent of the sample scoring less than 70 percent (Scheiderich, Freibaum, & Peterson, 1983). The researchers determined the staff nurses lacked sufficient diabetes knowledge to teach patients in the areas of urine testing, diet, oral medications, and home blood glucose monitoring (Scheiderich, Freibaum, & Peterson, 1983). These self management techniques are critical for the diabetic to understand. This lack of knowledge opened the door for further, more in depth, study of working registered nurses’ diabetes knowledge.
After Scheiderich, Freibaum & Peterson identified a lack of diabetes knowledge in the working registered nurse, numerous studies began. Diabetes treatment, management and education change on a daily basis and thus the knowledge level of the nurses must be assessed on all levels. One study tested 194 registered nurses in a 540-bed research hospital using the Diabetes Self-Report Tool (DSRT) and the Diabetes Basic Knowledge Test (DBKT) (Drass, et al., 1989). The DSRT, developed by the investigators, assesses the nurse’s self perceived knowledge of diabetes (Drass, et al., 1989). Perceived knowledge must be examined in order to determine if the nurses believe themselves capable to care for diabetics or see themselves needing further education. The nurses in this study reported themselves to be 91 percent in agreement with the DSRT on their knowledge of diabetes.

The DBKT was also developed by the investigators and consists of a 45-item multiple-choice questionnaire (Drass, et al., 1989). The DBKT is an adapted version of Scheiderich’s Diabetes Knowledge Test expanding on the areas Scheiderich found lacking (Drass, et al., 1989). When tested with the DBKT, the nurses who perceived themselves as knowledgeable, averaged a 64 percent (Drass, et al., 1989). The staff nurses’ perceived knowledge of diabetes was inversely related to their actual knowledge of the disease (Drass, et al, 1989). Drass, et al (1989) raised the concern that if nurses perceive themselves knowledgeable in the subject, and actually are not, they may not seek further education or assistance with diabetes instruction.
Continuing Education

Registered nurses face a number of confrontations and staying abreast of the latest treatments and management of chronic illness is just one of the many challenges. Continuing education and in-service training help nurses to stay current with new changes. However, some facilities are too small to provide in-service training and often the nurses are short on time to attend continuing education courses. Two researchers, Jayne and Rankin (1993), wanted to develop a comprehensive diabetes in-service education program and therefore investigated diabetes mellitus knowledge in 98 nurses from six inpatient units and an ambulatory care center within a university medical center. The DBKT and the DSRT, designed by Drass and colleagues, were utilized as needs assessment tools for the education program (Jayne & Rankin, 1993). The mean score achieved on the DBKT was 73 percent (Jayne & Rankin, 1993). Most nurses reported they felt competent in caring for the diabetic patient but their tested knowledge proved different (Jayne & Rankin, 1993). Although the mean score in this test was higher than that found in Drass et al (1989), the researchers still found the nurses lacking in adequate knowledge to teach diabetes patients. Technology in diabetes management is exceeding the knowledge base of the nurses caring for diabetics (Jayne & Rankin, 1993). However, testing on the subject must continue and must reflect the current progresses being made in diabetes management in order for adequate continuing education and in-service training to take place (Jayne & Rankin, 1993). It was also discovered that nurses receiving continuing education in diabetes, within six months, scored higher on the DBKT exam than those that did not receive education (Baxley, Brown,
Pokorny, & Swanson, 1997). This would lead one to believe that continuing education for
staff nurses, helps facilities ensure and validate competency levels in the area of staff nurse
instructed diabetes education for the acute care patient.

Physical Assessment

The nurse's knowledge of diabetes and ability to explain the disease to the patient are
areas proven to be of concern. The nurse's lack of knowledge can also lead to difficulty or
inability to identify life threatening conditions associated with diabetes. As the general
population ages, many elderly diabetics come to reside in long-term care facilities. A
diabetes knowledge test developed by a diabetic educator's group was utilized to investigate
the diabetes knowledge of nurses working in long-term care facilities (Leggett-Frazier,
Turner, & Vincent, 1994). The test questions focused on knowledge needed by long-term
care facility nurses to manage diabetic clients and included the areas of: blood glucose and
ketone monitoring, medications, illness care, foot care, exercise, diet, hypoglycemia and
hyperglycemia and patient/family education (Leggett-Frazier, Turner, & Vincent, 1994). Of
the 59 RNs and LPNs who completed the test, a mean score of 67 percent, with 70 percent
passing, was attained (Leggett-Frazier, Turner, & Vincent, 1994). The area the researchers
found most alarming focused on assessment skills. These nurses scored less than 40 percent
in the skill most needed in long-term care (Leggett-Frazier, Turner, & Vincent, 1994). These
same nurses also scored poorly in the areas of hypoglycemia, hyperglycemia and medications
(Leggett-Frazier, Turner, & Vincent, 1994). The inability to identify and treat these life-
threatening conditions causes reason for concern. What appears to be a generalized lack of knowledge in staff nurses, in all settings, raises serious implications for nursing educators.

Environment

It is postulated the work environment or area of employment influences the nurse’s diabetes knowledge. Those nurses exposed to diabetics on a regular basis with access to continuing education and specialty support should possess an adept knowledge base. The nurses working in isolated areas with little to no in-service training may lack the knowledge to educate diabetic patients. Staff nurses working in a 62-bed rural acute care facility answered the DSRT and DBKT tools (Baxley, Brown, Pokorny, & Swanson, 1997). Thirty-two nurses completed the tools with a mean score of 88 percent on the DSRT (Baxley, Brown, Pokorny, & Swanson, 1997). The mean score of the exam testing the actual knowledge was 75.3 percent (Baxley, Brown, Pokorny, & Swanson, 1997). The nurses’ perception of knowledge was found not related to their actual knowledge. The DBKT scores permitted the nurses to see the areas in which they lacked knowledge and thus requested educational updates in these areas (Baxley, Brown, Pokorny, & Swanson, 1997).

Often, the newly diagnosed diabetic requires in-home care and education. The nurses caring for these individuals are often more independent and self-reliant than the hospital based nurse. Nurses in a community hospital and home healthcare agency completed the DSRT and DBKT tools (El-Deirawi & Zuraikat, 2001). The response rate from the home healthcare agency far exceeded that of the community hospital. However, the two groups combined achieved a mean score of 72.2 percent on the DBKT (El-Deirawi & Zuraikat,
A significant correlation between perceived and actual diabetes knowledge was determined while previous tests did not correlate as well (El-Deirawi & Zuraikat, 2001). El-Deirawi and Zuraikat (2001) contributed this relationship to the higher number of home-health care nurses completing the tools. The correlation may be attributed to these nurses possibly being more autonomous and more confident in their knowledge (El-Deirawi & Zuraikat, 2001). The overall mean score concurs with earlier studies in that registered nurses lack sufficient knowledge to instruct the diabetic patient in self-care.

**Summary**

The earlier studies revealed the nurses to have an average to poor level of diabetes knowledge plus an inability to identify their lack of knowledge. Identification of the lack of knowledge suggests the need for better continuing education for staff nurses so they might better educate and treat diabetic clients.

When looking at the previous studies one might conclude that environment truly interacts with knowledge level. Scheiderich, Freibaum and Peterson (1983) and Lipman and Mahon (1999) noted that hospital settings employing diabetic educators and nurse specialists to educate patients with diabetes, housed staff nurses with limited diabetes knowledge. All the nurses tested in the previous studies, worked in facilities much larger than any of Montana’s Critical Access Hospitals. However, the access to continuing education played a significant role in the test outcomes. Drass, et al. (1989) found lower DBKT scores in nurses who had not received diabetes in-service training for greater than six months. Leggett-Frazier, Turner and Vincent (1994) also indicated that long term care facilities lack
continuing education programs and this deficit was evident in the nurses' knowledge. "The scores may indicate that that the nurses have forgotten the diabetes information they learned in school, or that they never learned it adequately, in either case, the need for periodic reviews is indicated by the test scores in this study" (Leggett-Frazier, Turner, and Vincent, 1994, p.309). The size of the facility in which these nurses work does not necessarily exclude them from education isolation similar to those nurses working in Critical Access Hospitals.
CHAPTER III

METHOD

While the study of diabetes education in registered nurses is not a new concept, this study is unique. The rural environment presents a challenge for the people who live and work in Montana. Therefore this study covers the distances to these rural communities and examines the perceived and actual diabetes knowledge of the staff nurses working in small and often isolated regions of the State.

Design

This study used a non-experimental descriptive design. The survey method of acquiring data was employed. As identified by Burns and Grove (2001) a “survey is used to describe a technique of data collection in which questionnaires (collected by mail or in person) or personal interviews are used to gather data about an identified population” (p.256). The design of this study was a replication of the study utilized by Drass et al., (1989). The questionnaires used to survey the nurses in the Critical Access Hospitals consisted of an anonymous demographic sheet, the DSRT and the DBKT.

Population and Sample

The Directors of Nursing from each of the 23 facilities were asked to distribute the tests to no more than five full time registered nurses. Due to the distance and isolation, many
of the Critical Access Hospitals do not employ five full time registered nurses but rather use traveling nurses. Traveling nurses were not permitted to participate in this study because of the risk they could complete the tests at more than one facility. Of the 23 Critical Access Hospitals that originally agreed to participate in the study, 12 facilities completed the questionnaires. The investigator received 41 completed packets in total.

Procedures for Data Collection

The Critical Access Hospitals’ Administrators and/or Directors of Nursing were approached, via telephone, for permission to test the registered nurses working in the area of patient care. The demographic sheet, DSRT, DBKT and a letter of instruction (Appendix E) along with a consent form were mailed to each facility in individualized packets of five. A letter to the Director of Nursing (Appendix F) accompanied the testing materials. The letter stated that the Director of Nursing should choose 5 full time nurses to complete the exams. It was then requested that the tests be returned within a two-week window. Testing took place at the individual nurse’s convenience over the two week period and then all tests, in each participating facility, were returned in self-addressed stamped envelopes to the investigator. All test packets were assigned an identification number for correlation purposes and to ensure anonymity.
The demographic data sheet (Appendix B) includes: the number of years experience, number of years at the Critical Access Hospital, education, number of diabetics cared for per month, presence of diabetes in self, family or friend, and how competent the nurse feels in caring for diabetic patients. The investigator received permission (Appendix A) from the author of the Diabetes Self-Report Test (DSRT) (Appendix C) and the Diabetes Basic Knowledge Test (DBKT) (Appendix D) to use these tools for the purpose of the study.

The DSRT measures each nurse’s perceived knowledge of diabetes mellitus including type I and type II diabetes, nursing care of a diabetic patient before an invasive procedure, loss of consciousness in the diabetic patient, performing and interpreting blood glucose levels and ‘sick day’ management for a diabetic patient. The test also covers insulin administration, oral hypoglycemic agents, recognition of hyperglycemia with and without diabetic ketoacidosis, effects of stress and exercise on blood sugar levels, dietary therapy and personal care of patients with diabetes. Through the suggestion of the DSRT author, the 1-4 Likert-type scale was altered to a 1-5 numerical scale with 1 indicating strong disagreement and 5 indicating strong agreement. The improved scale allows for the nurse to voice a “no opinion” when circling the number three.

The DBKT, a 45-item multiple-choice questionnaire was designed by the original author via modification of the Diabetes Knowledge Test implemented by Scheiderich (1983). The DBKT covers all the areas of diabetes mellitus management and treatment that the
DSRT contains. The author designed the two tests with the intention of comparing and contrasting the perceived and actual diabetes knowledge of the original study’s participants. After receiving recommendation from Drass, the answers to one question were revised to reflect current nutritional exchange lists. Another question dealing with oral hypoglycemic agents was altered to reflect the current prescription trends of health care providers. Using Chronbach’s $\alpha$ for internal consistency, a reliability co-efficient of .91 and .79 for DSRT and DBKT, respectively, has been obtained in earlier studies (Drass, 1989).

**Data Analysis**

Data were analyzed using the Statistical Package for Social Sciences (SPSS) 11.5 for Windows. Pearson’s correlation coefficients described the relationship between perceived and actual diabetes knowledge of rural nurses working in Montana’s Critical Access Hospitals. Descriptive statistics, such as frequencies, percentages, means and standard deviations were used to summarize the study results.

**Human Rights and Consent Process**

The research study focused on the perceived and actual knowledge of registered nurses working in Montana’s Critical Access Hospitals. There was no direct contact made with the registered nurses in these facilities. Each participating nurse voluntarily consented to the study. A signed consent form (Appendix G) was received from each registered nurse.
The questionnaires contained no information that could directly identify the registered nurse or the participating Critical Access Hospital. Results of the study were written in a thesis in partial fulfillment of the degree of master of nursing. Copies of the written study are available at the Montana State University – Bozeman, College of Nursing and the Montana State University Renne Library. The written thesis did not identify any nurses or the facilities in which they are employed. The summary proposal to the Human Subject Committee of the Montana State University – Bozeman was found exempt from the requirement of review by the human subjects committee on April 14, 2003, due to research involving the use of educational tests, survey procedures, interview procedures or observation of public behavior.
CHAPTER IV

RESULTS

A non-experimental descriptive survey and educational test were employed to determine the perceived and actual knowledge of registered nurses working in Montana’s Critical Access Hospitals.

All 23 identified Critical Access Hospitals were contacted via telephone and introductory letter during April and May 2003. The demographic survey, DSRT and DBKT were then mailed in bundles of five to all 23 facilities. The nurses receiving the questionnaires were chosen by the respective Directors of Nursing. Of the 23 facilities only 12 facilities responded with completed surveys. The total number of registered nurses completing these surveys was 41, resulting in a response rate of 34.2 percent. When the Directors of Nursing were contacted via telephone for the second time as a reminder to send the completed tests back to the investigator; many stated inability to find time to distribute the tests or the fact that the facility relied heavily on traveling registered nurses to complete its work force as reasons for not returning the tests.

Descriptive statistics were utilized to present the demographic profile of the nurses completing the questionnaires. The perceived and actual diabetes knowledge test results were compared via Pearson’s correlation coefficients. These results were also compared with the demographic material, especially the in-service training, educational degree, years of
experience, number of diabetic clients cared for, and level of perceived competency to
determine influence on the perceived and actual knowledge level of these nurses.

Demographic Profile

The demographic profile of the registered nurses working at Montana’s Critical
Access Hospitals as it relates to perceived and actual diabetes knowledge was identified.
This included years of experience, number of years at current facility, education level, time
since last diabetes in-service, number of diabetics cared for each month, presence of diabetes
in self, family or friend, and perceived diabetes competency level.

The mean number of years experience for the registered nurses was 13.24 (SD=10.86)
with a range of 1 year to 35 years working experience. The mean number of years working
at the current Critical Access Hospital was 6.06 (SD=7.68) with minimum of 1 year to
maximum of 35 years at current job position. A total of 9.8% (n=4) held a Diploma
registered nurse degree while 48.8% (n=20) earned an Associated Degree in nursing and
41.5% (n=17) possessed a Baccalaureate Degree in nursing.

Twenty-four of the 41 registered nurses (58.5%) reported no diabetes in-service
training program or having attended an in-service training program more than two years ago.
Greater than 60% (n=25) treat and/or care for more than 4 diabetic patients per month. Only
two (4.9%) of the 41 nurses reported having diabetes themselves; 56.1% (n=23) reported
having a family member or friend with diabetes. Overall, 60% (n=25) believed themselves
competent to very competent when caring for a diabetic client. Table 1 further illustrates the
demographic breakdown by percentages.
Table 1. Demographic Profile (n=41)

<table>
<thead>
<tr>
<th>Years of Experience</th>
<th>N</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5</td>
<td>13</td>
<td>31.7</td>
</tr>
<tr>
<td>6-10</td>
<td>10</td>
<td>24.4</td>
</tr>
<tr>
<td>11-15</td>
<td>4</td>
<td>9.8</td>
</tr>
<tr>
<td>16-20</td>
<td>3</td>
<td>7.3</td>
</tr>
<tr>
<td>21-30</td>
<td>7</td>
<td>17.0</td>
</tr>
<tr>
<td>31-35</td>
<td>4</td>
<td>9.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Years at CAH</th>
<th>N</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5</td>
<td>30</td>
<td>73.3</td>
</tr>
<tr>
<td>6-10</td>
<td>3</td>
<td>7.3</td>
</tr>
<tr>
<td>11-15</td>
<td>1</td>
<td>2.4</td>
</tr>
<tr>
<td>16-20</td>
<td>5</td>
<td>12.2</td>
</tr>
<tr>
<td>21-25</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>26-30</td>
<td>1</td>
<td>2.4</td>
</tr>
<tr>
<td>31-35</td>
<td>1</td>
<td>2.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Highest Education Level</th>
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<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diploma</td>
<td>4</td>
<td>9.8</td>
</tr>
<tr>
<td>Associate Degree</td>
<td>20</td>
<td>48.8</td>
</tr>
<tr>
<td>Baccalaureate Degree</td>
<td>17</td>
<td>41.5</td>
</tr>
<tr>
<td>Master Degree +</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Last Diabetes In-service</th>
<th>N</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>14</td>
<td>34.1</td>
</tr>
<tr>
<td>Within 6 months</td>
<td>2</td>
<td>4.9</td>
</tr>
<tr>
<td>More than 6m less than 1 yr</td>
<td>3</td>
<td>7.3</td>
</tr>
<tr>
<td>More than 1 yr less than 2 yr</td>
<td>12</td>
<td>29.3</td>
</tr>
<tr>
<td>More than 2 yr</td>
<td>10</td>
<td>24.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diabetics Seen/Month</th>
<th>N</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1-3</td>
<td>16</td>
<td>39.0</td>
</tr>
<tr>
<td>More than 4</td>
<td>25</td>
<td>61.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Presence of Diabetes</th>
<th>N</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>16</td>
<td>39.0</td>
</tr>
<tr>
<td>Friend</td>
<td>5</td>
<td>12.2</td>
</tr>
<tr>
<td>Immediate Family</td>
<td>18</td>
<td>43.9</td>
</tr>
<tr>
<td>Self</td>
<td>2</td>
<td>4.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Competency in Diabetes Care</th>
<th>N</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Not very</td>
<td>2</td>
<td>4.9</td>
</tr>
<tr>
<td>Somewhat</td>
<td>14</td>
<td>34.1</td>
</tr>
<tr>
<td>Competent</td>
<td>19</td>
<td>46.3</td>
</tr>
<tr>
<td>Very Competent</td>
<td>6</td>
<td>14.6</td>
</tr>
</tbody>
</table>
DSRT Scores

The DSRT measures the registered nurses' perceived diabetes knowledge. The statements on the DSRT were designed to reflect perceived knowledge in each diabetes-related content area (Drass, et al., 1989). Analysis of the DSRT revealed a mean score of 78.9%, with scores ranging from 64 to 95. Nurses who reported feeling very competent on the demographic sheet obtained a mean score of 88.7 (P< .001) on DSRT, whereas those who reported feeling competent (n=19) had a mean DSRT score of 78.3 (SD=4.94) percent. Despite reported confidence level, all mean scores on the DSRT were relatively similar except for the six registered nurses that reported they were very competent in caring for a diabetic patient. Figure 2 shows mean DSRT scores in relation to perceived competency.

Figure 2. Mean DSRT Scores for Perceived Competence
Those nurses with 5 or fewer years work experience provided a DSRT mean score of 79.0 (SD=5.49), while nurses with 31-35 years experience reported a mean score of 87.5 (SD=8.13). The lowest mean score was 64.5 (SD=0.71), as seen in Figure 3, from the registered nurses with 21-25 years work experience.

Figure 3. Mean DSRT Scores for Years Experience

The nurses who reported never having diabetes in-service in their career provided a mean DSRT score of 80.6 percent. Those nurses having received an in-service within the last six months scored a mean of 76.5 percent. However, only two nurses attended a diabetic in-service within the last six months while 14 stated they had never had an in-service. Figure 4 highlights the mean DSRT scores in relation to diabetes continuing education.
Further DSRT mean scores broken down by demographics remained fairly similar with registered nurses possessing a Diploma level degree (n=4) with 80.6 (SD=6.9) percent mean score. Nurses reporting themselves diabetic (n=2) had a mean DSRT score of 81.5 percent (SD=7.8). The majority of the DSRT mean scores remained in the high seventieth percentile or low eightieth percentile despite demographic profile. Table 2 presents the DSRT mean scores in relation to nursing degree, number of diabetics seen per month and presence of diabetes in self, family or friend.
Table 2. Mean DSRT Scores in Relation to Nursing Degree, Diabetics Seen and Presence of Diabetes

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Mean DSRT Score</th>
<th>SD</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nursing Degree</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diploma</td>
<td>80.75</td>
<td>6.89</td>
<td>4</td>
</tr>
<tr>
<td>Associate Degree</td>
<td>78.9</td>
<td>5.68</td>
<td>20</td>
</tr>
<tr>
<td>Baccalaureate Degree</td>
<td>78.53</td>
<td>8.46</td>
<td>17</td>
</tr>
<tr>
<td>Master +</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Diabetics Seen/Month</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>77.5</td>
<td>6.39</td>
<td>16</td>
</tr>
<tr>
<td>1 – 3</td>
<td>79.84</td>
<td>7.21</td>
<td>25</td>
</tr>
<tr>
<td>&gt;4</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Presence of Diabetes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>79.5</td>
<td>7.12</td>
<td>16</td>
</tr>
<tr>
<td>Friend</td>
<td>78.8</td>
<td>8.87</td>
<td>5</td>
</tr>
<tr>
<td>Family</td>
<td>78.17</td>
<td>6.64</td>
<td>18</td>
</tr>
<tr>
<td>Self</td>
<td>81.5</td>
<td>7.78</td>
<td>2</td>
</tr>
</tbody>
</table>

**DBKT Scores**

The DBKT was used to assess basic diabetes knowledge among the registered nurses. The mean score for all 41 nurses despite demographic profile was 74.41 percent (SD=8.49) with maximum score of 89 and low score of 56. The four nurses answering the demographic statement on competency as very competent provided a mean score of 81.5 percent. The nurses (n=19) stating they perceived themselves competent scored a mean score of 69.26 percent. The two nurses who reported feeling not very competent to care for diabetic patients averaged 80 percent. One of the two nurses perceiving him or her self as not very competent
achieved an 89 percent, the highest score obtained, on the DBKT. This nurse had 26 years experience all at the current Critical Access Hospital, saw more than 4 diabetic clients per month, had never attended a diabetes in-service, held a diploma nursing degree and had no personal contact with a diabetic. Figure 5 illustrates the demographic category of competency with DBKT scores.

Figure 5. Mean DBKT Scores and Perceived Competency

The mean DBKT scores in relation to continuing diabetes education were not strikingly different. The two nurses having received in-service training within the last six months, however, scored the poorest with a mean score of 65.5 percent. These two nurses scored a 58 and a 73 percent. The nurse scoring a 73 reported being a diabetic and somewhat competent in caring for a diabetic patient. The other nurse stated feeling competent in caring
for a diabetic patient and had no personal contact with a diabetic. Other mean DBKT scores in reference to last diabetes in-service attended may be viewed in Figure 6.

Figure 6. Mean DBKT Scores for Continuing Diabetes Education

![Figure 6](image)

Figure 7. Mean DBKT Scores for Years Work Experience

![Figure 7](image)
As seen in Figure 7, nurses with 26 to 30 years work experience scored a mean 83.2 percent on the DBKT followed by nurses with 16 to 20 years work experience with a mean of 82.6 percent. The entire group divided by work experience of greater or lesser than 15 years work experience demonstrated that those with less than 15 years (n=27) scored a mean 72.59 and those greater than 15 years (n=14) scored a mean 78.36 percent. A positive low Pearson correlation calculated for years experience and the DBKT (r=.34, P<.05).

Those registered nurses who reported having diabetes (n=2) tested with a mean of 76.5 percent (SD=4.95) on the DBKT. The nurses who answered the demographic with having a friend with diabetes (n=5) scored mean 80.2 percent. The largest number (n=18) were the nurses who had an immediate family member with diabetes, these nurses had a mean score of 73.9 percent (SD=9.15).

The nursing degree breakdown revealed nurses possessing a diploma degree (n=4) scoring a mean score of 76.5 percent (SD=10.59) on the DBKT. Nurses with an associate degree (n=20) achieved a mean 74.5 percent (SD=8.06) and those registered nurses with a baccalaureate degree (n=17) scored a mean 72.82 percent (SD=8.98) on the DBKT.

The 41 subjects were divided with 16 nurses seeing one to three diabetic clients per month and 25 seeing more than 4 diabetics per month. The 39 percent seeing between one to three diabetics per month scored a mean 74.25 percent (SD=9.27). The remaining 61 percent who see more than four diabetics each month, achieved a mean score of 74.76 percent (SD=8.28).
With an overall mean score of 74.41 percent on the DBKT, analysis of those questions most frequently missed by the registered nurses is critical. Table 3 represents those questions answered incorrectly by more than half of the registered nurse sample.

Table 3. Questions Most Frequently Missed on the DBKT

<table>
<thead>
<tr>
<th>Question</th>
<th>Nurses Answering Incorrectly</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>#6 Which are physiological actions of insulin?</td>
<td>25</td>
<td>61</td>
</tr>
<tr>
<td>#9 Which of the following affect the accuracy and precision of test results obtained with most of the blood glucose monitoring strips?</td>
<td>29</td>
<td>71</td>
</tr>
<tr>
<td>#10 What would a negative urine glucose test indicate about the blood glucose level in a diabetic with a normal renal threshold?</td>
<td>23</td>
<td>56</td>
</tr>
<tr>
<td>#13 A “double-voided” urine specimen can best be described as….</td>
<td>23</td>
<td>56</td>
</tr>
<tr>
<td>#18 Where should one store insulin that is PRESENTLY being used?</td>
<td>27</td>
<td>66</td>
</tr>
<tr>
<td>#21 The duration of action of metformin (Glucophage) is -</td>
<td>24</td>
<td>59</td>
</tr>
<tr>
<td>#38 Which is the most appropriate INITIAL action to take for the Type I diabetic who is having a hypoglycemic reaction (low blood sugar)?</td>
<td>37</td>
<td>90</td>
</tr>
<tr>
<td>#44 (Long question) Concerns identification of Somogyi or rebound effect based on clinical presentation.</td>
<td>31</td>
<td>76</td>
</tr>
</tbody>
</table>

While the questions in Table 3 were heavily answered incorrectly on the DBKT, there were four questions with a 100 percent correct response rate. These questions focused on the effect insulin has on blood glucose, normal fasting blood glucose level, maximum effect (peak) of regular insulin, and diabetic foot care.
The DSRT measured the registered nurses' perceived knowledge of diabetes while the DBKT measured the nurses' actual diabetes knowledge. Pearson's correlation coefficients were used to analyze the relationship between perceived and actual level of knowledge of diabetes. When the scores of the DSRT and DBKT were analyzed, a moderately positive linear correlation at the <0.01 level (2-tailed) was revealed. In general, nurses who scored higher on the DSRT scored higher on the DBKT. See Table 4.

Table 4. Pearson Bivariate Correlation for DSRT and DBKT

<table>
<thead>
<tr>
<th></th>
<th>DSRT</th>
<th>DBKT</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSRT</td>
<td>Pearson Correlation</td>
<td>.417**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.007</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>41</td>
</tr>
<tr>
<td>DBKT</td>
<td>Pearson Correlation</td>
<td>.417**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.007</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>41</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed)

An example of this correlation relates to the demographic breakdown of those nurses who reported themselves somewhat competent (n=14) in diabetes care provided a mean score of 76.07 percent on the DSRT then scored 74.64 percent on DBKT (r=.62, P<.02). The level at which the nurses perceived themselves was close to what they scored on the DBKT.

The uniqueness of rural nurses is the distance from colleagues and continuing education at major medical facilities. Mean DSRT and DBKT scores for the demographics
of years at current Critical Access Hospital and last diabetes in-service attended, must be placed side-by-side when examining this isolated population as in Table 5.

Table 5. DBKT and DSRT Mean Scores for Years at CAH and Last In-service Attendance

<table>
<thead>
<tr>
<th>Demographic</th>
<th>DSRT (%)</th>
<th>SD</th>
<th>DBKT (%)</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Years at current CAH.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤10 Years (n=33)</td>
<td>79.09</td>
<td>6.68</td>
<td>73.06</td>
<td>8.03</td>
</tr>
<tr>
<td>&gt;10 Years (n=8)</td>
<td>79.01</td>
<td>8.04</td>
<td>80.75</td>
<td>8.15</td>
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<td><strong>Last Diabetes In-Service Attended.</strong></td>
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<tr>
<td>None (n=14)</td>
<td>80.57</td>
<td>7.57</td>
<td>74.93</td>
<td>9.04</td>
</tr>
<tr>
<td>&lt;6 Months (n=2)</td>
<td>76.50</td>
<td>.707</td>
<td>65.50</td>
<td>10.60</td>
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<td>&gt;6 Months &lt; 1 Yr (n=3)</td>
<td>75.67</td>
<td>2.08</td>
<td>70.00</td>
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<tr>
<td>&gt;1 Yr &lt; 2 Yrs (n=12)</td>
<td>80.75</td>
<td>5.59</td>
<td>74.83</td>
<td>8.96</td>
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<tr>
<td>&gt;2 Years (n=10)</td>
<td>75.90</td>
<td>8.18</td>
<td>76.30</td>
<td>6.16</td>
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</table>

The majority of the sample population (80.4%) has worked for 10 years or less at the current nursing position (30 have worked five years or less at the current job). The DSRT and DBKT scores for this population have a fairly weak positive linear relation that is significant. (r=.390, P =.001) The nurses that worked more than 10 years at their current positions provided DSRT and DBKT scores with a moderately negative linear relation (t= -.432, P=.672). These nurses scored lower on the DSRT then scored higher on the DBKT.

The last diabetes in-service attended divided the group, with the two largest populations being those that never received diabetes continuing education (n=14) and the nurses having attended an in-service more than one year ago and less than two years ago (n=12). The two groups DSRT and DBKT scores were almost identical, with those having never received diabetes in-service DSRT of 80.57 percent mean score and a DBKT of 74.93 percent mean
score \( t=1.84, P=.07 \). The nurses attending an in-service more than one year and less than two had a DSRT mean score of 80.75 percent and a DBKT mean score of 74.83 \( t=1.84, P=.07 \).
CHAPTER V

DISCUSSION

Introduction

A non-experimental descriptive design of study via use of a demographic profile sheet, DSRT and DBKT supported this study in examining the perceived and actual knowledge of registered nurses in Montana's Critical Access Hospitals. A summary and discussion of the findings, limitations, implications for nursing practice and recommendations for future study are offered.

Summary of Findings

The study examined the perceived and actual diabetes knowledge of rural registered nurses from 12 different Critical Access Hospitals across Montana. Similarities in scores by demographics for both the DSRT and DBKT existed. The 41 scores on the DSRT were found moderately positively correlated to the scores of the DBKT. This suggests that a fair number of the nurses were near the knowledge level they perceived themselves to know. The largest differences in perceived and actual knowledge fell among some of the individualized demographic profiles. An example of this falls with the registered nurses with the most work experience. These nurses had a mean score of 87.5 percent on the DSRT and then scored a mean 77.1 on the DBKT exam. It is important to note that this was only 9.75 percent (n=4)
of the sample population. These small samples cause difficulty in ascertaining a significant negative correlation or rather an error due to small sample size.

The influence of environment on the test scores was examined through descriptive statistics of the demographic profile. Despite low statistical significance with the two profile topics most related to rural nursing; years at current job and continuing education service. Individual examination of these profiles in relation to the DSRT and DBKT scores was necessary.

**Discussion of the Findings**

More than 53,000 people are diagnosed with diabetes in the State of Montana (Montana Department of Public Health and Human Services, 2000). The diagnosed population must be seen by health care providers and for many of them Critical Access Hospitals are the closest health care facilities. In this given situation, it is very likely that registered nurses working in Montana’s Critical Access Hospitals will encounter diabetic patients on a daily basis. Certified diabetic educators are few and far between across the state, with the majority residing in Montana’s major trade centers. The rural registered nurse working hundreds of miles from these trade centers must care for and educate the diabetic client by him or her self. Knowledge of current diabetes management and therapy is crucial for safe clinical practice.

As covered in the review of literature, numerous studies examined the lack of diabetes knowledge by registered nurses. Drass, et al., (1989), originally developed the investigation tools utilized in this study. This study is a replication of their investigation.
The findings of this study indicated the Critical Access Hospital nurses had a mean score of 74.41 percent. This score was 10 percentage points higher than the mean score of 64 percent discovered by Drass, et al. (1989). The rural Montana nurses attained higher scores than those recorded by El-Deirawi and Zuraikat (2001) and Gossain et al. (1993). The study conducted by Baxley, Brown, Pokorny and Melvin (1997), with nurses working at a large rural hospital, still remains higher than the DBKT mean score from this study. Drass et al., (1989) considered a mean score of 64 percent to be analytic of insufficient knowledge of diabetes. Competency was measured by Baxley et al., (1997) as a score greater than 80 percent. No congruency existed in what should or should not be sufficient knowledge to educate diabetic patients. A cumulative look at previous studies revealed that, on the average, nurses obtained 75.3 percent or less on the DBKT (El-Deirawi & Zuraikat, 2001). The DBKT was originally designed to test diabetics on the subject of diabetes (Drass et al., 1989). With this in mind, a score of 75.3 percent is not a sufficient average for registered nurses who are expected to educate diabetics and their families (El-Deirawi & Zuraikat, 2001).

The actual knowledge of the nurses tested for this study indicated a need for further education. Across the board, the most frequently missed questions (Table 3) mirrored those missed by nurses in other studies (El-Deirawi & Zuraikat, 2001; Baxley, et al., 1997; Gossain et al., 1993, Jayne & Rankin, 1993; Drass et al., 1989). Unfortunately, these questions concerned skills and knowledge needed for basic survival by the diabetic. Of the 41 nurses tested only 4 knew the proper response for treating a Type I diabetic with hypoglycemia. Twenty-nine percent of the nurses knew what could affect the accuracy and precision of most
blood glucose monitoring strips and 34 percent knew that opened insulin could be stored at room temperature. These are misconceptions that are likely transmitted to the rural diabetic on a regular basis.

Aim 1

This study initiated with the aim of examining the perceived and actual diabetes knowledge of rural Montana registered nurses working in small Critical Access Hospital. Questionnaires were distributed to 23 Critical Access Hospitals with a 52 percent response rate. The number of full time employed registered nurses, at these facilities varies. Many of the Directors of Nursing responded by saying they used primarily traveling nurses to fill the vacant positions. Many of these travelers make their way from one Critical Access Hospital to another and therefore the reason only full-time registered nurses could complete the questionnaires.

Demographic Profile

The demographic profile revealed that more than 80 percent (n=33) of registered nurses working in these small facilities have been employed for 10 years or less. Even more concerning is that 30 of those 33 nurses have been at their facilities for five years or less. The education level of these nurses was split primarily between associate degree and baccalaureate degree. The years of experience ranged from less than one year to 35 years with a mean of 13.24 years (SD=10.86). Eleven of the 41 nurses (27%) had spent their entire nursing career at the current Critical Access Hospital. The majority of these nurses (n=25)
saw more than four diabetic patients per month and 23 of the 41 had a friend or family member currently diagnosed diabetic. Two nurses reported themselves as diabetic. Forty-six percent stated they were competent in caring for diabetic patients while 15 percent believed themselves very competent. Many of these nurses after completing the DBKT wrote notes on the bottom of the test stating the test to be too difficult or complicated. This indicated to the investigator that these nurses were possibly not as confident in their level of competency as they were prior to taking the tests.

Actual and Perceived Diabetes Knowledge

Analysis of scores on the DSRT and DBKT proved the nurses to be approximately as knowledgeable about diabetes as they perceived themselves to be. However, the majority reported themselves as competent to very competent. The mean score of 74.41 on the DBKT proved to be insufficient for educating diabetic clients as seen in earlier studies (Drass, et al. 1989; El-Deirawi & Zuraikat, 2001). The rural Critical Access Hospital nurses perceived themselves on the DSRT with a mean score of 78.93 percent. The overall DBKT score was lower than perceived, but barely lower. Ten of the 41 nurses scored higher on the DBKT than the DSRT.

Nurses in other studies scored much higher on the DSRT with mean score ranges from 89.72 percent to 92.47 (El Deirawi & Zuraikat, 2001). A number of reasons could contribute to the lower scores achieved by the Critical Access Hospital nurses. One reason is years of experience. More than 55 percent of the nurses surveyed had less than five years of experience. The nurses with 20 to 35 years experience scored higher on both tests. The best scores on the DBKT (89%) were achieved by four nurses with an average of 17 years work
experience. Three of the four nurses had spent the majority if not all of their years working at their current facilities.

**Aim 2**

The isolated environment of rural Montana provided not only a challenge for conduction of the surveys but proves challenging for diabetes knowledge. The majority of the nurses working in the respective Critical Access Hospitals have only been employed for less than five years at the facilities. This indicates a possible high employee turn over rate at these small facilities. The majority of nurses working are inexperienced nurses, this too adds to insufficient perception and knowledge of diabetes. It is the belief of this investigator that the rural environment proves to be too overwhelming for many new nurses and thus the use of traveling nurses and frequent turn over rate.

**Demographic Profile in Relation to the Rural Environment**

The two demographic statements that contribute most to the rural environment concern continuing education and number of years at the Critical Access Hospital. This investigator assumed that due to the distance and rural environment diabetes continuing education would be lacking. Fourteen of the 41 nurses reported never having a diabetes in-service, 12 nurses stated it was greater than one year and less than two years since their last in-service and 10 nurses answered with greater than two years. One nurse has spent all of his or her 26 years at the current Critical Access Hospital, and stated believing him or herself as not very competent in caring for diabetics. This nurse was one of the four nurses to achieve an 89 percent on the DBKT. The nurse scored a 78 on the DSRT. A possibility rests in the
idea that nurses similar to this one nurse with years of experience in isolation believes him or her self not competent due to lack of continuing education services. However this is purely speculation.

**Limitations**

Limitations exist with this study. The size and range of Montana made it difficult to test at the Critical Access Hospitals. If the investigator had the opportunity to travel to all 23 hospitals the sample population possibly would have been higher.

The registered nurses were allowed to complete the tests at their own discretion. It is possible the tests were completed with use of a text book when no supervision of testing took place.

The sample population itself raises the limitation in accuracy of the results. As stated by Burns & Grove (2001), the power of the findings relates heavily to the sample size. Many times, small samples do not provide enough variance in findings.

Another limitation focuses on the use of the Director of Nursing to distribute the tests. The results are highly influenced by who he or she personally chooses to complete the questionnaires. There remains a risk that the Director of Nursing could choose those nurses who possess more or less knowledge. Because the tests were gathered and returned by the Director of Nursing, there is a possibility that nurses who believed themselves to do poorly did not return their tests to the Director of Nursing. This would explain the low numbers from some of the facilities.
Implications of the Study

The results of the study have implications for the practice of nursing, nursing education and nursing administration. The findings illustrate the insufficient diabetes knowledge of nurses in Montana's Critical Access Hospitals. Many of the answers missed on the DBKT revolve around basic information and skills needed for diabetes education and care. Findings indicate the possible relation to inexperienced nurses not having adequate knowledge. More diabetes education is possibly indicated in registered nursing education programs.

The separation and isolation from major medical facilities may lead to the lack of continuing education services for staff. It is the responsibility of the Critical Access Hospital Administrators and Directors of Nursing to provide adequate and frequent education for the staff members.

Diabetics, as stated by Drass et al., (1989), who receive inadequate education related to poor knowledge level of the nurses, might lose trust and confidence in their local healthcare providers. It is the responsibility of the registered nurse to seek more continuing education hours. The Montana State Board of Nursing does not audit registered nurses nor require a set number of continuing education hours. Implementation of this form of policy might advance basic and diabetes knowledge in rural and frontier nurses.
Recommendations for Further Study

This study addressed the perceived and actual diabetes knowledge of registered nurses in Montana’s Critical Access Hospitals. It also examined possible relations of demographics and rural diabetes knowledge. It was not the intention of this study to investigate the amount of continuing education in these facilities but this is an area that needs further investigation. A study of the knowledge of the diabetics cared for in the Critical Access Hospitals would also help determine how these nurses are actually doing in getting diabetes education across to the client. The use of telemedicine with the assistance of certified diabetes educators might prove to improve both the nurse’s and the client’s diabetes knowledge.

A final suggestion of study would be examination of the reasons for the number of inexperienced nurses in these remote sites and is there frequent turnover rate leading to increased use of traveling nursing.

Conclusions

Rural registered nurses impact the lives of many Montana diabetics. An effort to provide more adequate and frequent continuing education is crucial for improved patient education. The registered nurses in the small Critical Access Hospitals did not return scores that indicated they perceived themselves as sufficiently knowledgeable nor did they possess sufficient diabetes knowledge. With the growing number of diabetics quality of care and self management education are the number one priorities. In Montana, where distances are long
and certified diabetic educators are short, it is essential that the nurses caring for diabetics possess excellent diabetes knowledge and skills.
REFERENCES CITED
REFERENCES CITED


REFERENCES CITED - CONTINUED


APPENDICES
APPENDIX A

PERMISSION TO USE TESTING TOOLS
Date: May 10, 2002

Connie Reichelt  
1024 Prairie Dog Lane  
Big Sandy, Montana

Connie,

Thank you for your recent request for a copy of each of the tools that were used in the published study "Perceived and Actual Level of Knowledge of Diabetes Mellitus Among Nurses". I have enclosed copies of all three instruments: "Demographic Data Sheet," "Self-Report Tool," and "Diabetes: Basic Knowledge Test".

One change is recommended in the Diabetes: Basic Knowledge Test in order to update it since its development. The answers to question # 43 should be updated to reflect the revised exchange lists. I have also enclosed a copy of the answer key for this questionnaire. It is also recommended that you change the Likert scale for the Self-Report Tool into a 5-point scale since this is generally accepted as a standard in attitudinal measurement. The addition would allow for individuals who truly have "no opinion" regarding the topic of inquiry.

You have our permission to copy these tools as needed for the purpose of your planned evaluation of learning needs and/or research study. We ask only that you would send us a copy of any revisions made in the tools for your use, as well as a copy of your study results.

Please feel free to contact me at 301-834-6571 should you have any further questions.

Sincerely,

Janice A. Drass, RN MA CDE

addendum - There are probably additional questions in need of revision as well to update to current standards. I would recommend that you get copies of other researchers' revisions of this tool - many studies using it have been reported in the literature. Thanks for your interest!
APPENDIX B

DEMOGRAPHIC SHEET
Demographic Data Sheet

Please circle or write in the number corresponding to your appropriate response:

1. Number of years nursing experience _____________

   Number of years at your current job _____________

2. Highest education preparation obtained:
   a. Diploma
   b. Associate Degree
   c. Baccalaureate Degree
   d. Master Degree +

3. Most recently attended in-service/continuing education in Diabetes was:
   a. none
   b. within the last 6 months
   c. more than 6 months but less than 1 year ago
   d. more than 1 year ago but less than 2 years ago
   e. more than 2 years ago

4. Number of diabetics cared for per month at your facility:
   a. none
   b. 1-3 patients
   c. more than 4 patients

5. Presence of diabetes in:
   a. self
   b. immediate family
   c. friend
   d. none of the above

6. Generally speaking, how competent do you feel you are in caring for a diabetic patient.
   a. very competent
   b. competent
   c. somewhat competent
   d. not very competent
   e. not at all competent
APPENDIX C

DIABETES SELF REPORT TOOL
Diabetes: Self-Report Tool

Please place a circle around the appropriate response to each statement. Please be as honest as you can in evaluating your knowledge and skills in taking care of diabetic patients.

5 = strongly agree; 4 = agree; 3 = neutral/no opinion; 2 = disagree; 1 = strongly disagree

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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<tbody>
<tr>
<td>1</td>
<td>I can describe the etiology of Type I diabetes.</td>
</tr>
<tr>
<td>2</td>
<td>I can describe the etiology of Type II diabetes.</td>
</tr>
<tr>
<td>3</td>
<td>I can describe the basic treatment plan for Type I diabetes</td>
</tr>
<tr>
<td>4</td>
<td>I can describe the basic treatment plan for Type II diabetes</td>
</tr>
<tr>
<td>5</td>
<td>I cannot identify the nursing needs of the diabetic patient undergoing surgery</td>
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<td>6</td>
<td>I can manage the nursing care of a diabetic patient experiencing mild hypoglycemia</td>
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<tr>
<td>7</td>
<td>I can manage the nursing care of a diabetic patient with loss of consciousness</td>
</tr>
<tr>
<td>8</td>
<td>I can interpret urine test results for a diabetic patient</td>
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<td>9</td>
<td>I cannot instruct a diabetic patient on self-care management for a “sick day”</td>
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<td>10</td>
<td>I can describe the action and effect of insulin</td>
</tr>
<tr>
<td>11</td>
<td>I can list the steps of the procedure for administering insulin</td>
</tr>
<tr>
<td>12</td>
<td>I can describe the action and effect of the oral hypoglycemic agents</td>
</tr>
<tr>
<td>13</td>
<td>I can assess the diabetic patient for the development of diabetic ketoacidosis</td>
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<tr>
<td>14</td>
<td>I can identify the long-term complications associated with diabetes</td>
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<tr>
<td>15</td>
<td>I cannot explain how stress affects diabetes control</td>
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<tr>
<td>16</td>
<td>I cannot explain how exercise affects diabetes control</td>
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<td>17</td>
<td>I can describe the diet recommended for Type I diabetes</td>
</tr>
<tr>
<td>18</td>
<td>I can describe the diet recommended for Type II diabetes</td>
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<tr>
<td>19</td>
<td>I cannot perform one method of blood glucose monitoring</td>
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<td>20</td>
<td>I can instruct the diabetic patient on daily person care</td>
</tr>
<tr>
<td>21</td>
<td>I can identify three sites for the administration of insulin</td>
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<tr>
<td>22</td>
<td>I can manage the nursing needs of the diabetic patient experiencing hyperglycemia without ketosis</td>
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APPENDIX D

DIABETES BASIC KNOWLEDGE TEST
Diabetes: Basic Knowledge Test

1. Which statement is characteristic of the etiology of Type I diabetes?
   a. Strongly associated with obesity
   b. Predominantly genetic
   c. Autoimmune, viral or toxic destruction of beta cells
   d. I do not know

2. Which of these statements about the management of Type I diabetes is true?
   a. Insulin injections are necessary to maintain life
   b. Insulin injections are not always necessary if diet and exercise are well controlled
   c. Oral hypoglycemic agents are sufficient for blood control in most patients
   d. I do not know

3. Which statement is characteristic of the etiology of Type II diabetes?
   a. Predominantly non-genetic
   b. Frequently associated with obesity and resistance to insulin
   c. Autoimmune, viral or toxic destruction of the beta cells
   d. I do not know

4. Which of these statements about management of Type II diabetes is true?
   a. Insulin injections are necessary to maintain life
   b. A controlled diet and exercise program is the most effective treatment
   c. Oral hypoglycemic agents are always effective
   d. I do not know

5. What effect does insulin have on the blood glucose?
   a. Insulin causes blood glucose to increase
   b. Insulin causes blood glucose to decrease
   c. Insulin has no effect on blood glucose
   d. I do not know

6. Which are physiological actions of insulin?
   1. Transports glucose across cell membranes for use by the cells
   2. Enhances the formation of proteins from amino acids
   3. Enhances the breakdown of fats for energy
   a. 1 and 2
   b. 1, 2 and 3
   c. 1 and 3
   d. 2 and 3
   e. I do not know
7. If a known diabetic is found unresponsive, which of these assumptions about the person’s blood glucose should guide your initial actions?
   a. It may be very high
   b. It may be very low
   c. It may be normal
   d. I do not know

8. Normal fasting blood glucose level can best be described as...
   a. Below 150 mg/dl
   b. Between 100 and 200 mg/dl
   c. Between 70 and 120 mg/dl
   d. I do not know

9. Which of the following affect the accuracy and precision of test results obtained with most of the blood glucose monitoring strips?
   1. Size and placement of the blood sample on the reagent pad
   2. Timing of the test
   3. Method of removal of blood from diabetic to the reagent pad
   4. The patient’s hematocrit level
   a. 1, 2 and 3
   b. 1, 2 and 4
   c. 1, 2, 3 and 4
   d. I do not know

10. What would a negative urine glucose test indicate about the blood glucose level in a diabetic with a normal renal threshold?
    a. It is less than 180 mg/dl
    b. It is more than 200 mg/dl
    c. It is less than 60 mg/dl
    d. I do not know

11. Which of the following tests can determine the patient’s average blood glucose control over an extended period of time?
    a. Glycosylated hemoglobin
    b. Plasma Renin Activity (PRA)
    c. Insulin antibodies
    d. I do not know
12. Which of these statements indicates one of the best reasons for utilizing blood glucose monitoring rather than urine testing?
   a. Drugs such as penicillins, ASA, cephalosporins, barbiturates, etc. can create falsely negative urine test results
   b. Urine retention and changes in kidney function can increase the lag time between blood glucose rise and spill over of glucose into the urine
   c. The diagnosis of diabetes can be more readily confirmed at the patient’s bedside than by laboratory testing
   d. I do not know

13. A “double-voided” urine specimen can best be described as…
   a. Urine that is collected and tested 30 to 60 minutes after the bladder has been emptied
   b. Urine that is collected and tested twice a day, in the morning and at bedtime
   c. Urine that is collected and tested twice before the result is recorded
   d. I do not know

14. When should a well-controlled diabetic always check urine for ketone?
   a. Whenever exercising
   b. Whenever testing urine for glucose
   c. Whenever urine glucose is 2% or blood glucose is greater than 240 mg/dl
   d. I do not know

15. What should a diabetic do when he/she has been showing 2% urine glucose or blood glucose greater than 240 mg/dl for two consecutive days and now has positive ketone urine tests?
   a. Omit the next dose of insulin or oral hypoglycemic medication and test urine/blood as usual
   b. Call the doctor, continue to test urine/blood every four hours or as directed by physician, and continue insulin or oral hypoglycemic medication
   c. Continue with insulin or oral hypoglycemic medication and urine/blood testing as usual. These are normal results for diabetics
   d. I do not know

16. The maximum effect (peak) of regular insulin occurs...
   a. 2-4 hours after injection
   b. 6-12 hours after injection
   c. 24-28 hours after injection
   d. I do not know

17. The maximum effect (peak) of both NPH and Lente insulin occurs...
   a. 2-4 hours after injection
   b. 8-12 hours after injection
   c. 24-28 hours after injection
   d. I do not know
18. Where should one store insulin that is PRESENTLY being used?
   a. In the refrigerator near the freezer section
   b. In the refrigerator away from the freezer section
   c. At room temperature and away from excess light
   d. I do not know

19. A diabetic contaminates the needle while preparing an insulin injection. What would be the BEST action to take?
   a. Dispose of needle even if this means disposing of the insulin and syringe and starting preparation from the beginning
   b. Wipe the needle with an alcohol sponge and continue preparing the injection
   c. Continue preparing the injection, but wipe the injection site thoroughly with alcohol
   d. I do not know

20. When short-acting (regular) and intermediate-acting (NPH) are ordered to be given by injection at the same time, the nurse should...
   a. Use separate syringes to administer each insulin
   b. Mix them in the same syringe drawing up the intermediate-acting insulin first
   c. Notify the doctor since these two insulins should not be given together
   d. Mix them in the same syringe drawing up the short-acting first
   e. I do not know

21. The duration of action of metformin (Glucophage) is –
   a. 6-12 hours
   b. 12-24 hours
   c. 24-60 hours
   d. I do not know

22. Which is NOT a reported side effect of oral hypoglycemic agents?
   a. Gastrointestinal upset
   b. Allergic reaction
   c. Skin rash
   d. Constipation
   e. I do not know

23. A symptom of hypoglycemia (low blood sugar) is –
   a. Frequent urination
   b. Dry mouth and dry skin
   c. Nervousness
   d. I do not know
24. A symptom of hyperglycemia (high blood sugar) is –
   a. Frequent urination
   b. Low grade fever
   c. Cool, clammy skin
   d. I do not know

25. What is one cause of hypoglycemia (low blood sugar) in a diabetic who is taking insulin or oral hypoglycemic agents?
   a. Skipping a meal
   b. Emotional stress
   c. Too little exercise
   d. I do not know

26. What is one cause of hyperglycemia (high blood sugar)?
   a. Decreased food intake
   b. Infection
   c. Excessive insulin
   d. I do not know

27. One symptom associated with diabetic ketoacidosis (diabetic coma) is –
   a. Cold, clammy skin
   b. Acetone (fruity) breath
   c. Negative urine for glucose
   d. I do not know

28. What is one cause of diabetic ketoacidosis (diabetic coma) in the Type I diabetic?
   a. Excessive exercise
   b. Excessive intake of diet soft drinks over a prolonged period
   c. Failure to take daily insulin dose
   d. I do not know

29. What effect does illness (for example, a “sick day”) have on a diabetic’s insulin requirements?
   a. Illness causes a decrease in insulin requirements
   b. Illness causes an increase in insulin requirements
   c. Illness causes no change in insulin requirements
   d. I do not know
30. In general, changes in the pattern of insulin administration for the diabetic undergoing surgery might include which of the following?
   a. Increase the dose of long-acting insulin the night before and the morning of surgery
   b. Discontinue all subcutaneous insulin the day of surgery and instead infuse long-acting insulin intravenously at a constant drip
   c. On the day of surgery, reduce the usual a.m. dose of insulin and give subcutaneous or IV boluses of short acting insulin per frequent blood glucose monitoring results
   d. I do not know

31. Which of the following long term complications are associated with diabetes?
   a. Eye changes
   b. Renal and cardiovascular changes
   c. Nervous system changes
   d. All of the above
   e. I do not know

32. The effect of physical and emotional stress on diabetes control includes –
   a. The secretion of stress hormones that cause an elevation in blood glucose levels
   b. The secretion of stress hormones that cause a decrease in blood glucose levels
   c. The secretion of stress hormones that has no effect on blood glucose levels
   d. I do not know

33. Why is it necessary that diabetics pay special attention to proper care of their feet?
   a. Several years of injecting insulin into the thighs can cause edema in both the legs and the feet
   b. Flat feet are commonly associated with diabetes unless preventive measures are routinely used
   c. Persons with diabetes often have changes in sensation and poor circulation to their feet
   d. I do not know

34. A diabetic has a small corn on the right foot and wants it removed. What should be done first?
   a. Use a liquid corn remover, following the directions carefully
   b. Refer the diabetic to a podiatrist
   c. Carefully trim the corn with a sterile cutting instrument
   d. I do not know
35. A diabetic has just received a minor abrasion on the left leg. What should be done to treat the abrasion?
   a. Wash gently with mild soap and water, dry with clean towel, and observe carefully for any signs of infection
   b. Wash gently with mild soap and water, apply a small amount of iodine or merthiolate, and observe carefully for any signs of infection
   c. Apply a small amount of iodine or merthiolate and call the doctor
   d. I do not know

36. What effect does exercise have on blood glucose when the diabetic’s blood glucose is less than 300 mg/dl?
   a. Decreases blood glucose
   b. Increases blood glucose
   c. Has little effect on blood glucose
   d. I do not know

37. What effect does increased exercise have on a diabetic’s food intake needs if the patient has well-controlled Type I diabetes?
   a. Decreases the need for food
   b. Increases the need for food
   c. Has little effect on the need for food
   d. I do not know

38. Which is the most appropriate INITIAL action to take for the Type I diabetic who is having a hypoglycemic reaction (low blood sugar)?
   a. Drink 4 oz. of regular soda
   b. Drink 4 oz. of orange juice with 2 tsp. of sugar
   c. Eat 4 crackers with butter or margarine
   d. I do not know

39. A Type I diabetic does not like one of the food items on the meal tray. What would be the BEST action for the nurse to take?
   a. Advise the patient to eat all other items on the tray and omit that one item.
   b. Advise the patient to omit that one item and adjust the next scheduled insulin dose to accommodate this deletion
   c. Explain to the patient that the diabetic diet is carefully calculated and that the dietician will be consulted about exchanging this item for another
   d. I do not know
40. Which of these is the main objective when developing a meal plan for the person with Type II diabetes?
   a. A calorie-controlled diet that will achieve and maintain ideal body weight
   b. A high-carbohydrate, high-protein diet that encourages an increase in body protein reserves
   c. A low-carbohydrate, high-protein diet that will prevent fluctuations in blood glucose levels
   d. I do not know

41. A diabetic diet is calculated for which of the following nutrients:
   1. Carbohydrate
   2. Protein
   3. Fat
   a. 1 and 2
   b. 1 and 3
   c. 1, 2, and 3
   d. 2 and 3
   e. I do not know

42. Which of these is the main objective when developing a meal plan for the person with Type I diabetes?
   a. A nutritionally balanced, six-small-meals-per-day plan that will prevent delayed stomach emptying time
   b. An individualized diet plan that will maintain euglycemia and normal growth and development to include foods from the basic four food groups, while ensuring that calories are evenly distributed
   c. A low-fat, low-fiber diet to prevent excessive weight gain and minimize the risk of cardiovascular disease
   d. I do not know

43. A diabetic has refused an evening snack of fruit juice and one half of a sandwich. You should substitute with—
   a. Five graham crackers and 8 oz of plain yogurt
   b. Six saltine crackers and 2 oz of cheddar cheese
   c. ¼ cup mandarin oranges, ¼ cup of low-fat cottage cheese and 3 whole wheat crackers
   d. I do not know
44. For the past two days, a diabetic patient has demonstrated the following:
* Urine test results for glucose and ketones that jump from negative/negative, to 1-2%/moderate to large in just a few hours
* Wide fluctuations in blood glucose levels over several hours, often unrelated to meals
* 2% glycosuria occurring upon awakening; preceded by nocturnal sweating, nightmares or headache

Based on this assessment data, which is the patient demonstrating?

a. Pass-through or flashback phenomenon
b. Somogyi or rebound effect
c. Dawn phenomenon
d. I do not know

45. Which of the following sets of figures best illustrates the correct sites for subcutaneous insulin administration?

a)

b)

c)

d) I do not know
Diabetes: Basic Knowledge Test
Answer Sheet

1. a. b. c. d.
2. a. b. c. d.
3. a. b. c. d.
4. a. b. c. d.
5. a. b. c. d.
6. a. b. c. d.
7. a. b. c. d.
8. a. b. c. d.
9. a. b. c. d.
10. a. b. c. d.
11. a. b. c. d.
12. a. b. c. d.
13. a. b. c. d.
14. a. b. c. d.
15. a. b. c. d.
16. a. b. c. d.
17. a. b. c. d.
18. a. b. c. d.
19. a. b. c. d.
20. a. b. c. d.
21. a. b. c. d.
22. a. b. c. d.

23. a. b. c. d.
24. a. b. c. d.
25. a. b. c. d.
26. a. b. c. d.
27. a. b. c. d.
28. a. b. c. d.
29. a. b. c. d.
30. a. b. c. d.
31. a. b. c. d.
32. a. b. c. d.
33. a. b. c. d.
34. a. b. c. d.
35. a. b. c. d.
36. a. b. c. d.
37. a. b. c. d.
38. a. b. c. d.
39. a. b. c. d.
40. a. b. c. d.
41. a. b. c. d.
42. a. b. c. d.
43. a. b. c. d.
44. a. b. c. d.
45. a. b. c. d.
APPENDIX E

LETTER OF INSTRUCTION
Dear Colleague:

You are being asked to take part in a study investigating the diabetes knowledge of rural registered nurses. I am conducting this research as partial fulfillment of my Master of Nursing Degree at Montana State University College of Nursing. This study consists of three separate questionnaires measuring your perceived diabetes knowledge and your actual knowledge of the subject. The third questionnaire consists of demographic questions. All questionnaires are numbered to help with correlation of the data. In no way can you be identified through these numbers. Your identity will remain anonymous. A consent form is also attached to each test. Please sign the consent form and place it in the return envelope separate from your test so that your identity remains anonymous on the tests.

This study is of no direct benefit to you but will assist in furthering nursing knowledge.

Please return all questionnaires, for your facility within two weeks of receiving them, in the included self addressed envelope. Thank you for your time and cooperation. Should you have any questions or concerns, please feel free to contact me at (406) 378-2361. If you would like to know your score on the exam, please write down the number in the lower left corner. I will send the scores to your facility by exam number so that you may know your results. Thank you again.

Sincerely,

Connie Reichelt, RN
1026 Prairie Dog Lane
Big Sandy, MT 59520
APPENDIX F

LETTER TO DIRECTORS OF NURSING
May 3, 2003

Charlotte Carroll, RN, DON
Mountainview Medical Center
P.O. Box Q
White Sulphur Springs, MT 59645

Dear Ms. Carroll:

Please find included in this envelope five sets of exams measuring the perceived and actual diabetes knowledge of registered nurses working in Montana’s Critical Access Hospitals. I am using these tests to conduct a study for a thesis I am writing to fulfill my Master of Nursing degree at Montana State University. I am asking for your cooperation in having five of your registered nurses complete the tests. I work in a Critical Access Hospital in Big Sandy, Montana and I am fully aware that five registered nurses might be more than you have currently employed. If this is the case, please give the tests to the number of nurses you have employed.

The tests are anonymous and no one will be identified by their answers. Each set of tests has a number written in the lower left corner. I will send your facility’s results to you by test number should your nurses be interested in their results.

I fully understand how busy your staff is and I greatly appreciate yours and their time and cooperation with doing these exams. Each nurse taking the exam may answer the questions at her or his convenience. All I ask is that each nurse answers the questions honestly and without assistance. I would appreciate it if the exams could be returned within two weeks of receiving them so that I may complete the study in a timely manner. I have included a self-addressed stamped envelope to simplify the return. Should you have any questions or concerns please call me at (406) 378-2361. Thank you again.

Sincerely,

Connie S. Reichelt, RN
1026 Prairie Dog Lane
Big Sandy, MT 59520
APPENDIX G

CONSENT FORM
SUBJECT CONSENT FORM
FOR
PARTICIPATION IN HUMAN RESEARCH
MONTANA STATE UNIVERSITY – BOZEMAN

PROJECT TITLE: The Perceived and Actual Diabetes Knowledge of Registered Nurses in Montana’s Critical Access Hospitals.

PARTICIPATION: You are being asked to take part in a study measuring nurses’ perceived and actual knowledge of diabetes. To be in the study you must be a registered nurse working in one of Montana’s designated Critical Access Hospitals.

PURPOSE: The information gathered in this research will be used to assess diabetes knowledge in rural nurses.

PROCEDURES: If you agree to take part in the study, you will answer questions to two questionnaires. The first questionnaire contains 22 questions and measures your perceived knowledge of caring for a diabetic patient. The second questionnaire contains 45 questions and measures your actual diabetes knowledge. These questionnaires may be answered at your convenience.

RISKS: There is no risk involved in answering the questionnaires. No identifying information is contained in the questionnaires.

BENEFITS: The study is of no benefit to you.

COST: Taking part in this study means an investment of your time without payment.

CONFIDENTIALITY OF RECORDS: The questionnaires contain no information that could directly identify you or your Critical Access Hospital. Data obtained from the questionnaires may be used in preparing manuscripts for publication. Signed consent forms will be kept in a locked file cabinet at Montana State University – Bozeman for five years and destroyed after that time.

CONCERNS: Any questions or concerns about the rights of human subjects can be answered by the Chairman of the Human Subjects Committee, Mark Quinn, (406) 994-5721.
AUTHORIZATION: I have read the above and understand the inconvenience and risk of this study. I, ______________________________, agree to participate in this research. I understand that I may later refuse to participate, and that I may withdraw from the study at any time. I have received a copy of this consent form for my own records.

SIGNED: ________________________________

WITNESS: ________________________________

INVESTIGATOR: ________________________________

DATE: ________________________________