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The Impact of Diabetes Education on Nurses' Knowledge of In-patient Diabetes Management

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Executive Summary

The Impact of Diabetes Education on Nurses' Knowledge of In-Patient Diabetes Management

Problem

Evidence from the literature indicates that practicing nurses lack diabetes knowledge about how to manage patients with diabetes (Abduelkarem & El-Shareif, 2013; Yacoub et al., 2014). The project site, the University of Mississippi Medical Center, provides care to many patients with diabetes; however, diabetes educational resources are limited. The PICO question for this Capstone Project was as follows: In direct-care staff nurses working at a small rural hospital in the southern United States, can an educational program on diabetes management as compared to no educational program, enhance the nursing knowledge of diabetes management for hospitalized patients with diabetes?

Purpose

The purpose of this evidence-based project, which was a quality improvement initiative, was to examine ways to enhance nurses' knowledge of managing the care of a hospitalized patient diagnosed with diabetes.

Goal

The overarching goal of this project was to evaluate whether the use of an educational intervention based on the most current ADA guidelines would improve nurses' knowledge of management of the hospitalized patient with diabetes.

Objectives

The most important objective for this study was to implement an educational intervention to improve the nurses' knowledge of managing a patient with diabetes.

Plan

After receiving Institutional Review Board approval from Regis University and permission to use and modify the Diabetes Knowledge Test (DKT), participants were recruited via flyers posted on nursing units. An information sheet and a paper and pencil demographic survey and DKT pre-test were disseminated to all participants by placing in workplace lockers weeks 1-2. The educational intervention was reviewed based on pre-test results week 3, followed by multiple sessions of 45-minute educational diabetes offerings delivered weeks 4-7. Following the intervention, the study information sheet with the paper and pencil demographic survey and DKT post-test were distributed to all participants via workplace lockers weeks 8-9.

Outcomes and Results

On average, participants who attended the Diabetes Education intervention, improved their overall DKT mean scores from ($M = 74.82$, $SE = 1.454$) to ($M = 83.48$, $SE = 1.288$). This difference, -5.310, 95% CI [-6.576, -3.865], was significant $t(28) = -7.527$, $p = .000$, and represented a large-sized effect, $d = .881$. These results indicate that there was improved knowledge of nurses receiving diabetes management education compared to those who did not receive the intervention.

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The Impact of Diabetes Education on Nurses' Knowledge of In-patient Diabetes Management

Diabetes is an enormous economic and health burden on the nation, contributing to one of the main causes of hospitalization in the United States (U.S.). Patients with diabetes account for approximately 480,958 in-patient hospital stays each year, with a 30-day readmission rate of 97,784 (Saccomano, 2014). Implementing evidence-based diabetes education to staff nurses may improve nurses' knowledge and provide better patient outcomes. This requires effective communication among staff nurses and other healthcare providers, adequate diabetes resources, and current evidence-based diabetes information. Both the American Diabetes Association (ADA) and the American Association of Clinical Endocrinologists (AACNE) have put forth standards and guidelines for diabetes management for in-patient diabetes care for nurses and other healthcare providers to follow. Zaccagnini and White (2014) suggest that a doctor of nursing practice (DNP) leader must participate in the work of the team and assume leadership of the healthcare team when appropriate.

This evidence-based project (EBP) was conducted to address the following question: Does an educational program on diabetes management improve the nursing knowledge of diabetes management for hospitalized patients? The study took place at a small, community based hospital, located in the southern United States. This paper discusses the problem statement and its significance and scope, the theoretical foundation and the review of the literature related to the practice problem statement, and the market and risk analysis. It also clearly describes the research study objectives, methodology, research findings and data analysis, recommendations, limitations and implications for practice.

Problem Recognition and Definition

Diabetes is the seventh leading cause of death in the U.S. and affects 23.6 million people (Healthy People 2020, 2014). Diabetes contributes to the following: lowering life expectancy by up to 15 years and increasing the risk of heart disease by two to four times. It is also the leading cause of kidney failure, lower limb amputations, and adult-onset blindness (Healthy People 2020, 2014). According to Nichols (2014), Mississippi ranks the highest in the nation for having the most patients diagnosed with diabetes. Many more Mississippians live with the complications of Type 2 Diabetes (The Mississippi State Department of Health (MSDH, 2015). These complications include: lower extremity amputations, end stage renal disease, blindness, heart disease, and premature death. MSDH (2015) reports that the diabetes rate in Mississippi is 12.9% compared to the United States (U.S.) 13.4%. Grenada County, the clinical practice area, has a diabetes mortality rate of 40.7% compared to the U.S. 23.9% (MSDH, 2015). Continuous effort has been made to improve diabetes care. Benchmarks have been established to reduce the annual number of new diabetes cases and reduce diabetes death rate (MSDH, 2015).

The national goal is to reduce diabetes and its economic burden, while improving quality of life of all persons diagnosed with diabetes or at risk for the disease (Healthy People 2020, 2014). The project site, University of Mississippi Medical Center, has limited diabetes resources and no diabetes management program. Although the hospital has a licensed dietician, who also practices the role of Diabetes Educator and assists the facility with diabetes updates and in-services, the dietician's primary role is to focus on the learning needs of patients. The nearest diabetic center is greater than 90 miles south of Grenada, located in Jackson, Mississippi. The Case Manager Director, M. Welch (personal communication, January 11, 2016) stated that the University of Mississippi Medical Center provides care to many diabetic patients on a weekly

basis throughout the hospital. Over half of those are readmissions with a primary or secondary diagnosis of diabetes. The nurse manager from the medical-surgical unit and progressive care unit verbalized that there is ineffective communication among nurses and lack of evidence-based knowledge in the management of care for these patients. Some of the novice nurses do not give appropriate hand-off report of patients with hypoglycemic episodes during shift change. Nirantharakumar et al. (2012) noted that it is important to know the outcome of patients who have had a hypoglycemic episode to monitor and improve care through implementation of interventions that will reduce hypoglycemic episodes and adverse outcomes associated with them. The nurse manager on the medical surgical unit also verbalized that some nurses are slow to intervene with hypoglycemic reactions. Hypoglycemia is associated with increased length of stay in the hospital and in-patient mortality (Garg, Hurwitz, Trivedi, & Turchin, 2013; Nirantharakumar et al., 2012). M. Welch (personal communication, January 15, 2016) stated that untimely monitoring of diabetic patients after hyperglycemic reaction occurrences and not always adhering to sliding scale orders have also been observed on different units. Hyperglycemia is associated with longer length of stay in the hospital and increased mortality in noncritical ill hospitalized patients (Mendez et al., 2013). Hypoglycemia and hyperglycemia require close monitoring and careful planning.

Educational interventions with current diabetes research, protocols, and competency assessments help to maintain the professional knowledge base of nurses and improve patient outcomes for the diabetic population (Dunkley et al., 2014). The American Association of Clinical Endocrinologists (AACE) and the American Diabetes Association (ADA) have developed the most recent clinical guidelines for glycemic control (ADA, 2015). This Capstone project sought to investigate the effect of an educational intervention on nursing knowledge of

diabetes management for hospitalized patients with diabetes. The teaching plan for the educational intervention was based on the most current ADA clinical guidelines.

Statement of Purpose

The purpose of this evidence-based project, which is a quality improvement initiative, was to examine ways to enhance nurses' knowledge of managing the care of a diabetic patient. It further assessed whether an educational intervention on diabetes management based on the most current ADA guidelines, will improve the nurses' knowledge of diabetes management in a rural acute care setting. In order to accomplish this purpose, the primary investigator completed the following tasks:

1. Implemented the intervention of a diabetic educational session (s) for nurses based on the most recent ADA guidelines on the following acute care units: critical care, progressive care, medical-surgical, and obstetrical units.
2. Evaluated for a change in the nurses' knowledge/understanding of diabetic management of the hospitalized patient using a pre-post Diabetic Knowledge Test (DKT) [Test Michigan Diabetes Research Training Center (MDRTC), 2015] (see Appendix A and B for Pre- and Post-tests).

The study was not intended to create new knowledge or to generalize findings external to the study site.

Problem Statement and PICO

For the Capstone Project, a description of the population, intervention, comparison, outcomes (PICO) is stated below:

P: Nursing staff providing care to hospitalized patients with diabetes in a small rural hospital in the southern United States.

I: An educational program on diabetes management.

C: Currently no educational program on diabetes management.

O: Improved nursing knowledge of diabetes management for hospitalized patients with diabetes.

The PICO question or problem statement for the study was written as: In direct-care staff nurses working at a small rural hospital in the southern United States, can an educational program on diabetes management as compared to no educational program, enhance the nursing knowledge of diabetes management for hospitalized patients with diabetes?

Project Significance, Scope and Rationale

This Capstone Project was significant for different reasons. As a result of the University of Mississippi Medical Center not having a diabetes management program, the nurses are more likely to have theory-practice gaps and the inability to provide the best patient outcomes. Several authors discovered nurses' knowledge of diabetes management improved after receiving an educational intervention on diabetes management (Abduelkarem & Shareif, 2013; Holmes & Dyer, 2012; Modic et al., 2013; Yacoub et al., 2014; Young, 2011). Yacoub et al. (2014) further noted the nurses' actual knowledge of diabetes is positively correlated with perceived knowledge, perceived competence, and level of education. Most diseases can be successfully treated by adhering to medication regimen. However, diabetes requires knowledge of medication, glucose monitoring, physical activity, and nutritional status. Inadequate short-term interventions can quickly result in long-term complications. These conditions further increase economic and financial burdens of health care. The American Diabetes Association (ADA) (2016) suggests that diabetes management requires an organized, systematic approach and the involvement of a coordinated team of dedicated healthcare professionals working in an environment where patient-centered care is a priority. Because of the high risk diabetic patient

population at the primary investigator's facility, nurses must stay current with evidence-based information to provide the best care for these patients. The scope of this capstone project was a convenience sample of 65 nurses in a small rural hospital and included an educational intervention on the most current evidence-based practices of in-patient management for patients with diabetes.

Theoretical Foundation

The theoretical framework for this project was represented by two theories: Knowles's Adult Learning Theory and Benner's Novice to Expert Theory. The Adult Learning Theory guided the project. Benner's Novice to Expert Theory was also used as it is a theoretical foundation for nursing practice. The utilization of different theories broaden knowledge base for organizing and understanding what happens in clinical practice. Theoretical knowledge is significant to suggesting the appropriate types of nursing interventions and patient outcomes, while fixing gaps in clinical practice.

According to Keesee (2011), Knowles delineates six assumptions of adult education as follows: self-concept, experience, readiness to learn, orientation to learning, motivation to learn, and relevance (see Appendix C for Adult Learning Theory Conceptual Diagram). The adult learners in this study brought life experiences and knowledge to the learning environment, and they expected to be treated with respect. In relation to self-concept, the nurses were motivated to learn and provide the best care for diabetic patients. It was important to build a trusting relationship and listen to what the nurses had to say. Nurses learn from previous experience and apply that learning to new learning experiences. Some of the participants in this project may have portrayed bias while moving toward a new understanding. Providing case studies helped to motivate readiness to learn. An orientation to learning allowed the nurses to develop increased

competency. This researcher encouraged the nurses to see the value of learning and utilize the best skills to improve patient outcomes.

Benner describes five competency levels related to nursing experience as follows: novice, advanced beginner, competent, proficient, and expert (Benner, 2013) (see Appendix D for Benner's Novice to Expert model). Some of the novice nurses at this facility lacked understanding of insulin management and relied on more experienced nurses when caring for diabetic patients. According to Benner's theory, nurses will go through stages, building on the previous one through experience while gaining clinical experience. Stage One is novice; these nurses lack experience and depend on rules. Stage Two is advanced beginner which refers to an acceptable competency level based on professional experiences. Stage Three is competent in which the nurse is more efficient and has from two to three years of experience. Stage Four is proficient and this stage refers to practicing with a holistic approach. Stage Five is expert where the nurse is recognized as being highly experienced and knowledgeable, achieving the highest level of competency. The five levels show that years of nursing experience strongly impact safety and quality of care provided. By using Benner's theory to guide this project, this researcher recognized that creating a climate of continuous learning could promote retention of experienced practicing nurses. The DNP leader plays an important role in mentoring and collaborating with other healthcare providers to help nurses stay knowledgeable and competent in their practice settings.

Literature Selection

For the literature review, key search terms included the following: diabetes management, nursing education, bedside nursing, diabetes education in hospital settings, insulin education for nurses, and diabetes knowledge for nursing staff. Scholarly databases searched included the

following: Google Scholar, PubMed, the Cumulative Index of Nursing and Allied Health Literature (CINAHL), the Cochrane Library, Science Direct, and MEDLINE. More relevant articles from Google Scholar and PubMed were used. Some of the same articles were found in different databases. This researcher also viewed the following websites: the American Diabetes Association (ADA), the Mississippi State Department of Health (MSDH), the Centers of Disease Control (CDC), and Healthy People 2020. After searching many abstracts and articles related to the project, 72 articles were revealed. The search was narrowed to 27 useable articles, ranging from 2007 to 2014. Articles that were unrelated to the project purpose or irrelevant to the PICO were excluded. In addition, since the intervention focused on insulin treatment, articles were excluded related to oral hypoglycemic treatment. A Systematic Review Table is included in the appendices of this paper (see Appendix E for Systematic Review Table). Melnyk's leveling model was used to evaluate the evidence (Houser & Oman, 2011).

Scope of Evidence

The systematic review of the literature was conducted based on the researcher's PICO statement in which three major themes surfaced. The themes included complications of diabetes, improved nurses' knowledge and competence, and evaluation instruments. The first theme, complications of diabetes, encompassed three other sub-themes: glycemic control, hyperglycemia, and hypoglycemia. As supported by the evidence, glycemic control was shown to improve a patient's overall health, and blood sugars can be better managed with accurate point-of-care testing, timely meal delivery and insulin administration and overall medication adherence, as well as following the most recent ADA guidelines. Episodic hyperglycemia and hypoglycemia also had associated risks of increase length of stay, systemic organ complications, and even death.

The second theme was improved nurses' knowledge and competence. Several studies discussed barriers and facilitators with an emphasis on ways to help nurses learn more about managing patients with diabetes. It was found that innovative and evidence-based educational approaches for in-patient diabetes management will help nurses with clinical reasoning, discernment, and judgment (Modic et al., 2013). The evidence showed that focused teaching sessions can have an impact on improving nursing knowledge in managing hospitalized patients as well as having a positive effect on patient outcomes. Siminerio, Funnell, Peyrot, and Rubin (2007) discovered that nurses and physicians both agreed that nurses should take larger roles in managing diabetes, such as taking on more responsibility for patient treatments and managing patient's routine checks without supervision.

Lastly, the third theme addressed an evaluation tool to assess the nurses' knowledge before and after an educational intervention on the management of a hospitalized patient with diabetes. The Diabetes Knowledge Test (DKT) was selected as the measurement instrument to assess the level of diabetes knowledge and knowledge gaps among the nurses for this Capstone Project. It had demonstrated reliability and validity in at least two other studies (Odili & Eke, 2010; Quandt, et al., 2013).

Review of Evidence

Background of Problem

Diabetes contributes to the seventh leading cause of death in the United States. At this researcher's clinical site, nurse managers verbalized: lack of nurses' having evidenced-based knowledge of diabetes management, ineffective communication among staff, some nurses not always quickly intervening to manage hypoglycemic reactions, untimely monitoring after reaction occurrences, and inconsistent adherence to sliding scale orders. According to supportive

research and the ADA (2015), nurses must stay current with evidence-based knowledge of diabetes management to prevent complications and provide quality patient care. This Capstone Project specifically evaluated an effect of an educational intervention on the nurses' knowledge of diabetes management of the hospitalized patient with diabetes.

Systematic Review of the Literature

As discussed previously, the literature search revealed common themes for this project's PICO. Complications of diabetes, improved knowledge and competency of nurses related to diabetes education, and evaluation instruments of nurses' knowledge of diabetes management are discussed in topical order in the following section of this paper.

Complications of diabetes. Diabetic patients face both acute and chronic health threats. Blood glucose must be monitored carefully for adequate, safe treatment. The ADA (2016) guidelines for glucose monitoring for hospitalized patients include monitoring glucose with bedside point-of-care testing for patients with known diabetes and nondiabetic patients receiving medication therapies that causes elevated blood glucose levels. According to the ADA (2016), blood glucose testing normal ranges are all random blood glucose levels below 180 mg/dL; intensive care unit (ICU) 140 mg/dL to 180 mg/dL; and non-ICU below 140 mg/dL. The lack of current, evidence-based diabetes education contributes to further complications related to glycemic control, hyperglycemia, and hypoglycemia (McHugh, Shang, Sloane, & Aiken, 2010; Mendez et al., 2013; Nirantharakmar et al., 2012).

***Glycemic control*.** McHugh, Sloane, and Aiken (2010) noted poor glycemic control correlates with disproportionately high costs and mortality. This nested case-control study, derived from administrative discharge abstracts and files, consists of 261 cases with poor glycemic control not present on admission at the California acute care hospitals from 2005 to

2006. The control group was matched using administrative data for age, sex, major diagnostic category and severity of illness (McHugh et al., 2010). There was no statistically significant difference between the severity of illness or the number of chronic conditions when compared in teaching hospitals to those in nonteaching hospitals. Nonteaching hospitals must invest more in nursing resources so that nurses can provide safe, quality care (McHugh et al., 2010). Insulin administration, point-of-care testing, and meal delivery are important for glycemic control. Insulin is preferred for glycemic control in hospitals.

Freeland, Penprase, and Anthony (2011) conducted a prospective observational study, and found that coordinating insulin administration, glucose monitoring, and meal delivery within tight time frames required for rapid-acting insulin, is a significant challenge not being met in hospitals. Han, Fglay, Davies, Zhang, and Radican (2012) noted proper management of medication with a fixed-dose combination improved glycemic control. This study compared effects of fix-dosed combinations and co-administered dual therapy of anti-hyperglycemic agents on glycemic control and medication adherence in patients with Type 2 Diabetes. There was a significantly greater glycemic reduction with fixed-dosed combinations (Han et al., 2012).

Elevated glycosylated hemoglobin is a true indication of diabetes. To confirm a diabetes diagnosis, the A1C test is based on the attachment of glucose to hemoglobin, the oxygen-carrying protein in the red blood cells. The A1C test (also called the hemoglobin A1C, HbA1c, or glycohemoglobin test) is performed to detect the average amount of glucose in the body over the past three months. Measuring A1C is useful in developing strategies to reduce readmission rates and costs (Strack, DeShazo, Gennings, & Olmo, 2014). This study consists of 70,000 admissions of in-patient diabetes data from 54 hospitals in the U.S. over a period of 10 years of over 5,000 providers. Groups of encounters considered for this study were: no A1C test

performed; A1C performed and in normal range; A1C performed with the result greater than 8% and no change in diabetic medications; and A1C performed with result greater than 8% and diabetic medication changed. Improving A1C may lead to improvements in patient safety and lower costs.

A study by Dorland and Liddy (2014) found that A1C levels improved during a comparison of two diabetes education programs. When targeting diabetic patients with higher A1C levels, shorter teaching methods were equally effective in producing improvements in diabetes, as compared to more intensive course formats. Any A1C level that is below 5.7% is normal; 5.7% to 6.4% is high risk of diabetes; and 6.5% or higher is diagnosed with diabetes. Abnormalities such as anemia, high cholesterol levels, kidney disease, and liver disease contribute to abnormal A1C test results. Monitoring the A1C in the hospital setting is very important for education and discharge planning. Stress or certain medications contribute to hyperglycemia. The A1C level can determine if the hyperglycemic state is long-term or due to other causes. It also offers an opportunity to assess the effectiveness of current therapy and make the necessary changes if needed.

Some relevant studies found that more than medication adherence improves glycemic control (Tricco, Ivers, Grimshaw, & Moher, 2012; Williams, Walker, Campbell, & Egede, 2014). These studies relate to this researcher's PICO because nurses providing in-patient diabetes care are on the frontline caring for these patients. The nurses must be current with evidence-based information of improving glycemic control for better patient outcomes. A systematic review by Williams et al. (2014) included the following 27 studies: 18 random control trials (RCTs), four pre- and post-tests, two combined quasiexperimental with pre- and post-tests, two cohorts, and one used a group with repeated measure design. Thirteen of the

studies concluding that medication adherence may not be solely responsible for achieving glycemic control. Education, skills, training, and problem solving were found to be vital components of diabetes management. Tricco et al. (2012) noted evidence-based quality improvement strategies on glycemic control improved diabetes management. In this systematic review and meta-analysis, 48 cluster randomized controlled trials were reviewed, targeting quality improvement strategies for health systems, healthcare providers, and patients. It takes a team effort to continuously find better ways to care for hospitalized diabetic patients (Tricco et al., 2012).

The ADA guideline recommendations on intervention content and delivery are significantly associated with improved glycemic control (Dunkley et al., 2014). Healthcare providers and nurses need to adhere to specific clinical diabetes guidelines when caring for these patients in the hospital setting. According to the ADA (2016), the American Association of Clinical Endocrinologists (AACE) and the ADA developed the following clinical guidelines for glycemic control:

- identify elevated blood glucose in all hospitalized patients
- establish a multidisciplinary team approach to diabetes management in all hospitals
- implement structured protocols for aggressive control of blood glucose in ICUs and other hospital settings
- create educational programs for healthcare providers caring for all diabetic patients, and
- plan for a smooth transition to out-patient care with diabetes management.

A study by Gerald, Griffin, and Fitzpatrick (2010) found that actual nurses' knowledge of diabetes management was low, and nurses lack continued education related to diabetes. This convenience sample consisted of 93 acute care registered nurses with direct patient care. Among

these participants, the mean score was 68%. Gerald, Griffin, & Fitzpatrick (2010) further noted evidence-based diabetes management information for nurses may be used as resources for the hospitals obtaining Magnet status. This researcher used the most recent evidence-based guidelines written by the ADA when planning the educational intervention on in-patient diabetic management.

***Hyperglycemia*.** Moreira, Silveiera, Neves, and Souza (2013) conducted a study on 2399 patients at 24 hospitals in Brazil to assess diabetes management and glycemic control in adult patients admitted with diabetes; 89.4% of patients presented with hyperglycemia or hypoglycemia. Hyperglycemia is associated with longer length of hospital stay and increased mortality in noncritical ill hospitalized patients. A study by Mendez et al. (2013) includes 935 diabetic patients admitted to the acute non-intensive care unit medicine and surgery services at Stratton Veterans Affairs Medical Center in Alabama, New York between January 2008 and January 2010. The study results concluded that for every 10 mg/dL increase in standard deviation and 10-percentage point increase in coefficient of variation, length of stay increased by 4.4% and 9.7%; relative risk of death in 90 days increased by 8% for every 10 mg/dL increase in standard deviation (Mendez et al., 2013). There was a significant association between longer length of stay and increased 90-day mortality. Acute complications of diabetes such as diabetes ketoacidosis and hyperglycemic hyperosmolar state cause dehydration, increased weakness, increased thirst, excessive urination and changes in mental status. These signs and symptoms lead to confusion and/or coma. Lack of treatment with insulin therapy and intravenous fluids, could result in serious cardiac problems, amputations, brain injury, and death. Furthermore, the long-term effect of these conditions damages arteries, kidneys, eyes, nerves, and feet. Careful

monitoring of all patients is important because elevated blood glucose levels may be due to steroids and other medications.

Hypoglycemia. Nirantharakumar et al. (2012) found that hypoglycemia contributes to mortality and extended hospital stay. Electronic data of 6374 admissions, based on results of laboratory or point-of-care glucose value were included in this study. The study subjects were placed in three different categories: without hypoglycemia, mild to moderate hypoglycemia, and severe hypoglycemia. The results of the study indicated the length of stay was 51% greater in those having mild to moderate hypoglycemia, and 133% greater in those with severe hypoglycemia. As a result of this study, in-patient mortality increased by 62% in those with mild to moderate hypoglycemia, and by 105% in those with severe hypoglycemia (Nirantharakumar et al., 2012). Guidelines for hypoglycemia are less than 70 mg/dL and the A1C less than 7.0% (ADA, 2015). Too much insulin, certain medications, skipping meals, and delaying meals contribute to hypoglycemia.

A study by Johnston et al. (2011) found that hypoglycemia leads to cardiovascular problems, such as acute myocardial infarction, coronary artery bypass grafting, revascularization, percutaneous coronary intervention, and unstable angina, in patients with Type 2 Diabetes. Garg, Hurwitz, Turchin, and Trivedi (2013) investigated the relationship between spontaneous hypoglycemia versus insulin-associated hypoglycemia and mortality in hospitalized patients. The study data was obtained from electronic databases between April 2008 and November 2010. Insulin-associated and spontaneous hypoglycemia was found to be associated with increased mortality among hospitalized patients (Garg et al., 2013). Hypoglycemia can occur suddenly and be treated quickly by mouth with glucose-rich foods or drinks and/or intravenous medications, depending on the blood glucose level. Some earlier symptoms include hunger, sweating,

irritable, and fatigue. If not treated in a timely manner, blood glucose can worsen and cause confusion, unsteady gait, seizures, coma, and death. It is important that nurses adequately monitor and treat hypoglycemic episodes because hypoglycemia can quickly lead to death. Nurses play a key role in education and collaboration to provide the best possible care to patients in the hospital setting.

Improved nurses' knowledge and competency.

Nam, Chesla, Scotts, Kroon, and Janson, (2011) noted identifying barriers of diabetes management can change the culture of the organization. In this study, barriers for healthcare providers include beliefs, attitudes, and knowledge; patient-provider interactions and communication; and health care system. The patients' disease perceptions are influenced by the types of services received and the healthcare professionals encountered as part of diabetes care. Out of 75% of patients diagnosed with Type 2 Diabetes receiving care from primary caregivers, only one-third of the patients correctly follow the healthcare provider's directions for diabetes care (Nam et al., 2011). Nurses reported use of research is moderate-high, but did not include if information was used to make clinical decisions (Squires, Hutchinson, Bostrom, & O'Rourke, 2011). Nurses that are knowledgeable and competent can provide quality, cost-effective diabetes care to improve patient outcomes. As nurses' knowledge improves, patient education and outcomes improve.

A study by White (2012) identified educational approaches for glycemic control. Interactive teaching, problem solving, and individualized education may determine gaps in knowledge of diabetes management (White, 2012). During this researcher's educational intervention, evidence-based web sites related to diabetes management were shared with nurses. Directing nurses to these current web sites will enhance nursing knowledge. Jones, Schilling,

and Pesut (2011) noted information seeking is becoming part of nurses' knowledge work and an expected professional competency. Lack of web searching skills and not knowing to use scholarly resources represent a professional nursing knowledge deficit that negatively impacts quality care (Jones, Schilling, & Pesut, 2011).

Nurses' knowledge of diabetes management improved after receiving an educational intervention on diabetes management intervention (Abduelkarem & Shareif, 2013; Holmes & Dyer, 2012; Modic et al., 2013; Yacoub et al., 2014; Young, 2011). A study by Abduelkarem & Shareif (2013) found that the overall knowledge of diabetes among the nursing staff was lacking. In this study, diabetes-related knowledge was assessed among 116 nurses working in different departments at the Tripoli Medical Center in Libya. A 66-item questionnaire was used to assess diabetes knowledge related to diet, chronic complications, hypoglycemia, and ketoacidosis. This study revealed that there was a need to develop educational programs for the nursing staff about diabetes and the management of in-patient hyperglycemia (Abduelkarem & Shareif, 2013).

Holmes and Dyer (2013) found that a half-day workshop on diabetes was effective in improving nursing knowledge. Diabetes knowledge related to blood glucose monitoring, sliding scales, management of hyperglycemia, and management of hypoglycemia. A pre-test/post-test questionnaire of in-patient diabetes care was used. Most of the nurses recognized that their knowledge and understanding of diabetes improved after the educational intervention. Following the workshop, a significant number of nurses' subjective confidence improved ($p<0.001$) (Holmes & Dyer, 2013). In addition, a study by Modic et al. (2013) found that nurses' knowledge of in-patient diabetes management principles was low. In this descriptive correlation study, 2250 registered nurses providing direct patient care completed the Diabetes Management Knowledge Assessment Tool, a 20-item questionnaire, as a pre-test/post-test.

Diabetes knowledge content was related to hyperglycemia, insulin therapeutics, hypoglycemia prevention and management, and diabetes survival skills. This study concluded that nurses' knowledge of diabetes management principles for in-patient diabetic patients may be low because of the inability to keep up with the rapidly changing technologies and drug regimens. The post-test scores revealed that nurses' knowledge of factual content increased after receiving a 4-hour educational intervention on diabetes management (Modic et al., 2013).

A study by Yacoub et al. (2014) found that there was knowledge deficit of diabetes among Jordanian registered nurses. The Diabetes Self-Report Tool and the Modified Diabetes Basic Knowledge Test and the Modified Diabetes were used to assess nurses' perceived and actual knowledge of diabetes. A total of 277 nurses participated in this study. There was knowledge deficit in clinical and theoretical-based topics, such as initial treatment of hypoglycemia, insulin storage and preparation, meal planning, and duration of action with hypoglycemic agents. In a slightly older study, Young (2011) evaluated nurses' knowledge of and deficits in management modalities when caring for in-patient diabetic patients. Live presentations and on-line presentations that were drawn from peer-reviewed articles included diabetes-related knowledge of pathophysiology, risk factors, diabetes and cardiovascular disease, hyperglycemia, current diabetes management guidelines, and nursing care. A 13-item questionnaire was electronically administered prior to the sessions. For the nurses who participated in the live presentation, a 15-item post-test was completed. The on-line participants completed a 20-item post-test. Diabetes information was relevant to nursing practice and new information presented allowed nurses to improve nursing knowledge of diabetes management (Young, 2011).

Evaluation instruments. Diabetes evaluation tools showed proven validity and reliability for measuring general diabetes knowledge (Odili & Eke, 2010; Quandt, et al., 2013). In a cross-sectional study among four major hospitals located in Benin City, Odili and Eke (2010) used the Diabetes Knowledge Test (DKT) to determine the level of diabetes knowledge and knowledge gaps among registered nurses. The 23-question multiple choice test consists of 14 questions related to general diabetes knowledge, such as diagnosis, treatment, complications, lifestyle modifications, optimal glucose control levels, hypoglycemia, diet, and exercise; the other nine questions related to insulin. Each question answered correctly scores one, and a total score equals 23 or 100%, as the maximum score (Odili & Eke, 2010). Quandt et al. (2013) assessed the performance of a shorter version of the Diabetes Knowledge Instrument in a large multi-ethnic sample of older adults with diabetes and to identify possible modifications to improve its ability to document diabetes self-management and long-term complications of diabetes. Three items were eliminated due to poor performance. The sample consisted of 593 African Americans, American Indians, White adults 60 years and older with diabetes, diagnosed two years prior to the study. The association with sociodemographic characteristics of the sample demonstrated validity. The study concluded that the 13-item instrument measures a stable level of knowledge in the patient population (Quandt et al., 2013). The researcher of this study used a modified version of the original 23-item DKT to evaluate the nurses' knowledge of in-patient diabetes management as this version is more focused on the healthcare provider's role in caring for patient with diabetes.

The review of the literature for this researcher's project supports an educational intervention on diabetes management for nurses. It also showed that it is important to provide evidence-based educational teaching sessions in order for nurses to improve nursing knowledge

and ultimately provide safer care to hospitalized patients with diabetes. According to Siminerio et al., (2007), nurses should take larger roles to manage diabetes, and there is an increased need for nurses to be involved in diabetes care. Research also indicated that having adequate resources improve diabetes care (Modic et al., 2013).

Project Plan and Evaluation

Market and Risk Analysis

An analysis of strengths, weaknesses, opportunities, and threats (SWOT) takes a balanced approach considering the internal and external factors of this researcher's project (see Appendix F for SWOT analysis). The strengths were: support from mentors, including the Diabetes Educator, project site manager, and chief executive officer (CEO), as well as overall organizational support. Other strengths included this researcher: having over 20 years of clinical practice experience; working as a nurse instructor and participating in continuing education as a DNP student; being employed at the facility; and having strong belief and support of the mission as well as strong community ties. In addition, the evaluation tool had been shown to have proven reliability and validity. Considering the strengths, positive support was evident for carrying out the needed educational intervention.

No diabetes educational program, limited diabetes management resources, and limited number of staff contributed to this project's weaknesses. This researcher believes the program provided evidence-based information to enhance nurses' knowledge and improve patient outcomes.

Important opportunities may lead to enhancing nurses' knowledge to improve patient outcomes, adopting the program for future educational use, and collaborating with other healthcare providers. According to Yacoub et al. (2014), appropriate care for people with

diabetes requires a multidisciplinary approach in which nurses play a pivotal role and need to be equipped with the necessary knowledge of diabetes care. Health outcomes improve when care is provided in a team-based way.

Identifiable threats were heavy workload for nurses and nursing shortages. Scheduling conflicts were sometimes problematic. This researcher tried to accommodate the nurses' schedules by offering flexible educational sessions. Another weakness was decrease job satisfaction. Based on the SWOT analysis, driving and restraining forces were carefully considered.

Driving and Restraining Forces

Driving forces move toward change, while restraining forces resist change (see Appendix G for Driving and Restraining forces). For this project, driving forces included the following: enhancing nurses' skills and knowledge, improving patient safety, and meeting the need to improve practice standards. The restraining forces were nurse time constraints, nurse workload, limited staff participation, and increase unit census. Change may occur when the driving forces exceed the restraining forces. This researcher engaged in strategies to overcome challenges, by providing flexibility to accommodate scheduling, using creative and innovative educational sessions, and incorporating evidence-based diabetes education to enhance nurses' knowledge.

Needs, Resources, and Sustainability

The need for this project was to improve in-patient diabetic management by the nurses who care for patients with diabetes. Diabetes contributes to be an economic and financial strain on health care in the US. The seriousness of diabetes is that 21% of Mississippians are diagnosed with diabetes or prediabetes (MSDH, 2015). According to MSDH (2015), hospital in-patient care contributes to 43% of the medical costs in MS. The major goal is to reduce the

economic and financial burden of diabetes and to improve the quality of life for all persons who have or at risk for diabetes (Healthy People 2020, 2014).

Resources were considered with project planning. For this project, the resources included: the participation of nursing staff; buy-in from the nurse managers, the Diabetes Educator and the CEO; access to the meeting room for the educational offering; and printing of program documents and tests. The Michigan Diabetes Research Training Center (MDRTC) provided the evaluation tool. Information from the ADA (2016) provided current evidence-based information and guidelines for diabetes. The resources were essential to driving the project, with hopes of contributing to sustainability.

Sustaining the diabetic educational intervention requires the use of resources in a responsible manner for future use (see Appendix H for Sustainability). This researcher's belief is that there must be support of the organization's mission to sustain the successful intervention. Having buy-in from front-line nurses and management was very important. Diabetes resources and diabetes management education was provided. Lifelong management with a culture of continuing education and learning will be needed to sustain this project. There must be an evaluation of the diabetes education by having a decreased rate of hospitalizations and emergency room visits related to diabetes complications; more nurses participating; and increased satisfaction in the program. There must also be collaboration among healthcare professionals. The outcome was quality improvement of diabetes management. This researcher believes that the diabetes management educational program will continue to be utilized for novice nurses and staff training sessions for all nurses.

Feasibility, Risks, and Unintended Consequences

The project was highly feasible. In the beginning the primary researcher met with the project mentor, hospital administrator and the nurse managers on the different units where the study took place. All were supportive of the project. The CEO did not pay the nurses to participate before and after shifts; however, the CEO did approve the researcher offering educational sessions during working hours as needed and depending on the nurse's workload and unit needs. The nurse managers worked closely with the researcher in planning and announcing when an educational intervention would take place. Nurse Managers would also remind the nurses of the researcher's study during daily huddles. This researcher worked at the selected study hospital and was familiar with the nursing staff and already had a rapport with them. Permission to use the DKT was easily obtained.

There were minimal risks. The participants may have had possible psychological distress when completing the demographic survey and DKT pre-and post-tests. The demographic survey took about one minute to complete while each DKT test took 15 minutes to answer all questions. In addition, the participants may have felt distress by taking time either prior to starting their shift or after their shift to participate in the educational sessions. Multiple sessions were offered during a shift and between shifts to lessen the subject burden to give each potential participant a better chance to attend and learn about the management of the hospitalized patients with diabetes.

Unintended consequences can alter program outcomes. Various difficulties occurred, such as scheduling conflicts, lack of some nurses participating, and time constraints. Whenever there is a change in the nurse's role or work flow, there are challenges for adapting to change. However, doing nothing will hinder nurses from receiving the evidence-based education.

Stakeholders and Project Team

Collaboration among stakeholders is important to a successful project outcome. The key stakeholders were the patients, clinical mentor, nurse managers, CEO, and hospital management. Other stakeholders included: other healthcare professionals, the Diabetic Shoppe (2015), and the ADA. The Diabetic Shoppe and the ADA provided current diabetes information and pamphlets for educational sessions. According to the ADA (2016), it is essential to seek ongoing input from external stakeholders and experts in order to promote program quality.

Expert contribution to this project involved the project team participation. The project team included: the researcher; Capstone Chair, Dr. Kathleen Whalen; mentor, Dr. Lawanda Herron; research statistics faculty, Dr. Cheryl Kruschke; CEO, Rhonda Duncan; Diabetes Educator, Dacia Kilgore; and nurse managers and nursing staff. All of these members provided valuable communication skills, knowledge, and expertise for a successful outcome. DNP leaders are suited to serve as effective collaborating team leaders and participants (Zaccagnini & White, 2014).

Cost-Benefit Analysis

The cost-benefit analysis refers to adding the project costs and subtracting from the project benefits (Zaccagnini & White, 2014). There were no actual costs for the Diabetes Educator because the intervention was part of this researcher's DNP assignment. Having over 20 years of clinical practice experience allowed this researcher to share knowledge and skills in preparing the next generation of nurses for effective practice. Working as a nursing instructor and continuing education in the DNP program also added to this researcher's qualifications of educating others with current evidence-based knowledge. Nurse participation was voluntary before or after shift or free-standing during work hours. There was a small cost for paper and

printing documents and tests. All of the educational materials and the use of the facility and any technical equipment were donated. The evaluation tool was free of charge. The budget included actual costs that were necessary to implement this project, based on 65 participants (see Appendix I for Budget and Resources).

The project benefits included providing the best patient care, improving nurses' knowledge, collaborating with other healthcare providers, and lifelong commitment. According to the ADA (2015), benefits include lower healthcare costs and compliance of nurses and hospitals with the ADA guidelines. The Affordable Care Act (ACA) targets quality improvement of serious and chronic health conditions, such as diabetes (Rosenbaum, 2011). Zaccagnini and White (2014) suggest that collaborative teams must focus on the needs of the population, while DNP leaders are prepared to play a central role in establishing interprofessional teams.

Mission and Vision

The mission for this project was to provide current evidence-based diabetes education to nurses, while improving the nurses' knowledge of diabetic management in the hospital setting. The vision was to positively empower others, encourage continuing education for staff nurses, and assure professional excellence, while improving patient outcomes for the in-house diabetic population. Northouse (2010) suggests that leadership influences a group of individuals to achieve a common goal.

Goal and Process and Outcome Objectives

The overarching goal of this project was to provide an educational program on diabetes management to nurses in the hospital setting, and if the project was successful, recommend that the clinical agency continue to use an evidence-based approach to provide ongoing education for

nurses who care for hospitalized patients with diabetes. In order to accomplish this goal, the following objectives were addressed:

1. Develop a diabetes management education program based on ADA evidence-based guidelines for in-hospital nursing management of diabetes by 2/20/16.
2. Implement the intervention of a diabetic educational session (s) for nurses based on the most recent ADA guidelines on the following acute care units: critical care, progressive care, medical-surgical, and obstetrical units by 3/26/16.
3. Evaluate for a change in the nurses' knowledge/understanding of diabetic management of the hospitalized patient using a pre-post Diabetic Knowledge Test (DKT) [Test Michigan Diabetes Research Training Center (MDRTC), 2015] by 4/08/16.
4. Share results of the study with unit administration where the research took place after capstone defense.

These objectives correlated to the evaluation plan for this project. The objectives are presented in more depth with the findings. According to Zaccagnini & White (2014), evaluation provides accountability to the stakeholders, demonstrates quality improvement and population effectiveness, and provides clear understanding of the program's purpose.

Logic Model

A logic model serves as a road map that describes the sequence of related events, while connecting the need for the planned program with the program's results (Hayes, Parchman, & Howard, 2011). The logic model was utilized to describe the plan for the diabetes management intervention (see Appendix J for Logic Model for project plan).

The Logic Model for this project included the following: resources to accomplish the goal, activities to address the problem, outputs pertaining to the service delivery, short and long-

term outcomes, and the impact of this project. The short-term outcomes included: improved nursing knowledge and skills; evidence-based guidelines for providing quality care to patients with diabetes; and increased confidence of nursing staff when caring for patients with diabetes. The long-term outcomes as outlined were: decreased rate of recurrent admissions related to diabetes complications and increased number of nurses who have the ability to teach patients diagnosed with diabetes based on evidence-based practice.

All of these concepts are addressed throughout the paper. The overall impact of the project was to have decreased diabetes complications in the community, improved nursing knowledge and skills related to diabetes while caring for patients in the hospital setting, continued management support of the diabetes program, and engagement with stakeholders for improved population health (see Appendix K for Project timeline). A DNP leader must be in the forefront for assessing and improving health outcomes of the target population.

Population and Sampling Parameters and Setting

The target population was a convenience sample of approximately two licensed practical nurses (LPNs) and 63 registered nurses (RNs) who work on a 45-bed medical-surgical unit or nine bed critical care unit, or 11 bed progressive care unit or a nine bed obstetrics unit. A *priori power analysis* for this project was based on a sample size of 65 participants. A power of .80 or greater was used to determine the strength of the study. In order to avoid error, a larger sample size would yield a larger power. By taking the target sample size of 65 and multiplying by power of .80, at least 52 must participate in the study. There were 29 participants (or 45%) who completed the study. This included those who took the pre-test, attended the educational session, and completed the post-test. In this study, the sample size was inadequate to achieve a power of

.80 and is considered as a limitation of the study (C. Kruschke, personal communication, September 2015).

Convenience sampling differs from random sampling, which requires more resources and larger groups (Givens, 2008). Gerald, Griffin and Fitzpatrick (2010) conducted a similar study to this researcher's proposed study in which a convenience sample of RNs was used to examine their levels of perceived and actual knowledge of an acute care setting. The advantages of using a convenience sample is that data can be collected and used to make direct observations of subjects to make inferences about the entire population. The cost is inexpensive and less time consuming than probability sampling, which requires sampling of an entire population. Limitations of convenience sampling are that there may be sampling bias, and the sample is not representative of the entire population. The results do not speak for an entire population. For this researcher's study, the convenience sample was useful because it represented the population of nurses caring for patients with diabetes. Subjects used in this study were readily available for participation. It was also less expensive than conducting research on an entire population.

Inclusion criteria were RNs and LPNs from the medical-surgical, critical care, progressive care, and obstetrics units, and the exclusion criteria were vulnerable subjects less than 18 years old. There were no vulnerable subjects in this project, as the primary researcher was not the unit manager of any of the participants. In addition, none of the participants were minors or elderly. After Institutional Review Board (IRB) was obtained, recruitment of subjects occurred by a recruitment flyer, that was placed on each of the four study units' bulletin boards, as determined by the respective unit managers. The researcher worked with the nurse managers to plan and announce when an educational intervention was to take place during the intervention phase of the study. In addition, the nurses did a huddle every morning on the day shift, including

day and night shift workers. This turned out to be a good time for the managers to remind the nurses of the study and educational session offerings. An information sheet was also disseminated to all participants with the pre-test and post-test. An informed consent was not required.

The setting was at the University of Mississippi Medical Center, a small rural hospital of 156 in-patient beds.

Design Methodology and Measurement

This project was an evidence-based practice (EBP) project in which a quality improvement plan, program evaluation, educational, or standard of care intervention was completed. In most cases, a pre-test/post-test evaluation will assess the effect of the intervention. The project was internal to an agency and informed the agency of issues regarding health care quality, cost, and patient satisfaction. The results of this project were not meant to generate new knowledge or generalize across settings but rather seek to address a specific population, at a specific time, in a specific agency. These projects translate and apply the science of nursing to the greater health care field.

The project utilized the acronym "PICO," rather than stating a formal research hypothesis. The acronym stands for: Population or Disease (P), Intervention or Issue of Interest (I), Comparison Group or Current Practice (C), and Outcome (O) and is usually framed as a question (Stillwell, Fineout-Overholt, Melenyk, & Williamson, 2010). The question this study addressed was: In direct-care staff nurses working at a small rural hospital in the southern United States (P), can an educational program on diabetes management (I) as compared to no educational program (C), enhance the nursing knowledge of diabetes management for hospitalized diabetic patients (O)?

This quality improvement study was a pre-test/post-test quasi-experimental design. A pre-test/post-test design allows a pre-test to measure an outcome of interest prior to an intervention, followed by a post-test on the same measure after the intervention. Toulany, McQuillan, Thull-Freedman, and Margolis (2013) suggest that this design bridges the gap between knowing what needs to happen and implementing it at a system level. The project was condition-specific, as it focused on a particular illness. The diabetes educational intervention was the project's independent variable. The dependent variable was the outcome, which is improved nurses' knowledge about in-hospital diabetic management.

The study included a pre-test, intervention, and post-test. The study was conducted as follows:

- Step 1: After receiving Regis University Institutional Review Board (IRB) approval, participants were recruited via unit flyers placed on critical care, progressive care, med-surgical, and obstetric units.
- Step 2: Disseminated an information sheet and a paper and pencil demographic survey and DKT pre-test to all participants by placing in their workplace lockers weeks 1-2. At the end of the first week, following the DKT pre-test, a reminder flyer was posted on each unit's bulletin board.
- Step 3: Reviewed the diabetes management educational program based on the DKT pre-test results week 3. After the evaluation of the pre-test results, the primary investigator adjusted the diabetic management educational intervention as needed, placing emphasis on topics that had the lowest scores on the pre-test.
- Step 4: Provided multiple sessions of a 45-minute educational diabetes session weeks 4-7 to accommodate staff participation, scheduling, and unit needs (see Appendix L

for Educational outline). An additional reminder to participate in the study was posted on each study unit mid-way through the intervention.

- Step 5: Attached the study information sheet again with the paper and pencil DKT post-test and distributed to all participants by placing in their workplace lockers weeks 8-9. At the end of the first week, following the DKT post-test, a reminder flyer was posted on each unit's bulletin board. Permission was granted from the nurse managers of each unit to post additional reminders.

Protection of Human Rights

This researcher received IRB approval through Regis University after obtaining an approval letter from the CEO at the clinical site (see Appendix M for IRB Approval Letter & Appendix N for Site Approval Letter). An Information Sheet was provided to each participant. The project did not require informed consent.

Confidentiality was maintained for all study participants. An attendance record was obtained for participation purposes only and secured in the investigator's locked box. By using an attendance record, the researcher was able to determine if additional educational sessions were needed during the intervention phase of the study (Step 4). The attendance record was destroyed immediately after all sessions were completed at the end of the intervention phase (Step 4). The demographic survey and the DKT tests were only distributed to the participant's personal workplace locker. In addition, participants were instructed to return their completed DKT pre-tests and demographic surveys and DKT post-tests via a mail slot on the investigator's locked box located in the Diabetes Educator's office with a combination lock intact. This lock box was locked at all times and only accessed by the investigator. In order to ensure confidentiality, participant names were not used in the research study, and there were no personal

identifiers that directly linked the participant to the information collected. All data collected was de-identified and reported as aggregate data. De-identified and aggregate data were analyzed using a statistical program with assistance from a research statistician/analysis expert. All de-identified aggregate data was stored electronically on the primary investigator's computer that is secure and password protected. This data, as described, will be stored on the investigator's computer for a total of three years.

Each participant received a study information sheet at the same time that the DKT pre- and post-tests were placed in their workplace lockers. The information sheet included the purpose of the study, what participants are expected to do, any risk or benefits, how confidentiality will be maintained, and contact information. Participants were informed that their participation was voluntary and that they may cease participation at any time without penalty or loss of benefits, and that their responses were confidential. Although the CEO did not pay the nurses to participate before and after shifts, she approved the researcher offering educational sessions during working hours depending on the nurse's workload and unit needs.

This research study qualified for Category I exemption as this project involved the researcher implementing multiple sessions of a 45-minute educational intervention on diabetes management to nurses in the clinical setting. Participation in the educational session was voluntary. In relation to Category II, the researcher conducted the study using pre-and post-tests delivered via the employees' lockers to evaluate the nurses' understanding/knowledge of in-patient diabetic management prior to and following the educational intervention on diabetes management. Personal identifiers were not collected linking individuals to the collected data. Aggregate, de-identified data was collected for the study. Lastly, there were minimal risks associated with the participation in this study (see Appendix O for CITI Training Certificate).

The participants benefited from improving evidence-based knowledge about the care of a patient with diabetes.

Instrument Reliability and Validity and Intended Statistics

DKT instrument reliability/validity. The Diabetes Knowledge Test (DKT) was used for the pre-test/post-test. The DKT is a 23-item multiple choice instrument that has been used to assess healthcare provider and patient diabetes knowledge. The tool was developed by the Michigan Diabetes Research Training Center (MDRTC). Permission was granted to use and modify the tool (see Appendix P for permission to use DKT). A study by the MDRTC shows proven reliability and validity with an alpha coefficient 0.71 (MDRTC, 2015). An article by Odili and Eke (2010) also explored the use of the DKT to examine nurses' knowledge of diabetes. In measuring reliability, it was believed that the tool will generate the same results in similar population settings. This researcher has modified the tool based on the 2015 ADA clinical practice guidelines for diabetes management. Questions on the pre-test/post-test were modified by consulting with the clinical mentor, the diabetes educator, and a nurse manager at the clinical site. Content validity was assessed for any revisions. Cronbach alpha was performed on the revised DKT and was measured at 0.88.

According to MDRTC (2015), the DKT was scored by summing the number of questions answered correctly; higher scores determined greater knowledge. The highest score to achieve was 100 and any items on the test that were missed or unanswered counted as incorrect (MDRTC, 2015). While interpreting scores, an article by the developer, discussed that scores were grouped into the following three categories: greater than or equal to 75%, 74 to 60%, and less than 59%. This researcher considered a low score below 75%. The DKT was used to

measure the effectiveness of the educational intervention on management of the hospitalized diabetic patient.

Demographic information. The demographic survey was included with the pre-test and excluded from the post-test. Demographic data were collected on gender, qualifications or highest degree or level of school completed, experience or number of years in practice, and longevity or number of years working on current unit (see Appendix Q for Demographic Survey). The pre-test and post-test results were not matched.

Intended statistics. Statistical data analysis included descriptive and inferential statistics. According to Griffin (2007), descriptive statistics describe data, and inferential statistics models relationships among variables. Descriptive statistics were used to describe data from the demographic survey and pre-test/post-test results. Descriptive statistics for this study included frequencies for the demographics of the participants and pre- and post-test means and the standard deviation. Barde and Barde (2012) suggest that standard deviation characterizes typical distance of an observation from distribution center or middle value. A 5-point scale standard deviation is 0.8 to 1.2; the larger the standard deviation, the larger the sampling error (Decision Support Systems (DSS) Research, 2015). Inferential statistical analysis included level of significance, confidence interval, Cronbach's alpha, paired samples t-test, Pearson's correlation, power analysis, and effect size. Statistical analyses drew conclusions about the study population based on the sample data provided for this study. This researcher used the Statistical Package for the Social Sciences (SPSS) Version 23 to analyze the data.

Data Collection and Treatment Protocol

The researcher had two weeks for collecting pre-tests and another week for any additional planning of the intervention. After reviewing the pre-test results and in addition to

making sure key points from the ADA guidelines were addressed, the researcher modified the educational intervention to ensure that the participants' greatest learning needs were also met. According to Abduelkarem and El-Shareif (2013), identifying areas of deficient s knowledge among nursing staff represents an important step towards implementation of targeted educational programs and ultimately the improvements of care standards for hospitalized patients with diabetes.

The treatment protocol was the educational intervention on nursing management of the hospitalized patient with diabetes. The educational outline consisted of current ADA in-hospital guidelines of diabetes, effects of illness and infection on blood sugar level, hypoglycemia and hyperglycemia signs, symptoms and treatment; and common types of insulin treatments and insulin reactions. Teaching-learning strategies utilized were handouts, case studies, role play and lecture. Refer to Appendix L again to view the educational outline. The researcher followed the educational outline to deliver four 45-minute offerings to nurses on the different study units and at different times over the next four weeks. The same content was presented at each of the four sessions. An attendance roster was kept for each session in a secure and locked location and it was destroyed at the end of the intervention. Following the educational session, post-test data were collected over the next two weeks. In addition, and as stated previously, all data collected were in aggregate form and de-identified.

Project Findings and Results

Demographic Survey Results

As shown in Table 1, the responses were provided by a diverse group of nurses. The response rate for the pre-test was 59% (38/65). The response rate for the post-test was 45% (29/65). This researcher believes that the response rate was less for the post-test because the

hospital was in the process of going live with Epic, a new electronic medical record system. This big change in practice added more workload to the nurses' schedules and heightened their stress levels; both of these factors impacted their ability to attend the educational intervention. The majority of nurses that participated were associate degree (ADN) prepared and those who had 1-5 years of experience in the nursing profession. The demographic survey helped the researcher to better understand the population in the study, which included a group of nurses from a rural healthcare facility. These nurses provided care to patients with diabetes on a daily basis.

Table 1

Demographic Survey Results for Pre- and Post-tests

Pretest Totals			
Gender (M, F, Blank)	Qualifications	Experience	Longevity
M – 1 F – 28 Blank - 9	Master's – 1 Bachelor's – 3 AD – 29 LPN - 5	< 1 year – 3 1-5 years – 13 6-10 years – 5 11-15 years – 7 16-20 years – 1 >21 years - 9	< 1 year – 8 1-5 years – 16 6-10 years – 6 11-15 years – 1 16-20 years –4 >21 years - 3
Post-test Totals			
Gender (M, F, Blank)	Qualifications	Experience	Longevity
M – 2 F – 26 Blank - 1	Master's – 0 Bachelor's – 3 AD – 24 LPN - 2	< 1 year – 1 1-5 years – 14 6-10 years – 7 11-15 years – 2 16-20 years – 0 >21 years - 5	< 1 year – 4 1-5 years – 17 6-10 years – 4 11-15 years – 0 16-20 years –3 >21 years - 1

Note. The table was created by this researcher.

Findings and Results by Objectives

Objectives one, two, and four.

Project findings and results are organized and discussed by objectives. Objective one was to develop a diabetes management education program based on ADA evidence-based guidelines for in-hospital nursing management of diabetes. Objective two was to implement the intervention of a diabetic educational session(s) for nurses based on the most recent ADA

guidelines on the following acute care units: critical care, progressive care, medical-surgical, and obstetrical units. Objective one and two have already been discussed as these steps preceded the actual data collection and were an integral part of the study. Objective four will be completed after the Major Paper is written and approved.

Objective three.

Objective three was to evaluate for a change in the nurses' knowledge and understanding of diabetic management of the hospitalized patient using a pre-post DKT. Out of 65 rural healthcare nurses recruited, 29 participated (45%). Confidence interval (CI) was set at 95% and a p value of < 0.05 for significance were used as standard parameters. Data were obtained for a Paired Samples test, reliability, Pearson's correlation and effect size.

***DKT Results*.**

As shown in Table 2, the Paired Samples Test revealed a statistically significant *p* value (.000). This was not due to random error. The *t* value, which is -7.527, showed significant difference between population means. The mean difference score is -5.310, indicated the pre-test scores were lower than the post-test. Other results of the Paired Samples test include: the standard deviation (SD) of 3.799, which signifies the variability between sample means, and the confidence interval (CI) where the population mean lies between -6.756 and -3.865. The importance of this interval is that it does not contain zero, which emphasizes that the true value of the mean difference is unlikely to be zero (C. Kruschke, personal communication, July 2016).

In summary, on average, participants given the Diabetes Education intervention, improved their overall mean scores from (M = 74.82, SE = 1.454) to (M = 83.48, SE = 1.288). This difference, -5.310, 95% CI [-6.576, -3.865], was significant t(28) = -7.527, p = .000, and represented a large-sized effect, d = .881(C. Kruschke, personal communication, July 2016).

These results indicate that there was improved knowledge of nurses receiving diabetes management education compared to those nurses not receiving the intervention. The *a priori power analysis* determined that 52 participants were needed to meet power. Although, this can be a limitation of the study, this intervention was for a particular group of nurses, and thus the power may not be significant to this project finding.

Table 2

Results of the Paired Samples Test

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Pretest - Posttest	-5.310	3.799	.706	-6.756	-3.865	-7.527	28	.000

Note. Table generated from the Statistical Package for the social Sciences (SPSS) version 23.

Cronbach's alpha revealed the internal reliability of the DKT tool. A result of 0.7 or higher is acceptable. As shown in Table 3, the reliability on the post-test was 0.88. Studies by the MDRTC (2012) and Odili and Eke (2010) had Cronbach's alpha of 0.71.

Pearson's correlation was done to correlate study variables to each other and to see if there was any impact between the variables. As shown in Table 4, there was a significant relationship between the variables experience (number of years in practice) and longevity (number of years on current unit) and the variables pre-test and post-test. Experience to longevity showed a strong correlation (.834), with a significant *p* value (.000). This means that the more experience the nurses had, the higher was their longevity. In other words, the greater the number of years of experience as a nurse, the longer the nurse stays working at the same job.

Pre-test to post-test showed a strong correlation (.865), with a significant *p* value (.000). This means if the score is better on the pre-test, the higher the score will be on the post-test.

Table 3

Results of the Reliability Test

Reliability Statistics

Cronbach's Alpha	N of Items
.881	2

Note: Table generated from the Statistical Package for the social Sciences (SPSS) version 23.

Table 4

Results of the Pearson's Correlation Test

Correlations

		Gender	Qualifications	Experience	Longevity	Pretest	Posttest
Gender	Pearson Correlation	1	-.055	-.137	-.020	-.299	.197
	Sig. (2-tailed)		.743	.413	.903	.068	.305
	N	38	38	38	38	38	29
Qualifications	Pearson Correlation	-.055	1	-.138	-.093	-.016	-.103
	Sig. (2-tailed)	.743		.409	.579	.925	.595
	N	38	38	38	38	38	29
Experience	Pearson Correlation	-.137	-.138	1	.834**	.021	-.316
	Sig. (2-tailed)	.413	.409		.000	.899	.094
	N	38	38	38	38	38	29
Longevity	Pearson Correlation	-.020	-.093	.834**	1	.036	-.191
	Sig. (2-tailed)	.903	.579	.000		.829	.322
	N	38	38	38	38	38	29
Pretest	Pearson Correlation	-.299	-.016	.021	.036	1	.865**
	Sig. (2-tailed)	.068	.925	.899	.829		.000
	N	38	38	38	38	38	29
Posttest	Pearson Correlation	.197	-.103	-.316	-.191	.865**	1
	Sig. (2-tailed)	.305	.595	.094	.322	.000	
	N	29	29	29	29	29	29

Note. Correlation is significant at the 0.01 level (2-tailed). Table generated from the Statistical Package for the social Sciences (SPSS) version 23.

To answer the research question: In direct-care staff nurses working at a small rural hospital in the southern United States, can an educational program on diabetes management as compared to no educational program, enhance the nursing knowledge of diabetes management for hospitalized patients with diabetes? The rural health care nurses' data indicate the diabetes management educational intervention was effective in improving nurses' knowledge.

Limitations, Recommendations and Implications for Practice

Limitations

Limitations of the study included a small convenience sample of participants which did not meet power; both of these limitations can lead to bias and prevent generalization of study findings to populations external to the study. Overall, the usefulness of this study was that it represented a population of nurses caring for diabetes patients. The participants were readily available, and it was less expensive than conducting research on an entire population.

In addition, reliability of the results on the post-tests could also possibly be skewed as the participants were allowed two weeks to complete the post-tests in a non-proctored setting. If this study is replicated, the researcher recommends administering the pre- and post-tests in a proctored setting to ensure test reliability.

Recommendations

Small rural hospital settings should provide more educational trainings on diabetes management to enhance nurses' knowledge of caring for diabetes patients. A high quality cost-effective approach like this may help to minimize the economic health care burden of diabetes. Learning opportunities can be incorporated into the work day, with flexible scheduling.

At this facility, a licensed dietician practices as the Diabetes Educator in which her focus is more on the dietary needs of the patient with diabetes. However, more diabetes training needs to look at nursing care, such as the educational intervention provided by this researcher. A Diabetes Educator who focuses on nursing care increases quality care of the patient with diabetes.

This study indicated that nurses in rural health care settings may benefit from resources to promote evidence-based practice. More research is needed to assess the nurse's competency in caring for patients with diabetes to see if there is a long-term impact of the educational intervention. Gerald, Griffin and Fitzpatric (2010) suggest that educational interventions with current diabetes research, protocols, and competency assessments help to maintain the professional knowledge base for nurses. This researcher believes that the outcome of this study may encourage hospital leadership to realize that more evidence-based diabetes management education needs to be done.

Implications for Practice

This project was significant because nurses' knowledge improved after an educational intervention on diabetes management. The national goal is to reduce diabetes and its economic burden, while improving quality of life of all persons diagnosed with diabetes or at risk for diabetes (Healthy People 2020, 2014). A study by Siminerio, Funnell, Peycot and Rubin (2007) noted that nurses should take larger roles in managing diabetes. A sound knowledge base is essential for the nurse to function effectively in this role.

The findings of this study and other similar studies suggest that nurses' knowledge of diabetes management can be improved with diabetes management educational training. There is a need for consistent efforts to improve nurses' knowledge and skills about diabetes. The intervention in the study included basic evidence-based information and skills necessary to

provide the best care to patient with diabetes. As guided by Knowles Adult Learning Theory, nurses learn from experience and apply that learning to new learning experiences. Nurses must practice to the full extent of education to improve patient outcomes.

The future actions by this researcher is to collaborate with management, the Diabetes Educator, and nurses at this facility and assist with continuing a diabetes management educational program for new hires and in-services. Measures must be taken to prepare nurses for providing quality care to patients with diabetes. Creating a continuous environment of learning may empower nurses to make the best educated healthcare decisions, while reducing risk for hospital readmissions due to diabetes complications. The usefulness of this study is that it increased awareness of the need for continuously updated knowledge. Innovative evidence-based information on diabetes management should be accessible for nurses. Most of all, mechanisms should be in place to assure nursing competency.

Conclusion

Findings from this study indicate that nurses continue diabetes management education to provide the best patient outcomes. Although resources are limited, rural facilities must provide nurses with access to current evidence-based practice. Patients deserve the best care. Similar studies found that nurses' knowledge of diabetes management improved after an educational intervention. To maintain a professional knowledge base, this researcher believes that more research on competency is needed for long-term impact of the educational training. Furthermore, this researcher believes that the educational intervention in this study was highly beneficial to the investigator's practice area.

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Appendix A

Diabetes Knowledge Measurement Tool/Instrument (Pre-test DKT)

Please circle correct answer(s). Each question has one answer except "check all that apply" questions. All questions relate to in-patient diabetes care. ***Test results are confidential; do not include your name****. It takes approximately 15 minutes to complete. After completion, place in slot in researcher's locker, located in the medical-surgical nurses lounge. Please return by the end of this week. Thank you for your time in completing the pre-test and demographic survey.*

1. Factors that seem to play a role in the development of Type 2 Diabetes include: (**Select all that apply**)
A) Weight
B) Liver disease
C) Heredity
D) Enzyme deficiencies
E) Childhood illnesses

2. Which statement best explains dietary management for a patient with diabetes?
A) Regulated food intake is basic to control
B) Salt and sugar restriction is the main concern
C) Small, frequent meals are better for digestion
D) Large meals can contribute to a weight problem

3. Your patient refuses his bedtime snack. This should alert the nurse to assess for:
A) Elevated serum bicarbonate and a decreased blood pH.
B) Signs of hypoglycemia earlier than expected.
C) Symptoms of hyperglycemia during the peak time of NPH insulin.
D) Sugar in the urine.

4. Blood glucose of a patient hospitalized with diabetes is well controlled when blood glucose is:
A) Between 70 and 130 mg/dL
B) Less than 180 mg/dL
C) Less than 160 mg/dL
D) Between 100-140 mg/dL

5. A nurse is admitting a client with hypoglycemia. Identify the signs and symptoms the nurse should expect. **(Select all that apply).**
A) Thirst
B) Palpitations
C) Diaphoresis
D) Slurred speech

6. A patient with Type 2 Diabetes complains of nausea, vomiting, diaphoresis, and headache. Which of the following nursing interventions should the nurse carry out first?
A) Hold the patient's next insulin injection.
B) Test the patient's blood glucose level
C) Administer Tylenol (acetaminophen) as ordered.
D) Offer fruit juice, gelatin, and chicken bouillon

7. What effect does unsweetened fruit juice have on blood glucose?
A) Lowers it
B) Raises it
C) Has no effect

8. For a person in good control, what effect does exercise have on blood glucose?
A) Lowers it
B) Raises it
C) Has no effect

9. The nurse knows that glucagon may be given in the treatment of hypoglycemia because it:
A) Inhibits gluconeogenesis
B) Stimulates the release of insulin
C) Increases blood glucose levels
D) Provides more storage of glucose

10. Infection is likely to cause:
A) An increase in blood glucose
B) A decrease in blood glucose
C) No change in blood glucose

11. A patient is in diabetic ketoacidosis, secondary to infection. As the condition progresses, which of the following symptoms might the nurse see?
A) Kussmaul's respirations and a fruity odor on the breath
B) Shallow respirations and severe abdominal pain
C) Decreased respirations and urine output
D) Cheyne-stokes respirations and foul-smelling urine

12. A clinical feature that distinguishes a hypoglycemic reaction from a ketoacidosis reaction is:
A) Blurred vision
B) Diaphoresis
C) Nausea
D) Weakness

13. A nurse should recognize which symptom as a cardinal sign of diabetes?
A) Nausea
B) Seizure
C) Hyperactivity
D) Frequent urination

14. Which of the following is usually associated with diabetes? (**Check all that apply**)
A) Vision problems
B) Kidney problems
C) Nerve problems
D) Lung problems

15. Signs of ketoacidosis include:
A) Shakiness
B) Sweating
C) Vomiting
D) Low blood glucose

16. The most serious complication of diabetes is:
A) Weight gain
B) Delayed wound healing
C) Hypoglycemia
D) Kidney failure

17. After the nurse gives intermediate-acting insulin (NPH), the patient is most likely to have an insulin reaction in:
A) 1-3 hours
B) 6-12 hours
C) 12-15 hours
D) More than 15 hours

18. The physician orders insulin lispro (Humalog) 10 units for the patient. When will the nurse administer this medication?
A) When the meal trays arrive to the floor
B) 15 minutes before meals
C) 30 minutes before meals
D) When the patient is eating

19. The nurse observes a patient with diabetes beginning to have a hypoglycemic reaction. What is the best intervention to instruct the patient to do?
A) Exercise
B) Lie down and rest
C) Drink some juice
D) Take regular insulin

20. Low blood glucose may be caused by:
A) Too much insulin
B) Too little insulin
C) Too much food
D) Too little exercise

21. The American Diabetes Association (ADA) definition of hypoglycemia is blood glucose less than:
A) 50 mg/dl
B) 70 mg/dl
C) 95 mg/dl
D) 100 mg/dl

22. High blood glucose may be caused by:
A) Not enough insulin
B) Skipping meals
C) Delaying your snack
D) Large ketones in your urine

23. Which one of the following will most likely cause an insulin reaction?
A) Heavy exercise
B) Infection
C) Overeating
D) Not taking your insulin

Appendix B

Diabetes Knowledge Measurement Tool/Instrument (Post-test DKT)

Please circle correct answer(s). Each question has one answer except "check all that apply" questions. All questions relate to in-patient diabetes care. ***Test results are confidential; do not include your name****. It takes approximately 15 minutes to complete. After completion, place in slot in researcher's locker, located in the medical-surgical nurses lounge. Please return by the end of this week. Thank you for your time in completing the post-test.*

1. Factors that seem to play a role in the development of Type 2 Diabetes include: (**Select all that apply**)
A) Weight
B) Liver disease
C) Heredity
D) Enzyme deficiencies
E) Childhood illnesses

2. Which statement best explains dietary management for a patient with diabetes?
A) Regulated food intake is basic to control
B) Salt and sugar restriction is the main concern
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B) Signs of hypoglycemia earlier than expected.
C) Symptoms of hyperglycemia during the peak time of NPH insulin.
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4. Blood glucose of patient hospitalized with diabetes is well controlled when blood glucose is:
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10. Infection is likely to cause:
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C) Nerve problems
D) Lung problems

15. Signs of ketoacidosis include:
A) Shakiness
B) Sweating
C) Vomiting
D) Low blood glucose

16. The most serious complication of diabetes is:
A) Weight gain
B) Delayed wound healing
C) Hypoglycemia
D) Kidney failure

17. After the nurse gives intermediate-acting insulin (NPH), the patient is most likely to have an insulin reaction in:
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19. The nurse observes a patient with diabetes beginning to have a hypoglycemic reaction. What is the best intervention to instruct the patient to do?
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C) Drink some juice
D) Take regular insulin

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A) Too much insulin
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C) Too much food
D) Too little exercise

21. The American Diabetes Association (ADA) definition of hypoglycemia is blood glucose less than:
A) 50 mg/dl
B) 70 mg/dl
C) 95 mg/dl
D) 100 mg/dl

22. High blood glucose may be caused by:
A) Not enough insulin
B) Skipping meals
C) Delaying your snack
D) Large ketones in your urine

23. Which one of the following will most likely cause an insulin reaction?
A) Heavy exercise
B) Infection
C) Overeating
D) Not taking your insulin

Appendix C

Conceptual Diagram (Knowles's Adult Learning Theory)

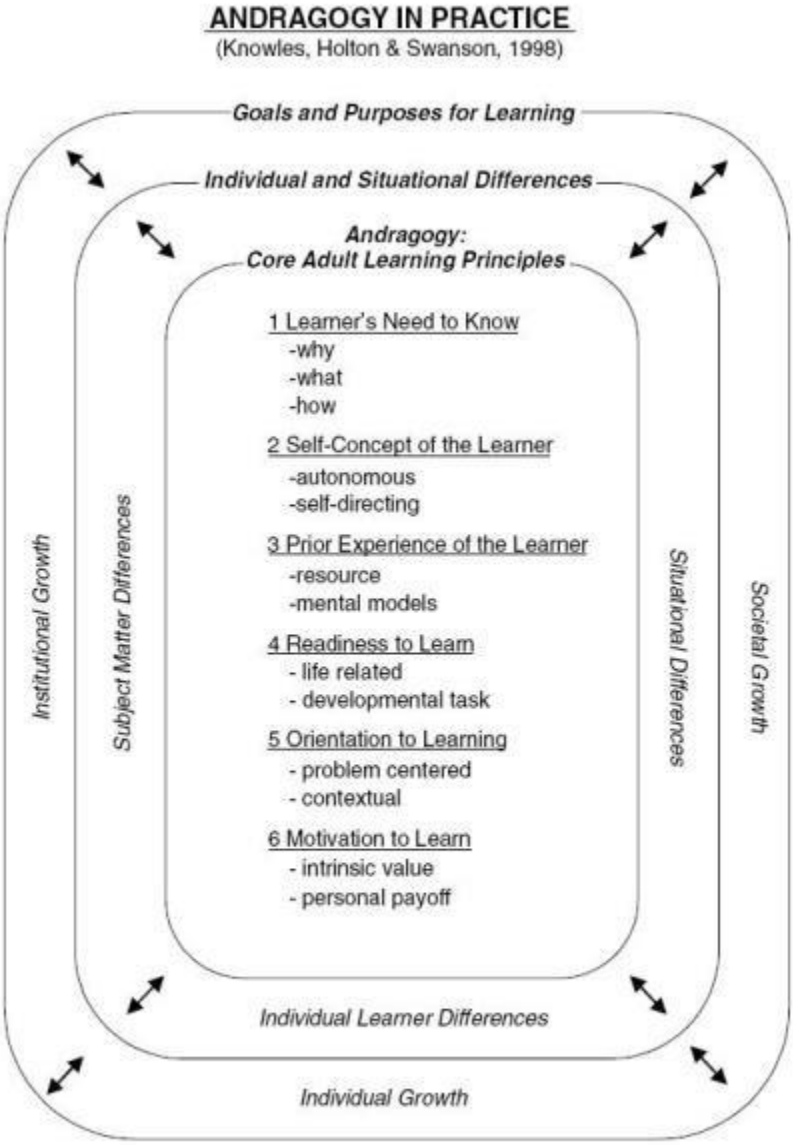


Figure 1-1. *Andragogy in practice (Knowles, Holton, and Swanson, 1998).*

Appendix D

Benner's Novice to Expert Model

Appendix E

Systematic Review Table

Article/Journal	Advancing quality diabetes education through evidence and innovation. *Journal of Nursing Care quality*, 25(2), 160-167, DOI: 10.1097/NCQ.06013e3181bff4fa.	Knowledge of diabetes mellitus among registered nurses in Benin City. International Journal of Health Research, 3(3), 145-151, DOI: 10.4314/ijhr.v3i3.70299.
Author/Year	Gerald, S., Griffin, M., & Fitzpatrick, J. (2010).	Odili, V. & Eke, I. (2010).
Database/Keywords	PubMed/diabetes education/nurses	Google Scholar/diabetes education in hospital
Research Design	Descriptive Correlational Study	Cross Sectional Study
Level of Evidence	VI	VI
Study Aim/Purpose	To examine the levels of perceived and actual knowledge of diabetes (DM) among acute care registered nurses (RNs).	To determine the level of diabetes knowledge and knowledge gaps among registered nurses.
Population/Sample size Criteria/Power	N=93 acute care RNs with direct care. A convenience sample was used. Study conducted at a 305-bed community, teaching hospital, with Magnet designation, in southern New England. A power of 80 was determined by study size. Moderate effect size (r=0.30 for a 2-tailed test with an alpha value of .05).	N=191 RNs working in all the wards of 4 major hospitals in Nigeria. The study was conducted in Benin City, located in southern Nigeria. The wards were visited repeatedly and questionnaires distributed to the nurses at work. Questionnaires that were not completed immediately were collected at a later time.
Methods/Study Appraisal Synthesis Methods	Data was collected through questions based on perceived and actual level of knowledge of DM; age and continued education were factors. There were 400 RNs on staff. Nurses who were not in a clinical role were excluded. Hospital has a decentralized nursing education department with no inpatient DM Educator. Outpatient DM Educator Program offered by the hospital at an on-campus-site.	Data from the questionnaire were entered into Microsoft Excel. SPSS software version 10 and Instat version 3 –descriptive and inferential statistics. Pearson correlation determined the level of association between knowledge scores and relevant demographic variables. Student t-test – determined differences in knowledge score with respect to categorical variables as well as compared knowledge scores of nurses across hospitals. 2-tailed p values were considered significant if less than or =0.05.
Study tool/instrument validity/reliability	3 tools used: a background data form, Diabetes Self-Report Tool (DSRT), and Diabetes Basic Knowledge Test (DBKT). The background data form included demographic information and a question about continuing education hours related to DM. The DRST consist of a Likert scale (1-4) with 20 questions, measuring actual knowledge of DM; Cronbach alpha value was .91 with	A demographic survey and the Diabetes Knowledge Test (DKT) from the Michigan Diabetes Research Training Center (MDRTC). The DKT with proven reliability and validity for the estimation of general diabetes knowledge. DKT is a 23-item multiple choice questionnaire, consisting of questions testing knowledge of diabetes diagnosis, treatment, complications,

	calculation = .81. The DBKT consist of 45 multiple choice questions, assessing knowledge of 20 content areas; modified to 9 of the 45 questions. 7 new questions related to more current DM issues were added to the DBKT. A separate analysis was done with the additional 7 questions. Cronbach alpha of .79 for DBKT with the additional questions; DBKT .75 for original 45 questions.	lifestyle modifications, and insulin management. Each correctly answered question earned a score of 1 and a total score was summed and converted to percentage with 23 or 100% being the maximum score.
Primary Outcome Measures/Results	46 nurses had no DM education in the past 2 years. Nurses' perceived level of knowledge of DM with mean score 60.15 and Likert scale = 3; positively correlated (r=0.402, p<0.0001). Actual level of knowledge of DM demonstrated significant differences in knowledge of various DM concepts; mean score on DBKT was 71.21. Relationship of perceived and actual knowledge was no significant relation between DSRT & DBKT; Pearson correlation –v0.05. Examination of mean DBKT scores by educational level of nurses (MSN/BSN and ADN/diploma) – *t* test indicated no significance (P=.992).	The average score of the 191 participants was 61.9% or 14.15 on a 100 point scale. No nurse was able to correctly answer all questions. 86.9% of nurses recognized long term complications; 86.4% answered correctly questions on symptoms of numbness and tingling, cause of high blood glucose, and problems associated with diabetes. Diet questions received the lowest percentages. There was a statistical difference in the knowledge scores of nurses that had a family history of diabetes and those that did not (P<0.05). 71% of the nurses had not received any recent diabetic education. There was poor correlation between years of experience and diabetes knowledge (r=0.2152, p<0.001).
Conclusions/Implications	Half of the sample that had no continued education on this topic in the previous 2 years. The evidence gained from this study was incorporated into a plan to establish DM education resources for the acute care agency. The nursing leadership of this Magnet hospital was receptive to the evidence presented.	The nurses' knowledge of DM was less than satisfactory. The investigators suggest regular appraisal of nurses' knowledge requirement followed by educational training tailored to improve nurses' level of knowledge. Lack of knowledge or inadequate knowledge among nursing staff has contributed to diabetic patients receiving inadequate health care instruction.
Strengths/Limitations	Strengths: Factors in this study led to an inpatient DM Educator position being established and budgeted for up to 10 hours per week. Limitations: Time to complete the documents ranged from 40 to 60 minutes, which was time consuming for an acute care facility.	Strengths: The results of the study show that all nurses need diabetes management education; the knowledge gap identified in this study can be a focus for initiating educational programs to provide better patient care/teaching.
Funding Source	No funding source identified.	No funding source identified.
Comments	In relation to my Capstone: My hospital setting has a high turnover rate with a diverse group of nurses. Although I may not use the same tools, I will use Pretests and Posttests to assess knowledge of DM. Currently there is no DM education offered at the facility. It is important to identify the learning needs to provide the best care for patients.	In relation to my Capstone: I will be using the DKT evaluation tool. Although I plan to modify the tool, this article gives insight to how the tool was utilized and how the nurses responded to the questionnaire.

Article/Journal	Educating staff nurses on diabetes: knowledge enhancement. *Medical-Surgical Nursing*, 20(3), 143-146, PMID: 21786491.	US nurses' perceptions of their role in diabetes care. *The Diabetes Educator*, 33(1), 152-162, DOI: 10.1177/0145721706298194.
Author/Year	Young, J. (2011).	Siminerio, L., Funnell, M., Peyrot, M., & Rubin, R. (2007).
Database/Keywords	CINAHL/educating nurses/DM management	Google Scholar/diabetes management/education
Research Design	Quasi-experimental Study	Cross-Sectional Design
Level of Evidence	III	VI
Study Aim/Purpose	To evaluate nurses' knowledge of and deficits in management modalities when caring for patients with diabetes (DM).	To examine nurse and physician perceptions of nurse involvement and roles in DM care.
Population/Sample size Criteria/Power	N=60 RNs at a medical center in central Pennsylvania. Convenience sample utilized; all RNs provide direct care. No power identified.	N=51 generalist nurses, 50 diabetes specialist nurses, 166 generalist physicians, and 50 diabetes specialist physicians – (US healthcare providers). The study was conducted in 13 countries representing 11 regions from Asia, Australia, Europe, and North America. Different sampling frames were used in different countries to generate heterogeneous samples from the entire country. The data in this article focuses on the data from US healthcare providers.
Methods/Study Appraisal Synthesis Methods	The project was conducted in 9 inpatient and outpatient areas of the Heart and vascular Institute (HVI) in a 484-bed academic medical center in central Pennsylvania. Patient population consists of patients who had undergone cardiac cardiothoracic and vascular surgery. Prior to offering the education, authors administered a 13 question electronic needs assessment to staff nurses who work in the HVI. The most pertinent needs identified by staff nurses – diabetes pathophysiology, medication management, nursing care, hyperglycemia outcomes, and current guidelines. Flyers and emails were used to notify nurses of education. 10 participants in a group attending live presentations – didactic session. 50 participants completing on-line manual – online session. Quiz and satisfaction surveys administered after receiving education.	All data are cross-sectional self-reports, gathered in mid-2001 by structured interviews conducted either face to face or by telephone that took 30 to 50 minutes to complete. Survey questionnaires were developed after reviewing a variety of diabetes-related instruments and conducting focus groups with patients, providers, and policy makers in 8 countries. Verbal informed consent was obtained from all respondents, and participation was voluntary. Ethical approval obtained from the IRB at Loyola College in Maryland.

Study tool/instrument validity/reliability	2 didactic sessions with PowerPoint, medications, and drug prices; included management of DM and cardiovascular disease from peer-reviewed journal articles. 8 sections of online education manual from same literature as didactic presentation. Didactic received a 15-item quiz based on session content. Quiz for manual consist of 20 items posted online for staff completion, receiving more continuing education (CE). Nurses completed a 6-question satisfaction survey to assess subjects' perceived mastery of the education; Likert scale used. Variation in satisfaction survey questions was based on the different education delivery methods.	Items selected form the full set of survey questions to address the research questions: 1. Are nurses willing to take on more responsibilities for DM care? 2. Wat is nurse involvement in DM management and medication prescribing? 3. Do nurses perceive themselves to be better in terms of promoting self-management than physicians? 4. Do nurses as compared to physicians perceive a need for better understanding of psychosocial issues? 5. Do nurses as compared to physicians perceive a greater need for improved communication between and among health professionals and patients? 6. Are nurses, who specialize in DM, as compared to generalist nurses more involved in DM management, facilitate self-management and participate in DM professional activities?
Primary Outcome Measures/Results	All 10 participants from didactic sessions completed the knowledge quiz and satisfaction survey. 36 subjects in online session completed the knowledge quiz and 30 in the satisfaction survey. Didactic group highly satisfied (100%) with presenter and material. Nurse satisfaction with the online manual showed 58% of respondents were highly satisfied and 42% were satisfied with the material.	Nurses and physicians agreed that nurses should take a larger role in managing DM. Most common differences identified between nurses and physicians were that nurses provide better education, spend more time with patients, were better listeners, and knew their patients better than physicians. All nurses had a high perceived need for better understanding of psychosocial issues and were more likely than physicians to suggest helping patients to take responsibility for their care. Nurses are better communicators. P=significant difference for profession (physician vs nurse); S=significant difference for specialist vs generalist. 98% of participants in the US sample agreed that there is a general need for more DM specialist nurses.
Conclusions/Implications	The satisfaction survey results indicated the staff nurse participants met their learning needs and were satisfied or highly satisfied with the content discussed. Nurses are clearly interested in diabetes education.	This study concluded that there is an increased need for more involvement by nurses, particularly specialist nurses in DM care.
Strengths/Limitations	Strengths: Multiple approaches used to educate nurses about CE credits positively increased participation based on online responses. Limitations: there was no attempt made to assess patient outcomes directly; a small number of nurses participated in didactic sessions; and there was no pre-test used to evaluate nurses' knowledge prior to	Limitations: Dietitians were not included because of the limited number of and access to these professionals in many countries. This limited the US due to specialist dietitians often assume many educational and care responsibilities; the study was limited to nurses, rather than the more inclusive educational team.

	delivering the education.	
Funding Source	No funding source identified.	Funded by Novo Nordisk; grants from the National Institute of Diabetes and digestive and Kidney Diseases of the National Institutes of Health; the US Air Force by the US Army Medical research Acquisition Activity, Fort Detrick, Maryland.
Comments	In relation to Capstone: This study is relevant because it shows that multiple approaches should be used for education. Offering evidence-based materials online may allow more flexibility for staff that's too busy during shift.	In relation to Capstone: This study gives insight to how healthcare providers perceive and identify with DM management in different countries/regions.

Article/Journal	Assessment of diabetes-related knowledge among nursing staff in a hospital setting. *Journal of Diabetes Nursing*, 17(8), 207-218, ISSN: 1368-1109.	An assessment of diabetes-related knowledge among registered nurses working in hospitals in Jordan. *International Nursing Review*, 61, 255-262, DOI: 10.1111/inr.12090.Epub 2014 Feb25.
Author/Year	Abduelkarem, A. & El-Shareif, H. (2013).	Yacoub, M., Demeh, W., Darawad, M., Barr, J., Saleh, A., & Saleh, M. (2014).
Database/Keywords	CINAHL/diabetes education/hospital/management	PubMed/diabetes/diabetes knowledge
Research Design	Non-experimental Descriptive Design	Cross-sectional, Descriptive Design
Level of Evidence	VI	VI
Study Aim/Purpose	To identify areas of deficient knowledge among hospital nurses regarding diabetes (DM) management.	To assess the level of Jordanian nurses' perceived and actual knowledge of diabetes (DM) and examine the relationship between nurses' actual knowledge of DM and their different characteristics.
Population/Sample size Criteria/Power	N=116 nurses working in different departments of the Tripoli Medical Centre Libya. The Tripoli Medical Centre serves as a tertiary care center and teaching hospital.	N=277 RNs from different clinical wards/units at 7 hospitals in Jordan. A convenience sample. 3 governmental, 2 private and 2 university-affiliated hospitals were randomly selected for this study. Statistical power analysis, using a medium effect size (0.30) and an alpha level of 0.05. The post hoc analysis revealed the statistical power for this study exceeding 0.99 for detection of a medium to large effect size.
Methods/Study Appraisal Synthesis Methods	Data was conducted through a 66-item questionnaire that was distributed directly to all the nurses attending DM educational courses as a pre-course test, organized by the author for nurses working at the Centre. The pre-course test was developed by the author; multiple-choice (MC) section of the questionnaire-generated using the American Association of Clinical Endocrinologists' 2002 "knowledge evaluation form". The form was modified and translated into Arabic for the Libyan nurses.	Data was conducted from all RNs who met the criteria of employment on a medical or a surgical unit; a combined medical-surgical or intensive care unit; and obstetrics and gynecology unit where people with DM could be admitted. There were no limitations for age, years of experience or type of employment. RNs were asked to complete self-administered questionnaires.

Study tool/instrument validity/reliability	The 66-item questionnaire included 51 MC questions, 7 true or false, and 8 open-ended questions. All questions referred to DM management and demographics. The nurses completed a questionnaire as a pre-course test. As a post-test, the nurses responded in 1 hour to the questionnaire; were not permitted to ask questions, ask questions, or refer to reference materials. The test was administered by the author. Statistical analysis-SPSS Statistics, version 17. Comparison of scores between groups was performed using t-tests; a P-value of <0.05 was considered significant.	3 questionnaires used for data collection: a demographic questionnaire developed by researchers specifically for this study; DSRT to assess perceived DM knowledge (22 statements with 5-point Likert Scale; and Modified diabetes Basic Knowledge test (MDBKT) to assess the actual level of DM knowledge (45 questions)–created by authors. The questionnaires and permission for use and adaptation were obtained from the authors. Data analyzed using the Statistical Package for social Sciences software version 16; descriptive statistics-identified nurses' actual and perceived knowledge of DM; Pearson's and spearman's correlation coefficients were used to determine the level of association between knowledge scores and relevant demographic variables. Independent-samples t-test-tests the mean knowledge scores differences. Analysis of variance (ANOVA) with Scheffe post hoc test was used to compare nurses' mean knowledge scores based on hospitals and clinical area where they practiced. The P values were considered significant if <0.05. Content validity was tested by consulting a panel of experts in DM and DM education. Final content validity index was calculated at 0.94. The calculated Cronbach's alpha coefficient for internal consistency on the MDBKT and DSRT was 0.77 and 0.80, respectively. Nurses had 35 minutes to complete questionnaires.
Primary Outcome Measures/Results	The mean total score was 48.5. Knowledge was highest for nurses working in pediatrics (62.0; $p<0.05$); mean knowledge scores of nurses working in medicine units (53.0) was significantly higher than those working in surgery (43.6; $p<0.01$) and dermatology (38; $p<0.01$) units. There was no significant effect of gender or family history of DM on total knowledge score or level of knowledge in the subscale questions. There is no significant difference in level of knowledge between Libyan and non-Libyan nurses.	A total of 277 RNs participated and returned questionnaires from 7 hospitals in Jordan. Nurses in this study mostly demonstrated a knowledge deficit in clinical and theoretical-based topics, such as initial treatment of hypoglycemia, insulin storage and preparation; meal planning and duration of action with hypoglycemic agents. Nurses' actual knowledge of DM was positively correlated with their perceived knowledge, perceived competence and level of education.
Conclusions/Implications	The overall knowledge of DM among the nursing staff was found to be lacking. Educational programs covering DM and inpatient DM management would be helpful to improve nurses' knowledge.	The study examined current knowledge among Jordanian RNs regarding DM. A knowledge deficit regarding DM was demonstrated by the nurses who participated in their study. The role of continuing education is essential to supporting nurses' knowledge of complex clinical conditions, such as DM.

Strengths/Limitations	Strengths: The duration of experience was taken into account when comparing non-Libyan nurses to Libyan nurses. After results of the study, local hospital officials and administrators were encouraged to build a system to promote continuous education.	Strengths: This study proves that adequate implementation and dissemination of evidence-based guidelines on caring for people with DM is a prerequisite to improve the nurses' knowledge. Limitations: Study participants were selected using convenience sampling. The length of time needed for nurses exceeded 50 minutes to complete study questionnaires.
Funding Source	No funding source identified.	Supported by the Deanship of Academic Research, the University of Jordan.
Comments	In relation to my Capstone: The nurse manager at my hospital site understands the importance of educating the unit staff. Lack of knowledge is visible. This education can empower the staff and patients.	In relation to my Capstone: This study shows that there is a knowledge deficit among nurses caring for diabetic patients. Evidence-based materials will definitely improve nurses' knowledge and patient care.

Article/Journal	Diabetes management unawareness: what do bedside nurses know? *Applied Nursing Research,* 27(2014), 157-161, DOI: 10.1016/j.apnr.2013.12.003.	Diabetes training for nurses: The effectiveness of an inpatient diabetes half-day workshop, *Journal of Diabetes Nursing*, 17: 86-94, No DOI.
Author/Year	Modic, M., Vanderbilt, M., Siedlecki, S., Sauvey, R., Kaser, N., Y Yager, C. (2013).	Holmes, C. & Dyer, P. (2013).
Database/Keywords	PubMed/diabetes management	Google Scholars/diabetes education/hospitalized
Research Design	Descriptive Correlation Study	Descriptive Study
Level of Evidence	VI	VI
Study Aim/Purpose	Aim #1: Is there a relationship between age and level of knowledge demonstrated on the Diabetes Management Knowledge Assessment Tool (DMKAT)? Aim #2: Is there a difference in level of knowledge demonstrated on the DMKAT based on education or years of experience? Aim #3: Is there a difference in the relationship between nurses' self-rated comfort and familiarity and level of knowledge demonstrated on the DMKAT? Aim #4: Is there a gain in knowledge of inpatient diabetes management principles as demonstrated on the DMKAT after a diabetes course? Purpose: To examine nurses' knowledge of inpatient diabetes management principles before and after a structured diabetes education program.	To assess the effectiveness of training nurses in inpatient diabetes (DM) care through pre- and post-workshops.
Population/Sample size Criteria/Power	N=2250 RNs. Mostly 86.4% females, 80.9% Caucasian, and worked fulltime 71.1%. The mean age of nurses was 36.2 (SD=10.9). The convenience sample was conducted in a large 1200 bed health care center in the Midwest. Participants included RNs in all specialties except operating room and neonatal intensive care unit.	N=336 nurses of 3 Birmingham hospitals: Heartlands Hospital, Good Hope Hospital, and Solihull Hospital. All hospitals are part of The Heart of England NHS Foundation Trust. The NHS in England spends more than 2 billion a year on inpatient care for people with diabetes.
Methods/Study Appraisal Synthesis Methods	This study was designed by 2 inpatient certified diabetes educators (CDEs). The curriculum was based on a previously conducted needs assessment, adhering to a hypoglycemic rescue protocol and insulin error data. The 4 topics covered within the course were hyperglycemia, insulin therapeutics, hypoglycemic prevention and management, and diabetes survival skills. The teaching strategies used in the class included a pre-assessment test, lectures, strategic questioning, and case studies. Following presentation of course content, a posttest was administered, allowing attendees to identify areas for further improvement. A pretest was conducted	Data conducted by carrying out a training needs analysis of nurses' knowledge in DM inpatient care and 3 levels of training needs were identified: basic awareness, enhanced awareness, and advanced training. The Trust carried out a study into the effectiveness of 8 half-day workshops by issuing questionnaires to participants prior to and after the workshop. This was done to: improve quality of care for people with DM while hospitalized; increase knowledge and skills of healthcare professionals; and support inpatient diabetes ward metrics.

	prior to a 4-hour diabetes management course and posttest immediately following course.	
Study tool/instrument validity/reliability	Tool used was the Diabetes Management Knowledge Assessment Tool (DMKAT) – measured nurses' comfort, familiarity, and knowledge of DM management; included the 20 question assessment. Comfort scores summing 8 items, and range from 0-80; construct validity assessed using principle component analysis with varimax rotation which confirmed reliability .87. Familiarity scores, summing the next 6 items in the DMKAT, ranged from 0-60; a factor solution of construct validity – reliability .78. Knowledge portion of tool included 20 multiple choice questions. Content validity – 2 stage Delphi technique. 15 inpatient CDEs from local hospitals served as content experts. 80% of whole test indicated acceptable knowledge of DM management skills for the hospitalized patient. Data analyzed using SPSS version 19.0. Pearson's correlation was used to examine relationships for continuous level data (age) and spearman's was used to assess nominal level data (education level and years of experience). ANCOVA – examined baseline differences in knowledge related to education level and years of experience. A paired t-test examined knowledge. Significance level was set at .01 rather than 0.5, due to large sample to control for likelihood of a type 1 error.	Through website, a DM knowledge questionnaire was administered for baseline knowledge and the same questionnaire repeated at end of course. Questions were selected by DM inpatient team and drawn from DM educational websites, clinical papers, and trust diabetes guidelines. NHS DM e-learning modules completed. At the workshop, nurses received interactive teaching on key components of DM management in hospital; delivered by the DM inpatient specialist nurses and a consultant physician diabetologist. Statistical analyses were performed with Microsoft Excel. Descriptive statistics were performed and relationship between pre- and post-workshop knowledge was analyzed with the t-test. The Cronbach's alpha score was used to assess the reliability of the questionnaire.
Primary Outcome Measures/Results	Nurses' knowledge of inpatient DM management principles was low. There was no correlation between knowledge scores and age, education, employment status, years of experience or clinical specialty. Aim #1: Pearson's correlation-negative correlation (r= .182; p<.001) between age of nurse and level of knowledge demonstrated on the DMKAT. Spearman's correlation-age correlated with education (r=140; p<.001) and nursing experience (r= .729; p< .001). Aim #2: ANOVA – no differences in level of knowledge as demonstrated on the DMKAT based on education level. Aim #3: Pearson's correlation-no correlation between neither comfort (r= .002; p=.912) nor familiarity (r=.013; p=.556) and diabetes knowledge. Correlation found between comfort and familiarity (r=706; p<.001. Aim #4: Paired t-test significant increase in scores from pretest (x=11) to posttest (x=20).	336 nurses completed the pre-workshop questionnaire. 286 completed post-workshop questionnaire. The questionnaire was found to have a high overall internal consistency by a Cronbach alpha of 0.80. A significant number of nurses' subjective confidence improved following the workshop (P<0.001). Mean scores rose from 59 to 67 in the 3 centers (P<0.05).The results indicate that the workshops were an effective method of training nurses in DM care and the authors suggest hospitals should encourage training in this area.

	It is unclear whether some of the questions were confusing.	
Conclusions/Implications	This study concluded that nurses do not feel comfortable and are not adequately prepared to make patient care decisions or provide survival skill education for patients with DM in the hospital. The nurses' knowledge of DM management principles of the hospitalized patient was low, and this may be due in part to the inability to keep up with the rapidly changing technologies and drug regimens. While this study demonstrates an improvement in knowledge related to attendance at this educational program, it is unclear whether these gains were sustained over time.	Diabetes is highly prevalent in hospital inpatients. All healthcare providers should have a basic knowledge of how to manage people with DM when they are admitted. Knowledge alone is not sufficient to result in changes to practice; methods of empowering nurses are also important.
Strengths/Limitations	Limitations: This study took place in a single facility that may not be like other facilities; however, the large sample and diverse age, education level, and years of experience for this sample suggest that findings may be generalizable to other facilities with a similar mix. Although the instrument and knowledge test underwent rigorous content evaluation by a team of content experts, psychometric analysis of the individual knowledge questions was not done – discriminant validity of individual questions is not known.	Strengths: The interactive nature of the workshop, with numerous case studies and worked examples, was strength of the workshop. It enabled nurses to translate what was being taught back to their clinical areas but also allowed them to work out the best course of management in each situation. Limitation: Only half-day training was provided.
Funding Source	No funding source identified.	No funding source identified.
Comments	In relation to my Capstone: Once again, this proves that nurses' knowledge of DM management improves with proper education.	In relation to my Capstone: The education training can positively empower the nurses. All nurses on the unit need basic knowledge of caring for DM patients. I plan to use different methods of teaching so that the information can be learned and retained. Increasing knowledge will improve patient's care. This study shows that diabetes training is effective in the hospital setting.

Article/Journal	Barriers to diabetes management: Patient and provider factors. *Diabetes Research and Clinical Practice,* 93(2011), DOI: http://dx.doi.org/10.1016/j.dibres.2011.02.002.	Barriers and benefits associated with nurses' information seeking related to patient education needs on clinical nursing units. *The Open Nursing Journal,* 5: 24-30, DOI: 10.274/1874434601105010024.
Author/Year	Nam, S., Chesla, C., Stotts, N., Kroon, L. & Janson, S. (2011)	Jones, J., Schilling, K., & Pesut, D. (2011).
Database/Keywords	PubMed/diabetes management/barriers/hospital	PubMed/diabetes/knowledge/patient education
Research Design	Systematic review	Qualitative Exploratory Design
Level of Evidence	Level I	VI
Study Aim/Purpose	Purpose: To summarize existing knowledge regarding various barriers of diabetes management from the perspectives of both patients and clinicians.	Purpose of this study was to answer the following 2 questions: What are clinical nurses' rationales for their approaches to finding patient educational materials on the web? What are perceived barriers and benefits associated with the use of web-based information resources for patient education in the context of nursing clinical practice?
Population/Sample size Criteria/Power	N=80 studies for review. PubMed, CINAHL, ERIC, & PsycINFO searched from January 1, 1990-June 1, 2009, using key words: Type 2 diabetes, diabetes, barriers, diabetes self-management, treat guidelines, adherence, and diabetes care. Includes cross-sectional studies, RCTs, observational studies, and qualitative studies.	N=8 nurses recruited from an urban teaching hospital with multiple affiliated clinics and a small urban community hospital with an associated home care agency. Both institutions value patient education. All participants were Caucasian; 7 females and 1 male. 2 of the 8 participants were formal nurse patient educators. The remaining 6 worked as clinical nurses on medical-pediatric, surgical, and day-surgery units. All had significant computer experience (>2 years) and used computers every day at work or at home. This was a convenience sample. No power identified.
Methods/Study Appraisal Synthesis Methods	Of 1454 citations, 1353 were excluded based on the table and abstract non-relevant to Type 2 diabetes mellitus (T2DM). 21 of 101 full text articles did not specifically focus on barriers to diabetes control or self-management. A total of 80 studies were included in the review, which related to knowledge of various barriers of diabetes management from the perspectives of both patients and clinicians. Patient factors included: adherence, attitudes/beliefs, knowledge, culture/ethnicity/language, financial	Over 179 individual data units were analyzed to understand clinical nurses' rationales for their approaches to find patient educational materials on the web. The observation of nurse participants on the clinical units provided fundamental data about the practice context and the issues that emerge when information seeking is required. In the teaching hospital, patient education is coordinated

	resources, co-morbidities, and social support. Healthcare provider's factors included: beliefs/attitudes/knowledge, patient-provider interaction/communication, and healthcare system.	through the "Learning Center"; at the community hospital, patient education is integrated into daily nursing care. Most nurses make heavy use of the standardized educational materials on the hospitals' intranets.
Study tool/instrument validity/reliability	Evidence-based searches of PubMed, CINAHL, ERIC, and PsycINFO were utilized to conduct this systematic review.	The nurse participants were observed on their clinical units on 16 separate occasions (two observations per participant), lasting between 30 minutes to 2 hours. Participants' comments were audio-taped and later transcribed. A detailed log of the search path, search history, and search terms was recorded. The research observer took field notes during the observation. Open-ended questionnaire completed immediately after finishing their searches. 2 independent analysts with expertise in qualitative research methods and knowledge of patient education were recruited to assist in content analysis. Inter-rater reliability was assessed with excellent correlation coefficients ranging from 0.782 to 0.990. Content analysis identified 306 individual data units representing either benefits (178 units) or barriers (128) to nurses' use of web resource for on-unit patient care.
Primary Outcome Measures/Results	Findings for Patient Factors include: (1) adherence - can reduce mortality and disability, improve quality of life, and reduce healthcare costs; (2) attitudes and beliefs – affects the way they perceive the need for and importance of self-management education; (3) knowledge – relationship between knowledge and health outcomes is inconsistent, not necessarily leading to risk-reducing behavior; (4)culture/ethnicity/language – culture influences an individual's beliefs, attitudes, knowledge, and behaviors, and in turn, can affect diabetes self-management; (5) Financial resources – cost of treatment may be a significant barrier to diabetes treatment, particularly for patients with a low socioeconomic status and limited to no health insurance coverage; (6) co-morbidities – people with multiple chronic conditions frequently experience barriers to self-management due to the simultaneous demands of competing co-morbidities; (7) social support – numerous studies showed that lack of social support affects perceived barriers to self-care and future mortality and morbidity; mixed results shown. Findings for HealthCare Provider Factors include: (1) beliefs/attitudes/knowledge –	9 rationales were detected related to why nurses search the web. 4 primary themes emerged as barriers to the use of web-based resources: time requirements to perform a search; nurses' experience and knowledge about the resources or required technology; specific characteristics of individuals' electronic information resources; and organizational procedures and policies. 3 primary themes represented the benefits: past experiences and knowledge of a specific resource or the required technologies; availability and accessibility on the unit; and specific characteristics of individual information tool.

	physicians' attitudes toward diabetes management may be more important than their actual knowledge of the disease; (2) patient-provider interaction/communication – patients' disease perceptions are influenced by the types of services they receive and the types of healthcare professionals they encounter as part of their diabetes care; (3) health care system – over 75% of individuals diagnosed with T2DM receive diabetes care exclusively from primary care providers; yet only about one-third of patients with T2DM correctly follow the health care provider's directions for diabetes care.	
Conclusions/Implications	The study concluded that clinicians may further influence the patient's perception through effective communication skills and by having a well-integrated health care system. Identifying barriers to diabetes management is necessary to improve the quality of diabetes care, including the improvement of metabolic control, and diabetes self-management. Further research that considers these barriers is necessary for developing interventions for individuals with T2DM. An adequate infrastructure and system change should take place at both the organizational and community level. Identifying various stakeholders and building a collaborative partnership with them will reduce the significant gap between what is known about diabetes care and what is commonly practiced in primary care.	Information searching is the interaction between and among information users and computer-based information systems. This research investigated how the use of information technology for the retrieval of patient educational material supports and expands patient education.
Strengths/Limitations	Limitations: A number of methodological issues, including causality, selection bias, self-report, confounders, and measurement issues limit the studies reviewed for exploring patient factors. Another limitation is that most RCTs were primarily conducted in primary care settings and research subjects were physician providers rather than nurse practitioners, dieticians, pharmacist and other diabetes educators who commonly provide diabetes care. The patients in the reviewed RCTs were primarily Caucasian instead of population of underserved ethnic minorities with rates of high mortality and morbidity who disproportionately suffer from diabetes.	Strengths: This study provides empirical evidences related to the barriers and benefits of information seeking in the context of patient education needs in inpatient clinical settings. Limitations: The study was small and homogenous sample. A high level of subjectivity inherent in qualitative exploratory studies may weaken results.
Funding Source	Financial support: California Endowment and American Association of Colleges of Nursing (AACN), Nurse Faculty Program, 2007-2009.	No funding source identified.

Comments	In relation to my Capstone: Knowledge of communication with diabetic patients is essential. My DM education will include the importance of interacting with patient to understand patient's perception of illness and identify deficits with DM management. It is important for the nurses to assess the patient's needs to provide the best interventions.	In relation to my Capstone: It is important that nurses develop and master information seeking skills for assessing and finding resources to provide to patients and caregivers. Technology is rapidly advancing. I plan to include evidence-based websites related to DM management during my teaching. Nurses need to access information to help make better decisions and improve communication with patients.

Article/Journal	Glycemic control and diabetes management in hospitalized patients in Brazil. *Journal of Diabetology & Metabolic Syndrome*, 5:62, DOI: 10.1186/1758-5996-5-62.	Glycemic effectiveness and medication adherence with fixed-dose combination or coadministered dual therapy of antihyperglycemic regimens: A meta-analysis. *Current Medical Research & Opinions*, 28(6), 969-977, DOI: 10.1185/03007995.2012.684045.
Author/Year	Moreira, E., Silveira, P., Neves, R., & Souza, C. (2013)	Han, S., Iglay, K., Davies, M., Zhang, Q., & Radican, L. (2012).
Database/Keywords	PubMed/diabetes/glycemic control	Google Scholars/diabetes/glycemic
Research Design	Cross-sectional Descriptive Study	Systematic Review & Meta-analysis
Level of Evidence	VI	I
Study Aim/Purpose	To assess glycemic control and diabetes (DM) management in adult patients admitted to hospitals in Brazil.	To compare effects of fixed-dosed combinations (FDCs) and coadministered dual therapy (CDT) of antihyperglycemic agents on glycemic control and medication adherence.
Population/Sample size Criteria/Power	N=2399 patients at 24 hospitals located in 13 cities belonging to all 5 Brazilian regions. Higher proportion of males than females. No power identified.	N=1246 abstracts identified. These articles were limited to studies that compared equivalent drug components within FDC and CDT.
Methods/Study Appraisal Synthesis Methods	For site selection, each of the participating cities where identified by a list of candidate hospitals to be chosen from those with longer experience in clinical research and epidemiological surveys. Each medical center had to be a general hospital, medium to large size (>50 beds), with registry of primary and secondary diagnosis for all inpatients, and had to have medical chart archives accessible to study data collectors in order to gather information from patient charts. Hospitals joining the study were classified as academic (7), public (6), or private (11). Inclusion: > or= 18 years of age, known diagnosis of DM type 1 or 2 either prior to admission or during the hospitalization, and 72-hour or longer length of stay in the hospital. Exclusion: admitted for DM ketoacidosis, hyperosmolar hyperglycemic state or gestational DM, history of pancreatic transplant, or on hospice or palliative care during hospitalization. Each hospital was asked to enroll at least 80 and no more than 120 patients.	Searches used PubMed (1966-2011), EMBASE (1974-2011), Web of Knowledge (1950-2011), and the Cochrane Library. Of the 1246 identified abstracts, 152 articles were reviewed and 10 met the inclusion criteria. There were no restrictions on the year of publication. Limited to articles in English. The final search was performed through November 2011. The results were extracted and pooled in a meta-analysis, using a random-effects model. Cohort comparisons were described as mean differences with 95% confidence intervals.

Study tool/instrument validity/reliability	Socio-demographic information, hospitalization details, and data on DM diagnosis, management and treatment were collected for all patients by chart review using a structured questionnaire. Information on all blood glucose (BG) readings for a maximum of 20 consecutive days of hospitalization was recorded for each patient. BG measurements were recorded for each measurement day as available, both bedside and laboratory serum glucose values were utilized. Appropriate insulin therapy was defined as scheduled subcutaneous insulin that delivers basal, nutritional and correction components for non-critically ill patients and as continuous intravenous insulin for critically ill patients. Glycosylated hemoglobin (A1C) values included if recorded during 1st week of hospitalization or within 30 days prior to admission. 2 analytic approaches for reporting BG levels: (1) the patient day approach – grouped BG levels by calendar day for each patient and then calculated a mean BG level for each patient day, (2) the patient approach – employed each patient's mean BG level for entire hospitalization as a single data point. A hospital questionnaire completed at each hospital. Statistical analyses performed with Stata version 10.	Articles were screened and selected if they compared the efficacy and/or the adherence between FDC and CDT. The search results were independently screened and reviewed by 2 authors. The 2 reviewers independently extracted the data from the selected articles using a standardized form , which was used to collect study methodology information such as the study design type, study size, study time period, comparison drugs, time of follow-up, adjustment of confounding variables, outcomes reported, and the study results. The extracted data were cross-checked and any disagreements were resolved through a consensus based on the study details. The endpoints of interest included glycemic control (HbA1c) and medication possession ratio (MPR). Since HbA1c and MPR are continuous variables, the mean difference was used to compare the results. A random effects model was used for the meta-analyses. Sensitivity analysis was performed to explore the changes of the effect sized due to varying methodologies of the studies. The quality assessment and risk of bias was qualitatively assessed for the studies. The statistical analyses were conducted using MIX 1.7.
Primary Outcome Measures/Results	The Southeast and South regions contributed more patients to the study, while the North and Mid-west regions contributed fewer patients, resembling the demographic distribution of population in Brazil. Most patient had DM Type 2 and the information on DM type was missing in over on third of the patients. The prevalence of patients presenting hyperglycemic or hypoglycemic events was 89.4% and 30.9% in patients in general wards, and 88.2% and 27.7% in Intensive Care Units, respectively.	The 10 articles that met the inclusion criteria had a total study size of 70,573 patients. 4 articles reported HbA1c results, which had a total of 5 cohort comparisons of FDC and CDT use. The meta-analysis revealed a significantly greater HbA1c reduction with FDC (MD = -.053% Cl: 0.78, -0.28; p<0.0001). 8 studies evaluated medication adherence (MPR) –a total of 12 cohort comparisons were made and were further divided into 3 subgroups based on comparison types. 5 comparisons described MPR for FDC versus CDT cohorts, with significantly higher MPR with FDC (MD = 8.6% (95% Cl: 1.6, 15.6; p=0.0162). 4 comparisons examined patients who switched from monotherapy to FDC or CDT, with higher MPR for patients who switched to FDC. 3 comparisons described results for patients who switched from CDT to FDC or stayed on CDT, with higher MPR for patients who switched to FDC.

Conclusions/Implications	Inpatient glycemic control and DM management needs improvement. Opportunities to improve care in Brazilian hospitals include expanded use of intravenous insulin and subcutaneous basal-bolus insulin institution wide quality improvement efforts targeting both physician and nursing behavior.	In a meta-analysis, use of FDCs with antihyperglycemic agents was associated with lower HbA1c and higher MPR values compared to CDT use in patients with type 2 DM. In summary, use of fixed-dose combination therapy with antihyperglycemic agents was associated with improved glycemic control and medication adherence compared to coadministerd dual therapy in patients with type 2 DM.
Strengths/Limitations	Strengths: Strengths include its data collection methods with rigorous inclusion criteria, collection of detailed glycemic data by a team of non-staff trained personnel, and use of various statistical approaches to more accurately assess glycemic control. Limitations: The data are retrospective and only a limited number of clinical variables could be assessed for each patient. There was no practical method to assess nutritional status or the adequacy of insulin dosing over time for each patient.	Strengths: The present results of better adherence and efficacy with fixed-dose combination therapy are supported by results from other therapeutic classes including antihypertensive agents, antiretroviral therapies for HIV, and lipid-modifying therapies. Limitations: since these studies were not randomized, other confounders or selection bias could be present. The present analysis used abstracts to potentially counter publication bias, but abstracts have incomplete information.
Funding Source	Funded by a research grant from Sanofi-Aventis, which played a role in and provided support for the study in the following ways: design and conduct of the study, data collection and monitoring, and approval of final version of manuscript.	Funded by Merck Sharp & Dohme Corp., a subsidiary of Merck & CO., Inc., Whitehouse Station, NJ, USA.
Comments	In relation to my Capstone: My education will include the importance of controlling glycemic levels and insulin therapy. These factors are significant when providing care to diabetic patients	In relation to Capstone: This information can be provided in my teaching plan, relating to improving glycemic control and importance of managing patients' medications and glucose levels while hospitalized.

Article/Journal	Risk factors for hospital-acquired "poor glycemic control": A case-control study. *International Journal for Quality in Health Care,* (2010) 1-8, DOI: 10.1093/intqhc/mzq067.	Patient empowerment and optimal glycemic control. *Current Medical Research & Opinion,* 28(6), DOI: 10.1185/03007995.292.677417.
Author/Year	McHugh, M., Shang, J., Sloane, D., & Aiken, L. (2010).	White, R. (2012)
Database/Keywords	Google Scholars/diabetes/glycemic control/hospital	Google Scholars/diabetes education/glycemic control/empower
Research Design	Randomized Nested Case-control Study	Narrative Non-systematic Meta-analysis
Level of Evidence	II	III
Study Aim/Purpose	To determine the patient and hospital characteristics associated with severe manifestation of poor glycemic control - a no-pay hospital-acquired condition defined by the US Medicare program based on hospital claims related to severe complications of diabetes (DM).	To update clinicians on strategies of insulin use and educational approaches to empower their patients to use insulin correctly in self-management treatment plans.
Population/Sample size Criteria/Power	N=261 patients with manifestations of poor glycemic control (not present on admission) admitted to California acute care hospitals from 2005 to 2006.	N=562 articles from guidelines from the American Association of clinical Endocrinologists (AACE), the American Diabetes Association (ADA), and the European Association for the Study of Diabetes (EASD).
Methods/Study Appraisal Synthesis Methods	261 controls were matched (1:1) using administrative data for age, sex, major diagnostic category and severity of illness. The study data also include present on admission indicators necessary for evaluating hospital-acquired conditions. The cohort for selecting cases and controls included adult patients aged 18 years and older with DM (ICD-9 codes 250) treated in an inpatient prospective payment system participating adult, non-federal, acute care hospital in California for the years of 2005-2006. Secondary diagnosis codes were excluded. Data from the American Hospital Association Annual Survey (AHAAS) from the years 2005-2006 were merged with patient data to identify hospital characteristics.	The resources for the sample focused on the treatment of diabetes (DM), the design of clinical trials, and the assessment safety profiles and efficacy of several insulin types. A PubMed literature search was conducted to identify peer-reviewed clinical trials published in English in the last 10 years. Publications that only addressed oral antidiabetic drugs, letters, commentaries, and case studies were excluded. Inclusion: selected article bibliographies were reviewed and referenced.
Study tool/instrument validity/reliability	Data on hospital organizational characteristics were drawn from the AHAAS and included hospital bed size, ownership, teaching status and registered nurse (RN) staffing. Cases were compared with matched and	Search terms: glycemic control, insulin, type 2 DM, empowerment, and self-management. Following a review of the abstracts, full test articles that met all the criteria were obtained. Articles with clinical data pertaining to the efficacy, safety, and

	unmatched controls using the Cochran-Mantel-Haenszel chi-square test for categorical variables and 2-tailed t-tests for continuous variables. Univariate conditional logistic regression models were estimated to evaluate the relationship between each risk factor and poor glycemic control using the matched case-control data. Odds ratios and 95% CIs were calculated using multivariate conditional logistic regression models to estimate the effect of hospital characteristics after controlling for patient risk factors using the matched case-control data. Analyses were conducted using the STATA version 10 statistical software program. Main outcome measures: the adjusted odds ratio (OR) for experiencing poor glycemic control.	tolerability of insulin as well as data on the role of patient empowerment in DM care were included. Studies were included depending on quality study design, methodology and clinical relevance. Oral antidiabetes agents in conjunction with insulin are not addressed.
Primary Outcome Measures/Results	Deaths (16 vs. 9%, P = 0.01) and total costs were significantly higher among poor glycemic control cases. Risk-adjusted conditional logistic regression revealed that each additional chronic condition increased the odds of poor glycemic control by 12% (OR: 1.12, 95% CI: 1.04-1.22). the interaction of RN staffing and hospital teaching status suggested that in non-teaching hospitals, each additional nursing hour per adjusted patient day significantly reduced the odds of poor glycemic control by 16% (OR: 0.84, 95% CI: 0.73-0.96). Nurse staffing was not significant in teaching hospitals (OR: 0.98, 95% CI: 0.88-1.11).	A total of 562 articles were initially identified. Papers that did not provide data pertinent to the efficacy and tolerance of insulin types for treatment of type 2 DM were excluded. Based on methodology, results, and clinical implications, 12 clinical trials were included for discussion in this review.
Conclusions/Implications	Severe poor glycemic control complications are relatively rare but meaningful events with disproportionately high costs and mortality. Increasing nurse resources may be an effective strategy in reducing poor glycemic control complications particularly in non-teaching hospitals.	Patients with type 2 DM who are empowered with knowledge about their disease and treatment can take an active role in their DM care, and therefore, are more likely to achieve blood glucose and A1c goals, which can slow progression of their disease and the onset of complications. Educational strategies such as interactive teaching, problem solving, and individualized education can have a positively impact on diabetic patients.
Strengths/Limitations	Strengths: This study found that the effect of nurse staffing depended on hospital teaching status. Limitations: The cross-sectional nature of this study limits ability to draw conclusions about causation. It is also possible that there was systematic undercoding of manifestations of poor glycemic control.	Strengths: The study proves that there are benefits of early optimal and intensive glycemic control. Limitations: Not all relevant publications were identified in the PubMed search because they were not indexed in a manner that met the search criteria employed. The identification of relevant publications was performed by the author; therefore, there is the potential for subjectivity.

Funding Source	Supported by University of Pennsylvania University Research foundation, the Agency for Healthcare Research and Quality, and the National Institute of Nursing Research.	Funding to support the preparation of manuscript was provided by Novo Nordisk, Inc.
Comments	In relation to my Capstone: This can be used as a part of education, relating to importance of glycemic control and lowering healthcare costs.	In relation to my Capstone: Glycemic control is one of my education topics. By using interactive teaching/problem solving/variety of teaching methods, the nurses can instill these values into patients. The nurse and patient will become empowered. The main focus is on achieving BG and A1c goals.

Article/Journal	Hypoglycemia is associated with increased length of stay and mortality in people with diabetes who are hospitalized? *Diabetic Medicine*, 29: e445-e448, DOI: 10.1111/dme.12002.	Evidence linking hypoglycemic events to an increased risk of acute cardiovascular events in patients with type 2 diabetes. *Diabetes Care*, 34: 1164-1170, DOI: 10.2337/dcio-1915.
Author/Year	Nirantharakumar, K., Marshall, T., Kennedy, A., & Narendran, P. (2012)	Johnston, S., Conner, C., Aagren, M., & Smith, D. (2011)
Database/Keywords	Google Scholars/diabetes/hypoglycemia/hospitalized	PubMed/diabetes/hypoglycemia/hospitalized
Research Design	Retrospective Descriptive Study	Retrospective Observational Study
Level of Evidence	IV	IV
Study Aim/Purpose	To study the length of stay and inpatient mortality of patients with diabetes (DM) who had an episode of hypoglycemia in a non-clinical care setting at University Hospital Birmingham, UK.	To examine the association between ICD-9-CM-coded outpatients hypoglycemic events (HEs) and acute cardiovascular events (ACVEs) in patients with type 2 diabetes (T2DM).
Population/Sample size Criteria/Power	N=25,118 electronic data of patient admissions with DM; all were age 16 and older; registered in the Patient Administration System as having been admitted to University Hospital Birmingham between 2007-2010.	N=860,845 patient claims with diagnosis T2DM; derived from healthcare claims for individuals with employer-sponsored primary or Medicare supplemental insurance. All participants age 18 and older.
Methods/Study Appraisal Synthesis Methods	Patient Administration System data were linked to the Patient Information and Communication System data and patients with a recorded diagnosis of DM in the Patient administration System, or who did not have a DM diagnostic code but were identified in the Patient Information and communication System as having received treatment with anti-diabetic medication, were classed as having DM if they did not meet exclusion criteria. Exclusion: patients on metformin, patients who received short- or rapid-acting insulin alone, patients with one or more ICU stay, and inconsistent records. Inclusion: only patients with at least one recorded blood glucose concentration.	Data were derived from inpatient, outpatient, and outpatient prescription drug claims and encounter records for approximately 43 million employees and dependents with employer-sponsored primary or Medicare supplemental insurance. Two consecutive years of data from the Commercial and Medicare databases utilized.
Study tool/instrument validity/reliability	The National Health Service (NHS) Diabetes guideline treatment cut-off value (blood glucose values of 3.9 or less) to categorize hypoglycemia was used. Cut-off blood glucose value of 2.2 for severe hypoglycemia. Admissions were categorized based on the lowest value of blood glucose recorded during the spell. To allow for the clustering effect of some of the patients being admitted more than once, a multi-level model, using mixed-effect logistic	The 1st year (baseline period) was used to select a prevalence-based sample of patients with T2DM and identify their baseline demographic and clinical information. The 2nd year (evaluation period) was used to evaluate the presence of HEs and ACVEs. Inclusion: at least one claim with a diagnosis code for T2DM and no claims with code for T1DM; with at least 2 prescription claims for antidiabetic drugs; at least 18 years of age at start of baseline period; and

	regression, was used to study the inpatient mortality outcome; a mixed-effect linear regression model was used to study length of stay. Charlson co-morbidity score used.	continuous enrollment and pharmacy benefits throughout the 24-month study period, except death due to acute cardiovascular disease. Bivariate descriptive statistics used to test for statistical significant differences; A P value of 0.05 was maximum P value for which differences were considered statistically significant. Multiple logistic regressions used to examine the association between HEs occurring during the evaluation period and any ACVE occurring during the evaluation period.
Primary Outcome Measures/Results	There were 148 admissions with severe hypoglycemia, 500 admissions with mild to moderate hypoglycemia and 5726 admissions with no recorded hypoglycemic episode. After adjustment, length of stay, when compared with those without a recorded hypoglycemic episode, was 1.51 (95% Cl 1.35-1.68) times higher in the group with blood glucose values of 2.3-3.9 and 2.33 (95% Cl 1.91-2.84) higher in the group with blood glucose values <2.2. Adjusted odds ratio of inpatient mortality when compared with the group without hypoglycemia was 1.62 (95% Cl 1.16-2.27) in the group with blood glucose values of 2.3-3.9 and 2.05 (95% Cl 1.24-3.38) in the group with blood glucose values <2.2. Confidence interval 95% and P-values less than 0.05 were deemed significant. Data was analyzed using Stata 10 software and the generalized estimating equation (GEE) class of models.	Of the 860,845 patients in the analysis set, 27,065 (31%) had ICD-9-CM-coded HEs during the evaluation period. The main model retained 17 significant independent variables. Patients with HEs had 79% higher regression-adjusted odds (HE odds ratio 1.79; 95% Cl 1.69-1.89) of ACVEs than patients without HEs; results in patients aged 65 or greater were similar to those for the entire population (HE odds ratio 1.78, 98% Cl 1.65-1.92). All analyses were conducted using SAS 9.1 and 9.2. To test sensitivity, a secondary independent variable was a dichotomous indicator for the occurrence of HEs in the period from 1 to 365 days immediately preceding the date of an ACVE. The sensitivity analysis used a modeling approach, specification, and variable selection criteria that were otherwise identical to those used in the primary models.
Conclusions/Implications	Hypoglycemia is associated with increased length of stay and inpatient mortality. While causative evidence is lacking, our data are consistent with the need to avoid hypoglycemia in our current and continued approach for optimal glycemic control in people with DM admitted to hospital.	ICD-9-CM-coded HEs were independently associated with an increased risk of ACVEs. Further studies of the relationship between hypoglycemia and the risk of ACVEs are warranted.
Strengths/Limitations	Strengths: This study, in relation to previous studies, indicates hypoglycemia as either being a marker of poor prognosis or that the patients are being at risk of an adverse outcome as a consequence of hypoglycemia. Limitations: The inconsistent availability of electronic blood glucose values for admissions with DM and the retrospective nature of the study.	Strengths: The study results contribute uniquely to the body of recent findings related to the complex relationship between hypoglycemia and adverse outcomes. Limitations: In administrative claims data, clinical information is extracted from ICD-9-CM diagnosis and various procedure coding systems that are used by physicians to support claims for reimbursement. Such coding may result in misclassification error if the codes are incorrectly coded, misused, or not recorded at all. The study results do not represent proof of causal associations.

Funding Source	Funded by the National Institute for Health Research (NHR) through the Collaborations for Leadership in Applied Health Research and Care for Birmingham and Black Country (CLAHRC-BBC) programme.	Funded by Novo Nordisk.
Comments	In relation to my Capstone: Hypoglycemia is one of the main complications of DM that will be a part of my educational offering. Nurses need to understand that proper interventions/treatments can benefit the patient and prevent adding more days to hospitalization. This causes a burden on health care.	In relation to my Capstone: Teaching related to hypoglycemia and other complications while caring for patients with diabetes.

Article/Journal	To what extent do nurses use research in clinical practice? A systematic review. *Implementation Science*, 6:21, DOI: 10.1186/1748-5908-6-21.	Impact of healthy lifestyle on the patients of diabetes mellitus. *Journal of Universal College of Medical Sciences*, 1(2), DOI: 10.3126/jucms.v/i2.8407.
Author/Year	Squires, J., Hutchinson, A., Bostrom, A., & O'Rourke, H. (2011)	Srivastav, S., Khare, R., & Kumar, A. (2013)
Database/Keywords	Google Scholar/Diabetes education/research	Google Scholar/impaired glucose/diabetes
Research Design	Systematic Review	Prospective Randomized Trial
Level of Evidence	I	II
Study Aim/Purpose	To systematically identify and analyze the available evidence related to the extent to which nurses use research findings in practice.	Aims: To increase the knowledge about the disease and self-care. To improve/promote a change in health related behavior of patients of diabetes (DM) and impaired group. To emphasize importance of control measures in avoiding further complications. To develop understanding balance between nutrition, exercise and medication. To enable patients to live with quality life through self-restrain in terms of unhealthy practices like drug addiction, junk food, and sedentary habit, etc.
Population/Sample size Criteria/Power	N=13 online bibliographic databases: Cochrane Database of Systematic Reviews (SR), Cochrane Central Register of Controlled Trials, MEDLINE, CINAHL, EMBASE, HAPI, Web of Science , SCOPUS, OCLC Papers First, OCLC World Cat, ABI Inform, Sociological Abstracts, and Dissertation Abstracts. N=55 articles for inclusion of this study, after refined search.	N=264 participants; located at the Swarn Jayanti Park in the city of Lucknow in India.
Methods/Study Appraisal Synthesis Methods	The study was a SR of published and grey literature. Inclusion criteria consisted of primary research reports that assess professional nurses' use of research in practice, written in the English or Scandinavian languages. Experimental (intervention) and non-experimental designs that examined the use of research by nurses in clinical practice were included. Extent of research use was determined by assigning research use scores reported in each article to one of	Study conducted through identification of problem area and problem group. The publicity was done in the park and nearby houses of the area with free test for detection of DM, on a fixed date and time. Study period from January to June 2010. Research question: Impact of healthy life style modification on the patients of DM and impaired group.

	four quartiles: low, moderate-low, moderate-high, or high. Exclusion: articles that reported on nurses' adherence to clinical practice guidelines; articles that reported on predictors or barriers to research utilization if they didn't also report on nurses' use of research in their practice; and articles where a quantitative measure of the extent of research use was not provided or could not be derived from the data reported. The search strategy was developed in consultation with a health sciences librarian. All databases in the sample above were searched. 2 team members (JES and HMO) independently screened the titles and abstracts of the 12,418 citations. A total of 55 articles were retained. All included articles (n=55_ were independently assessed for methodological quality by 2 reviewers. Data extracted on : study design, country, sample and subject characteristics, setting, measure of research use, reliability and validity, main findings with respect to use of research and the intervention. For the 4 intervention studies, data extracted on both pre- and post-research use score. Disagreements in data extraction were resolved through consensus.	
Study tool/instrument validity/reliability	2 tools used. The 1st tool - Estabrooks' Quality Assessment and Validity Tool for Cross-Sectional Studies. The tool contains a maximum of 16 points and assesses studies in 3 core areas: sampling, measurement, and statistical analysis. Measured as weak, moderate-weak, moderate-strong, or strong. This tool assessed the methodological quality of all cross-sectional studies included in the review (n=51). The 2nd tool – Quality Assessment Tool for Quantitative Studies, which was suitable to be used in SR of effectiveness measuring interventions. Measured as weak, moderate ore strong. Assessed all intervention studies included (n=4).	Field intervention. Structured interview formats (interview form and history sheets) for data collection. Techniques used; lecture discussion, group discussion, demonstration and video, question and answer sessions, DM support group session. Fasting blood glucose was measured by means of glucometer 4.6. Randomly selected study and control group as follows: (1) Diabetic group – (study group) who will take drug and exercise both; (control group) who will take drug only and no exercise; (2) Impaired group – (study group) who will take exercise; (control group) who will not take exercise.
Primary Outcome Measures/Results	A total of 12,418 titles were identified through database searches-133 articles retrieved. 55 articles finalized, which included cross-sectional/survey (n=51) and quasi-experimental (n=4) designs. Moderate (moderate-weak and moderate-strong) and strong quality did not show significant differences. In a majority of the articles (n=39,69%)-nurses reported moderate-high research use.	Diabetic group: the mean level of fasting blood sugar in diabetic group with exercise has decreased as a result of medication but not to that extent as in case of along with exercise. Impaired group: the mean level of fasting blood glucose has decreased considerably after adopting healthy life style and exercise. Fasting blood glucose in impaired group who were doing exercise: ($p<0.01$) highly significant. Fasting blood glucose in diabetic group who were doing exercise

		along with medication: ($p<0.01$) highly significant. Diabetic group taking medicine without any exercise: (p-value for the t-statistic <0.05) but (>0.01), indicating significant but not highly significant.
Conclusions/Implications	The study concluded that nurses' reported use of research is moderate-high and has remained relatively consistent over time until the early 2000's. There is a clear need for the development of standard measures of research use and robust well-designed studies examining nurses' use of research and its impact on patient outcomes. Future research should examine the extent to which nurses use other information sources, in addition to and in combination with research, to make clinical decisions.	This study has been an attempt to know the effectiveness of healthy lifestyle on people suffering from DM having raised fasting glucose tolerance on the volunteers.
Strengths/Limitations	Limitations: The terms "evidence-based practice" and "decision making" were excluded from the searches. There was an absence of studies in which attempts are made to assess the effects of varying levels of research use on patient outcomes.	Limitations: the study was restricted only to few people.
Funding Source	Funded by: Canadian Institutes for Health Research, Alberta Heritage Foundation for Medical Research, CIHR Fellowships, AHFMR and CIHR Fellowships, AHFMR and KT Canada doctoral scholarships, Canadian Foundation for Dental Hygiene Research and Education.	No funding identified.
Comments	In relation to my capstone: This study gives me insight to how nurses use research in practice.	In relation to my Capstone: This study shows that a healthy lifestyle lowers blood sugar levels. My educational offering includes healthy lifestyle for care of patients with DM.

Article/Journal	Effectiveness of quality improvement strategies on the management of diabetes: A systematic review and meta-analysis. *Science Direct*, 379: 2252-61, DOI: 10.1016/50140-6736(12)60480-2.	Effective interventions to improve mediation adherence in Type 2 diabetes: A systematic review. *Diabetes Management*, 4(1), 29-48, DOI: 10.2217/dmt.13.62.
Author/Year	Tricco, A., Ivers, N., Grimshaw, J., & Moher, D. (2012)	Williams, J., Walker, R., Smalls, B., Campbell, J., & Egede, L. (2014)
Database/Keywords	Google scholars/diabetes management/outcomes/improving care	Google Scholar/diabetes management/medication treatment
Research Design	Randomized Systematic Review & Meta-analysis	Systematic Review
Level of Evidence	I	I
Study Aim/Purpose	To assess the effects of quality improvement (QI) strategies on glycated hemoglobin (HbA1c), vascular risk management, microvascular complication monitoring, and smoking cessation in patients with DM.	To distinguish whether interventions were effective and identify areas for future research
Population/Sample size Criteria/Power	N=48 cluster-randomized trials, including 2538 clusters and 84865 patients. N=98 patient-randomized trials, including 38664 patients.	N==27 scholarly articles from MEDLINE between January 2000 and May 2013. The study eligibility criteria – interventions measuring medication adherence in adults with Type 2 DM.
Methods/Study Appraisal Synthesis Methods	Trials were included assessing 11 predefined QI strategies or financial incentives targeting health systems, health-care professionals, or patients to improve management of adult outpatients with DM. The QI strategies targeted health systems, professionals, or patients.	A reproducible strategy used. Studies identified by searching MEDLINE on May 23, 2013 for English language between 2000 to 2013. Search terms based on the Cochrane Metabolic and Endocrine Disorder Group search strategy for Type 2 DM and the Cochrane search strategy for medication compliance/adherence. Some search terms in Cochrane strategies were not used based on the goals of this review. 27 studies include the following: 18 RCTs, 4 pre-and post-tests, 2 combined quasiexperimental with pre-and post-tests, 2 cohorts, and 1 used a group with repeated measure design. Eligibility assessment performed by 4 independent authors; disagreements resolved by a 5th author. Titles and abstracts were reviewed using a standardized checklist. Abstracts eliminated if did not investigate a Type 2 DM patient population, measure medication adherence/compliance as an outcome or describe an intervention. Interventions included RCTs and quasi-experimental studies. Data (for each study) extracted on the number of participants, sample population, duration of intervention, setting of intervention, study design, and type of control.

Study tool/instrument validity/reliability	Studies were identified through Medline, the Cochrane Effective Practice and Organization of Care database from inception to July 2010. Study requirements: report at least 1 process of care measure (proportion to patients taking aspirin, statins, antihypertensive drugs, screened for retinopathy, screened for foot abnormalities, monitored for renal function) or immediate outcome (HbA1c and LDL-cholesterol concentrations, diastolic and systolic blood pressure, proportion of patients with controlled hypertension, or who quit smoking). An experienced librarian developed the search strategy, which was peer- reviewed independently by another information specialist. To ensure reliability-undertook a training exercise before the screening process with a random 5% sample of search results; 2 reviewers independently abstracted data and appraised risk of bias. The Cochrane EPOC method assessed risk bias. Well established methods used to adjust cluster-randomized controlled trials for meta-analysis with patient-randomized controlled trials. A random effects model was used to estimate the pooled risk ratio (RR, dichotomous data) or the mean difference (continuous data) across the included trials. Consistency-forest plots; post-hoc secondary analysis to explore whether the effectiveness of QI strategies varied. Decided a priori to do meta-regression with a linear fixed-effects model (Pro Mixed SAS Version 9.2) for studies reporting HbA1c. The sponsor of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report.	Each article was analyzed for relevant intervention characteristics, including whether it was culturally tailored, educational or skills focused, device driven, and/or personnel administered. A narrative review was performed as the heterogeneous measures used to determine medication adherence precluded conducting a meta-analysis. Although risks of bias exist, articles were not excluded due to the limited evidence available in the literature.
Primary Outcome Measures/Results	48 randomized controlled trials included 2538 clusters and 84865 patients, and 94 patient randomized controlled trials, including 38664 patients. In random effects meta-analysis, the QI strategies reduced HbA1c, by a mean difference of 0.37%; LDL cholesterol by 0.10; systolic blood pressure by 3-13 mm Hg; and diastolic blood pressure by 1.55 mm Hg vs usual care. We noted larger effects when baseline concentrations were greater than 8.0% for HbA1c; 2.59 for LDL cholesterol; and 80 for diastolic and 140 for systolic blood pressure. The effectiveness of QI strategies varied depending on baseline HbA1c, control. QI strategies increased the likelihood that patient received aspirin (11 trials; RR 1-33, 95% Cl 1-21-1-45); antihypertensive drugs (ten trials; RR 1-17, 1-01-1-37); screening retinopathy (23	The search resulted in 922 citations for review. Title review produced 171 abstracts to examine. 27 studies met the inclusion criteria and 13 showed a statistically significant change in medication adherence. 17 studies (8 RCTs) showed a statistically significant change in medication adherence for interventions with or without comparison groups, and 10 studies reported significant statistical changes in glycemic control. 7 studies described interventions that significantly improved both medication adherence and HbA1c. Effective medication adherence was defined as a significance improvement at -<0.05.

	trials; RR 1-22, 1-13-1.32): renal function (14 trials; RR 128, 1-13-1.44); foot abnormalities (22 trials; RR 1-27, 1-16-1.39). The following were not significantly increased: statin use (ten trials; RR 1-12, 0-99-1.28); hypertension control (18 trials; RR 1-01, 0-96-1.07); and smoking cessation (13 trials; RR 1-13, 0-99-1.29).	
Conclusions/Implications	Many trials of QI strategies showed improvements in DM care. Interventions targeting the system of chronic disease management along with patient-mediated QI strategies should be an important component of interventions aimed at improving DM management. Interventions solely targeting health-care professionals seem to be beneficial only if baseline HbA1c control is poor.	Heterogeneity of the study designs and measures of adherence made it difficult to identify effective interventions that improved medication adherence. Additionally, medication adherence may not be solely responsible for achieving glycemic control. Researchers must emphasize tailored interventions that optimize management and improve outcomes, and examine the need for clear indicators of medication adherence.
Strengths/Limitations	Strengths: The findings of the study suggest that key aspects and intermediate outcomes of DM care can be improved and that a larger effect is evident when baseline achievement of quality indicators is poor. Limitations: Include the complexity of the QI strategies, which were difficult to classify consistently, and all potential confounding factors could not be controlled. Another limitation is the inability to assess interactions in the meta-regression analysis.	Strengths: Findings indicate that interventions can be designed to improve medication adherence. Limitations: the search was limited to articles published in the English language between January 2000 and May 2013; limited to studies using interventions addressing medication adherence as an outcome.
Funding Source	Funding by Ontario Ministry of Health and Long-term Care and the Alberta Heritage Foundation for Medical Research.	Funding by the National Institute of Diabetes and Digestive Kidney Disease.
Comments	In relation to my Capstone: This study indicates evidence-based information that describes the importance of QI strategies on glycemic control for improving DM management.	In relation to my Capstone: This study emphasizes the importance of diabetes management as it relates to medication adherence.

Article/Journal	Assessment of a short diabetes knowledge instrument for older and minority adults. *Diabetes Educator*, 40(1), 68-76, DOI: 10.1177/0145721713508824.	A pragmatic comparison of two diabetes education programs in improving type 2 diabetes mellitus outcomes. *Biomedical Research International,* 7: 186, DOI: 10.1186/1756-0500-7-186.
Author/Year	Quandt, S., Edward, H., Kirk, J., & Saldana, S. (2013).	Dorland, K. & Liddy, C. (2014).
Database/Keywords	Google scholars/diabetes/knowledge	PubMed/diabetes education/program outcomes
Research Design	Descriptive Study	Retrospective, Observational Study
Level of Evidence	VI	IV
Study Aim/Purpose	To assess the performance of a Short Diabetes Knowledge Instrument (SDKI) in a large multi-ethnic sample of older adults with diabetes (DM) and to identify possible modifications to improve its ability to document DM knowledge.	To compare the effectiveness of 2 distinct diabetes (DM) education programs in improving clinical outcomes in patients with type 2 diabetes (T2DM) in a primary setting.
Population/Sample size Criteria/Power	N=593 participants with DM; consist of African American, American Indian, and white female/male adults; all age 60 and older. Recruited from 8 North Carolina counties. Site-based sampling.	N=80 participants enrolled in 2 DM classes. 39 in the "ABC's of DM" class (retrospectively) & 41 in the "Conversation Map's" class (respectively). The sample consists of patients with T2DM at 2 academic family health team (FHT) sites in Ottawa, Ontario.
Methods/Study Appraisal Synthesis Methods	Data was completed for June 2009 through February 2010. The goal of the sampling plan was to recruit 100 participants for each ethnic/gender cell. Participants were recruited from various organizations and locations within each county to represent site-based sampling. Interviews completed in participants' homes, unless they requested otherwise. A $10 incentive given for completion of an interviewer-administered, fixed response questionnaire.	Data conducted from October 27, 2010 to November 22, 2011 for voluntary DM education classes. Participants had their charts reviewed and objective outcome measures recorded up to 1 year before the class and up to 6 months after the class. FHTs consist of group of family practitioners, nurses, dieticians, and social workers. Each team included a dietician, nurse, and pharmacist for follow-up. Patients at the clinics were free to choose which program they preferred to attend. Exclusion: patients who did not have a diagnosis of T2DM, as well as participants of the conversation Maps class who did not attend at least 2 of the 3 classes.

Study tool/instrument validity/reliability	The 16-item questionnaire (diabetes knowledge instrument developed and utilized by Samuel-Hodge and colleagues) collected data on personal characteristics such as age, ethnicity, education, income, DM status, and DM knowledge. Glycemic control (A1c) was assessed at the interview visit after all questionnaire data were collected, using a finger stick blood sample and the procedures for the handheld Bayer A1cNow+machine. For test-retest reliability, additional data were collected in Spring 2012 from 46 participants from the original sample, equally divided by ethnic, sex, and education groups. The interview was repeated 1 month after the 1st (retest). Data analysis included descriptive statistics including percentage correct for individual items, item-scale correlation, item response theory (IRT) analysis, bivariate analysis between the knowledge score and important factors, and internal consistency and reliability assessments.	The ABC's of Diabetes class (one 2-hour didactic teaching session); The Conversation Maps class (3 highly interactive weekly classes, 6 hours in total); The Clinical Outcomes assessed were glycosylated hemoglobin levels (HbA1c), low density lipoprotein (LDL), systolic blood pressure, diastolic blood pressure, and weight. Patients with HbA1c>8% were also examined in a specific sub-analysis. Similarity of the 2 cohorts-chi-squared tests. Pre- and post-intervention data compared with a paired, 2-tailed t-test; then Shapiro-Wilk test. Confirmation with the Wilcoxon Signed Ranks test. An independent, 2-tailed, t-test compared the change in outcomes between the 2 classes. The Mann-Whitney U test for comparison of normality related to change in HbA1c form pre to post 3 months in the Conversation Maps class.
Primary Outcome Measures/Results	Three items were removed after item-response analysis. Scores for the resulting instrument were lower among minority and older participants, as well as those with lower educational attainment and income. Scores for test-retest were highly correlated. Cronbach's alpha for standardized scores was 0.73. Mean knowledge scores for the test and retest were 8.20 (2.38) for the initial test and 8.43 (2.41) for the repeated test, respectively. Scores were highly correlated (r=0.75; p<.0001). The percentage agreement calculated for consistently correct and incorrect responses to individual item at test and retest ranged from 67% to 91%.	A trend towards lower HbA1c was observed after completion of both classes, with an average reduction of 0.2%, and 0.6% after 6 months in the ABCs of DM class and the Conversation Maps class, respectively. A significant decrease in weight was observed 6 months after the ABCs of DM class (p-0.028), and in LDL after the Conversation Maps class (p=0.049). Patients with HbA1c>8% showed a drop of 1.1% in HbA1c 3 months after either class (p=0.004). A p-value <0.05 indicated statistical significance. All statistical analyses were carried out using SPSS 20.0.
Conclusions/Implications	The SDKI (13-item questionnaire) appears to be a valid and reliable instrument to evaluate knowledge about DM. Assessment in a multi-ethnic sample of older adults suggests that this instrument can be used to measure DM knowledge in diverse populations. Further evaluation is needed to determine whether or not this instrument can detect changes in knowledge resulting from DM education or other interventions.	No significant difference in outcomes was found between the 2 DM education classes assed. There was a trend towards improved glycemic control after both classes, and patients with high HbA1c levels demonstrated statistically significant improvements. This indicates that shorter sessions using didactic teaching methods may be equally effective in producing improvements in DM self-management as more intensive course formats.

Strengths/Limitations	Strengths: The study describes a more up to date knowledge questionnaire, which shows validity and reliability among older adults.	Strengths: This study indicative of the goal that most DM treatment methods is to reduce HbA1c. Limitations: Selection bias because in this retrospective, observational design, the participants selected the education program. The sample size was limited by patient attrition and limited access to clinical data for community-based patients.
Funding Source	Funded by the National Institute on Aging.	No funding received for this project.
Comments	In relation to my Capstone: This study addresses a tool for baseline knowledge of DM. An assessment of knowledge of DM among nurses and patients is crucial to understanding and the learning process. In order to educate staff or patients, a baseline needs to be established. Nurses must understand that some patients need basic questions, as it relates to age/or education status.	In relation to my Capstone: This study shows how diabetes education is beneficial to lowering glycemic levels, improving patient health, and increasing nurses' knowledge.

Article/Journal	Effective interventions to improve mediation adherence in Type 2 diabetes: A systematic review. *Diabetes Management*, 4(1), 29-48, DOI: 10.2217/dmt.13.62.	Effectiveness of disease-management programs for improving diabetes care: A meta-analysis. *Canadian Medical Association Journal*, 183(2), DOI: 10.1503/cmaj.091786.
Author/Year	Williams, J., Walker, R., Smalls, B., Campbell, J., & Egede, L. (2014)	Pimouguet, C., LeGoff, M., Thiebaut, K.R., & Dartgues, J. (2011).
Database/Keywords	Google Scholar/diabetes management/medication treatment	Google Scholar/improving diabetes care
Research Design	Systematic Review	Meta-analysis
Level of Evidence	I	II
Study Aim/Purpose	To distinguish whether interventions were effective and identify areas for future research	To assess the effectiveness of disease-management programs for improving glycemic control in adults with DM and to study which components of programs are associated with their effectiveness?
Population/Sample size Criteria/Power	N==27 scholarly articles from MEDLINE between January 2000 and May 2013. The study eligibility criteria – interventions measuring medication adherence in adults with Type 2 DM.	N=41 RCTs from scholarly databases form published studies up to December 2009. All articles involved adults with Type 1 or 2 DM, evaluating the effect of disease-management programs on glycated hemoglobin concentrations.
Methods/Study Appraisal Synthesis Methods	A reproducible strategy used. Studies identified by searching MEDLINE on May 23, 2013 for English language between 2000 to 2013. Search terms based on the Cochrane Metabolic and Endocrine Disorder Group search strategy for Type 2 DM and the Cochrane search strategy for medication compliance/adherence. Some search terms in Cochrane strategies were not used based on the goals of this review. Eligibility assessment performed by 4 independent authors; disagreements resolved by a 5th author. Titles and abstracts were reviewed using a standardized checklist. Abstracts eliminated if did not investigate a Type 2 DM patient population, measure medication adherence/compliance as an outcome or describe an intervention. Interventions included RCTs and quasi-experimental studies. Data (for each study) extracted on the number of participants, sample population, duration of intervention, setting of intervention, study design, and type of control.	Several databases for studies published up to December 2009 were searched. Inclusion: RCTs involving adults with Type 1 or 2 DM that evaluated the effect of disease-management programs on glycated hemoglobin concentrations. Disease management was defined as ongoing and proactive follow-up of patients that includes at least two of the following 5 components: patient education, coaching, treatment adjustment, monitoring, and care coordination. The following computerized databases were searched: MEDLINE, Scopus, Web of Science, and the Cochrane Library. References were searched with the terms: patient care team, case management, managed care programs, disease management, home-based intervention, and patient care management, diabetes mellitus, HbA1c, and glycated hemoglobin. 2 reviewers reviewed the titles and abstracts of identified articles and then examined the full-text version of selected articles.

	Tools: Each article was analyzed for relevant intervention characteristics, including whether it was culturally tailored, educational or skills focused, device driven, and/or personnel administered. A narrative review was performed as the heterogeneous measures used to determine medication adherence precluded conducting a meta-analysis. Although risks of bias exist, articles were not excluded due to the limited evidence available in the literature.	Only RCTs were included. Exclusion: trials in which the intervention did not involve direct contact between the disease manager and the patient or was unclear, unspecified or exclusively based on contact by internet or mail. For missing data, the original authors of the article were contacted by email. **Tools:** Meta-regression analysis used to determine what part of between-study variance was explained by patient characteristics and components of the disease-management programs. 3 sensitivity analyses were performed based on key components of internal validity to test the robustness of our results. In the 1st sensitivity analysis, trials that had a dropout rate of 20% or more and trials without dropout information were excluded. 2nd analyses excluded trials in which the difference in dropout rates between study groups was 7% or more and trials without dropout information. 3rd analyses excluded trials with unclear information about allocation concealment. For all analyses, a p value of 0.05 or less was considered to be statistically significant.
Primary Outcome Measures/Results	The search resulted in 922 citations for review. Title review produced 171 abstracts to examine. 27 studies met the inclusion criteria and 13 showed a statistically significant change in medication adherence. 17 studies (8 RCTs) showed a statistically significant change in medication adherence for interventions with or without comparison groups, and 10 studies reported significant statistical changes in glycemic control. 7 studies described interventions that significantly improved both medication adherence and HbA1c. Effective medication adherence was defined as a significance improvement at -<0.05.	41 RCTs were included in this study. Across these trials, disease-management programs resulted in a significant reduction in hemoglobin A1c levels (pooled standardized mean difference between intervention and control groups -0.38, which corresponds to an absolute mean difference of 0.51%). Sensitivity analyses: standardized mean difference -0.60v. -0.28 in trials with no approval to do so; p<0.001. Programs with a moderate or high frequency of contact reported a significant reduction in hemoglobin A1c levels compared with usual care. High frequency of contact led to a significantly greater reduction compared with low-frequency (standardized mean difference -0.56v. -0.30, p -0.03).
Conclusions/Implications	Heterogeneity of the study designs and measures of adherence made it difficult to identify effective interventions that improved medication adherence. Additionally, medication adherence may not be solely	This study concludes that disease-management programs had a clinically moderate but significant impact on hemoglobin A1c levels among adults with DM. Effective components of

	responsible for achieving glycemic control. Researchers must emphasize tailored interventions that optimize management and improve outcomes, and examine the need for clear indicators of medication adherence.	programs were a high frequency of patient contact and the ability for disease managers to adjust treatment with or without prior physician approval.
Strengths/Limitations	Strengths: Findings indicate that interventions can be designed to improve medication adherence. Limitations: the search was limited to articles published in the English language between January 2000 and May 2013; limited to studies using interventions addressing medication adherence as an outcome.	Strengths: The study includes a comprehensive SR of the literature, with a large number of studies included. These authors' work confirms the findings of previous reviews, with a mean difference in hemoglobin A1c level similar to that observed in previous studies. Only RCTs included with large sample sizes, making the study more precise than that in previous studies. Limitations: The analyses were based on results from RCTs, and adjustment was not done at an individual patient level. By including only studies in English, may have missed other relevant studies.
Funding Source	Funding by the National Institute of Diabetes and Digestive Kidney Disease.	Funding source not included in article.
Comments	In relation to my Capstone: This study emphasizes the importance of diabetes management as it relates to medication adherence.	In relation to my Capstone: This study was helpful in showing how disease-management of DM positively impacts hemoglobin A1c levels among adults with diabetes. This information is beneficial to my project goal.

Article/Journal	Hypoglycemia, with or without insulin therapy, is associated with increased mortality among hospitalized patients. *Diabetes Care,* 36:1107-1110, DOI: 10.2337/dc12-1296.
Author/Year	Garg, R., Hurwitz, S., Turchin, A., & Trivedi, A. (2013)
Database/Keywords	Google Scholar/Insulin treatment/Hypoglycemia
Research Design	Retrospective Cohort Study
Level of Evidence	IV
Study Aim/Purpose	To investigate the relationship between spontaneous hypoglycemia versus insulin-associated hypoglycemia and mortality in hospitalized patients.
Population/Sample size Criteria/Power	N=2,890 patients admitted to the Brigham and Women's Hospital between April 1, 2008 and November 30, 2010. Data was obtained from the Research Patient Database Registry and point-of-care glucose meter download data. Patients were divided into 4 groups: noninsulin-treated hypoglycemia (NTH) (n=135); insulin-treated hypoglycemia (ITH) (n=961); noninsulin-treated control (NTC) (n=1,058); and insulin-treated control (ITC) (m=736).
Methods/Study Appraisal Synthesis Methods	Data from this retrospective cohort study included a Hypoglycemic group and a Control group. For the hypoglycemic group hospitalized patients with one or more blood glucose values less than or = 50 were included. When insulin was used during hospitalization, hypoglycemia was assumed to be insulin related. For the control group age, sex, and race-matched patients with all blood glucose values greater than or = 70 were selected. Exclusion: patients receiving oral antidiabetic agents during hospitalization. Mortality data were obtained and time between period of hypoglycemia and death was noted.
Study tool/instrument validity/reliability	The Charlson comorbidity index (CCI) was calculated from the ICD-9 codes. Patient characteristics were compared between groups using Wilcoxon rank sum test or logistic regression for mortality. Cox regression was used to assess the significance of single and simultaneous multiple predictors of death. The retention of covariates in the final model depended on the association with mortality ($P<0.10$). Statistical analyses were performed using SAS version 9.2.
Primary Outcome Measures/Results	Of the 4 groups: Mortality was higher in the ITH group compared with the ITC group (20.3 vs 4.5%, $P<0.0001$) with a relatively higher CCI (1.8 vs. 1.5%, $p<0.0001$), but much higher in the NTH group compared with the NTC group (34.5 vs. 1.1%, $p<0.0001$) with much higher CCI (2.4 vs. 1.1%, $P<0.0001$). Mortality was higher in the NTH group compared with the ITH group ($P<0.0001$) but lower in the NTC group compared with the ITC group ($P<0.0001$). After controlling for age, sex, CCI, and admission to the ICU, insulin treatment was associated with a lower mortality among the hypoglycemic patients. Hazard ratio of death in the ITH group relative to the NTH group was 0.34 (95%) CCI 0.25-0.47, $P<0.0001$).
Conclusions/Implications	This study concluded that insulin-associated and spontaneous hypoglycemia is associated with increased mortality among hospitalized patients.
Strengths/Limitations	Strengths: This study is different from previous studies due to a different patient population and inclusion of patients with more severe hypoglycemia. Limitations: This was a single-center study and the sample size for the spontaneous hypoglycemia group was rather small. The study did not have data on the nutritional status of the patients. Also there were no details about the type of DM, duration of DM, insulin regimens, or glucose control.

Funding Source	Funding by R.G., who is the guarantor of this work, had full access to all the data, and takes responsibility for the integrity of the data and the accuracy of the data analysis.
Comments	In relation to my Capstone: Hypoglycemia is included in my teaching plan. The study shows how critical it is to control blood glucose of patients in the hospital setting.

Article/Journal	Diabetes prevention in the real world: effectiveness of pragmatic lifestyle interventions for the prevention of Type 2 diabetes and of the impact of adherence to guideline recommendations. Diabetes Care, 37, 922-933, DOI: 10.2331/dc13-2195.	Increased glycemic variability is independently associated with length of stay and mortality in noncritical ill hospitalized patients. Diabetes Care, 36:4091-4097, DOI: 10.2337/dc12-2430.
Author/Year	Dunkley, A., Bodicoat, D., Greaves, C., & Russell, C. (2014)	Mendez, C., Mok, K., Ata, A., Tanenberg, R., Calles, J., & Umpierrez, G. (2013)
Database/Keywords	Google Scholar/diabetes management/education for nurses	Google Scholar/Hyperglycemia management in hospital
Research Design	Systematic Review & Meta-analysis	Retrospective Cohort Study
Level of Evidence	I	IV
Study Aim/Purpose	To summarize the evidence on effectiveness of translational DM prevention programs based on promoting lifestyle change to prevent Type 2 DM in real-world settings and to examine whether adherence to International guideline recommendations is associated with effectiveness.	To investigate the association between glycemic variability (GV) and both length of stay (LOS) and 90-day mortality in noncritical ill hospitalized patients.
Population/Sample size Criteria/Power	N=25 experimental and observational studies from bibliographic databases up to July 2012. Included studies had a follow-up of > or = 12 months and outcomes comparing change in body composition, glycemic control, or progression to DM. Included adults > or = 18 years old and high risk Type 2 DM. Studies were English language and as full-length articles.	N=935 hospital admissions; patients admitted to the acute non-ICU medicine and surgery services of the Stratton Veterans Affairs Medical Center in Albany, NY, between January 2008 and January 2010. Exclusion criteria: patient admitted to or transferred from the ICU and long-term care wards (n=1,624); patient admissions with very long hospital stays (> 60 days), to avoid patients not acutely ill (n=5); patient admissions with no point-of-care glucose monitoring (n=1,456); patient admissions with fewer than 2 glucose values per day of hospitalization on average (n=240); and patient admissions with inconsistent date of death information (n=2). Patients who were hospitalized more than once had each admission counted separately.
Methods/Study Appraisal Synthesis Methods	The authors searched Embase, MEDLINE, and the Cochrane Library using a combination of MeSH terms and keywords that were tailored to individual bibliographic databases. Exclusion: articles published after January 1998. The final search strategy included only terms related to the intervention and the study design. 2 reviewers independently assessed abstracts and titles for eligibility and retrieved potentially relevant articles,	Data extracted from the VISN 2 Veterans Health Information systems and Technology Architecture and the Veterans Affairs Regional Data Ware-house. Blood glucose concentrations were measured in capillary blood obtained by finger stick with a point-of-care device; also on venous blood in the central hospital laboratory. LOS was calculated by the number of days from admission date to discharge or death date. Mortality was defined as in-hospital

	with differences resolved by a 3rd reviewer where necessary. Authors were contacted for additional data or clarification. Lifestyle interventions aimed to translate evidence from previous efficacy trials of DM prevention into real-world intervention programs. Data extracted by 1 reviewer. Data was extracted on sample size, population demographics, intervention details, and length of follow-up.	death or death within 90 days from discharge.
Study tool/instrument validity/reliability	Data was combined using random-effects meta-analysis and meta-regression considering the relationship between intervention effectiveness and adherence to guidelines. Pairwise comparison meta-analyses examined the effect size where data were available. Meta-regression was used to assess the relationship between weight change at 12 months and the total IMAGE guidance score, as explanatory variables. Sensitivity analyses for the primary outcome, weight, where missing guideline data were treated as unknown and a total guidance score was not given for those studies and where the analysis was restricted to RCTs only. Publication bias assessed using the Egger test and heterogeneity.	Mean in-hospital glucose (MHG) was calculated from all glucose readings available during each individual hospitalization. Hypoglycemia was defined as any episode of blood glucose <70 mg/dL during the hospital stay. Linear and modified Poisson regression analyses were used to assess associations between measures of GV and the 2 outcomes. Charlson comorbidity index (CCI), hypoglycemia, MHG, MDG, and use of human regular insulin as the sole regimen for glycemic control during the hospitalization. A bivariate analysis was initially performed to identify significant associations between individual variables and the 2 outcome measures. Regression analyses were performed to assess the risk of hypoglycemia occurrence in those patient admissions with high CV and high SD of glucose. Statistical software STATA 11.0 used for all analyses.
Primary Outcome Measures/Results	Searches yielded 6,326 citations, and 3,872 unique titles or abstracts were screened for eligibility. Replies were received for 12 studies, 10 of which were subsequently included in the 25 studies that met the review criteria. The primary meta-analysis included 22 studies with outcome data for weight loss at 12 months. The pooled result of the direct pairwise meta-analysis shows that lifestyle interventions resulted in a mean weight loss of 2.32 kg (95% -2.92 to -1.72; =93%). Adherence to guidelines was significantly associated with a greater weight loss (an increase of 0.4 kg per point increase on a 12-point guideline-adherence scale).	After exclusion criteria were applied, the final sample consisted of 935 hospital admissions comprising 620 individual patients. Results of adjusted analysis indicate that for every 10 mg/dL increase in SD and 10-percentage point increase in CV, LOS increased by 4.4 and 9.7%, respectively. Relative risk of death in 90 days also increased by 8% for every 10-mg/dL increase in SD. These associations were independent of age, race, service of care, previous diagnosis of DM, GbA1c, BMI, the use of regular insulin as a sole regimen, mean glucose, and hypoglycemia occurrence during the hospitalization.

Conclusions/Implications	This study concluded that pragmatic DM prevention programs are effective. Effectiveness varies substantially between programs but can be improved by maximizing guideline adherence. There were significant reductions in other diabetes and cardiovascular risk factors, including blood glucose, blood pressure, and some cholesterol measures.	This study concludes that increased GV during hospitalization is independently associated with longer LOS and increased mortality in noncritical ill patients. Prospective studies with continuous glucose monitoring are necessary to investigate this association thoroughly and to generate therapeutic strategies targeted at decreasing GV. The increased LOS observed in the patients with higher GV may indicate a significant increase in morbidity and could directly affect the cost of care.
Strengths/Limitations	Strengths: This study used comprehensive search criteria and focused on establishing the utility of pragmatic attempts to achieve DM prevention in real-world service delivery settings. Limitations: there were insufficient data to analyze outcomes beyond 12 months; findings may not translate into long-term therapeutic value due to uncertainty around sustaining outcomes, such as weight loss, in the longer term.	Strengths: This study found a significant association between high GV and longer LOS and increased 90-day mortality.
Funding Source	States that no funding bodies had any role in study design, data collection and analysis, decision to publish, or preparation of the manuscript. This is an independent research. No funding source identified.	Funding by C.E.M, who has full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.
Comments	In relation to my Capstone: This is helpful information related to complications of DM. My teaching plan consists of DM complications and DM guidelines from the ADA.	In relation to my Capstone: Hypoglycemia and hyperglycemia are part of my teaching plan. This information is important and beneficial to my project. This evidence supports the fact that diabetes management must be improved in the hospital setting to decrease LOS and improve patient outcomes.

Article/Journal	Nursing practice patterns: Timing of insulin administration and glucose monitoring in the hospital. *The* Diabetes *Educator,* 37:357.	Impact of HbA1c measurement on hospital readmission rates: Analysis of 70,000 clinical database patient records. *Biomedical Research International,* (2014), DOI: 10.1155/2014/781670.
Author/Year	Freeland, B., Penprase, B, & Anthony, M. (2011),	Strack, B., DeShazo, J., Gennings, C., & Olmo, J. (2014)
Database/Keywords	PubMed/diabetes management, hospital, education	Google Scholars/diabetes/glycemic control
Research Design	Prospective observational study	Cross-sectional Non-randomized Meta-analyses
Level of Evidence	Level VI	III
Study Aim/Purpose	Purpose: To describe diabetes nursing practice patterns related to the timing of morning insulin administration, blood glucose monitoring, and meal intake for patients with type 2 diabetes and to report how frequently nurses were able to meet the expected standard of care.	To examine historical patterns of diabetes (DM) care in patients with DM admitted to a US hospital and to inform future directions to lead to improvements in patient safety.
Population/Sample size Criteria/Power	N=50 nonrandom convenience sample occurrences of morning care among 39 patients hospitalized with T2DM in an acute care unit in an urban level 1 trauma emergency hospital serving the Detroit metropolitan area. The hospital is 1 of 8 hospitals compromising a large academic medical center, where most hospital admissions are through the ER. The sample of nurses consists of 39 staff nurses, which 6 declined to have demographic data recorded. 45% were AD nurses with 11 years of experience. The mean age was 43; more than half were white.	N=70,000 inpatient diabetes encounters across the United States (US). Analysis of a large clinical database (74 million unique encounters corresponding to 17 million unique patients.
Methods/Study Appraisal Synthesis Methods	Sample drawn from 50 occurrences of insulin delivery during the morning routine with only rapid-acting insulin being included. Exclusion criteria: patients not eating or fed by enteral or parental means, those receiving insulin by infusion pump or IV, and patients that were not present on the nursing unit for all 3 elements of diabetes morning care: insulin administration, glucose monitoring, and breakfast. Also prisoners, psychiatric, and pregnant patient were excluded. A diabetes flow sheet in the electronic	Data conducted through the Health Facts database (Cerner Corporation, Kansas City, MO), a national data warehouse that collects comprehensive clinical records across hospitals throughout the US. All data were de-identified in compliance with the Health Insurance Portability and Accountability Act of 1996 before being provided to the investigators. The Health Facts data represented 10 years (1999-2008) of clinical care at 130 hospitals and integrated delivery networks throughout the US.

	medical record was used to obtain insulin administration and capillary blood glucose (CBG) times. Insulin administration time and dose are documented when the nurse scans the patient's identification band and drug label at the time of bedside administration. Observation or patient recording of meal start time was relied on. Nurses were asked to voluntarily provide demographic data after all relevant patient care activities occurred.	
Study tool/instrument validity/reliability	Measures of central tendency were used to describe the frequency with which staff nurses met the standard of checking CBG within 30 minutes before insulin administration and administered rapid-acting insulin within 10 minutes before or after a meal. A standard deviation of each measure of time was also expressed. Further analysis was conducted with SAS 9.2. The Fisher exact test was used to test the significance of relationships between variables. The t-test was used to evaluate the relationship between meeting insulin timing standards and CBG values pre-lunch, as well as change in CBG value from pre-breakfast to pre-lunch.	Information was extracted from the database for encounters that satisfied the following criteria: it is an inpatient encounter (a hospital admission); it is a diabetic encounter; the length of stay was at least 1-14 days; laboratory tests were performed during the encounter; and medications were administered during the encounter. 101,766 encounters were identified to fulfill all of the inclusion criteria. 4 groups of encounters were considered: (1)no HbA1c test performed (2)HbA1c performed and in normal range (3) HbA1c performed and the result is greater than 8% with no change in diabetic medications (4)HbA1c performed, result is greater than 8%, and diabetic medication was changed. The preliminary dataset contained multiple inpatient visits for some patients and the observation could not be considered as statistically independent, and assumption of the logistic regression model. The significance level was determined by a P value of less than 0.01. Multivariable logistic regression was used to fit the relationship between the measurement of HbA1c and early readmission while controlling for covariates such as demographics, severity and type of the disease, and type of admission. Graphics were used to help in the interpretation of interaction terms in the final model. The analysis was performed in R statistical software.
Primary Outcome Measures/Results	Of the sample, 77% had diabetes listed as part of their primary diagnosis. Before admission, all 39 participants had uncontrolled diabetes-8.2% to 20.3% A1c results. Mean glucose control measured by A1C was 12.24, equating with an average estimated glucose of 305. All patients had orders for rapid-acting aspart insulin, and all but 1 had orders for long-acting	Measurement of HbA1c was infrequent, occurring in only 18.4% of encounters where DM was included as an admission diagnosis. When an HbA1c was not obtained, 42.5% of patients had a medication change during the hospitalization, whereas those providers who ordered the test appear to have been somewhat more responsive as determined by changes in

	glargine insulin. Patients did not receive rapid-acting insulin within the standard recommended time of 10 minutes pre-meal/post-meal 84% of the time, nor did they receive glucose monitoring within the recommended 30 minutes pre-meal 57% of the time. The mean time recorded was 46 minutes. There was no significant relationship found between timely insulin administration and glucose monitoring. The activities of monitoring CBG and administering insulin were not related (p= .44). There were no significant relationships found between care activities and pre-lunch glucose control or glucose variability-p- .81.	medication (55.0%, P<0.001). With readmission and taken as a whole without adjusting for covariates, measurement of HbA1c was associated with a significantly reduced rate of readmission (9.4 vs 8.7%, P = 0.007). The final model suggests that the relationship between the probability of readmission and the HbA1c measurement significantly depends on the primary diagnosis. There was no significant interaction with other primary diagnoses, such as circulatory diseases and respiratory.
Conclusions/Implications	The study concluded that coordinating insulin administration, glucose monitoring, and meal delivery within the tight time frames required for rapid-acting insulin is a significant challenge not being met. Timeliness of diabetes nursing care is not the sole determining factor to good glucose control in hospitalized patients. Standards regarding timing of these activities need to be evaluated.	The decision to obtain a measurement of HbA1c for patients with DM is a useful predictor of readmission rates which may prove valuable in the development of strategies to reduce readmission rates and costs for the care of individuals with DM. The analysis showed that the profile of readmission differed significantly in patients where HbA1c was checked in the setting of a primary DM diagnosis, when compared to those with a primary circulatory disorder. While readmission rates remained the highest for patients with circulatory diagnoses, readmission rates for patients with DM appeared to be associated with the decision to test for HbA1c, rather than the values of the HbA1c result.
Strengths/Limitations	Limitations: A major limitation of this study was the small sample size in a homogeneous sample of convenience. Also the focus of this study was nursing care rather than medical care, focusing on nursing's ability to deliver care to a standard rather than on evaluating insulin regimens and resulting glucose control. The study was also limited in that nurse-patient ratios, patient acuity, and length of hospital stay were not measured. Nurse knowledge of newer insulin preparations and general diabetes care was not assessed	Strengths: The study provides a striking cross-sectional view of inpatient DM care for more than 70,000 admissions in 54 hospitals in the US. Limitations: It is possible that HbA1c values not in the dataset were available to the practitioners and influenced treatment patterns. Limited by a nonrandomized study design.
Funding Source	No funding source cited.	Cerner Corp. and the VCU Center for Clinical and Translational Research (CTSA Grant no. UL1TR000058); the

		Ministry of Science and Technology of Spain (Project no. TIN-2011-22408); the FEDER funds; and the National Institutes of Health (Grant no. 1R01HD056235).
Comments	In relation to my Capstone: Part of my teaching intervention is pertaining to insulin treatment. This study is informative to my study.	In relation to my Capstone: This study is helpful with teaching importance of glycemic control and improving health.

STUDENT NAME: Arletha Coffey: Systematic Review Evidence Table Format [adapted with permission from Thompson, C. (2011). Evidence table format for a systematic review. In J. Houser & K. S. Oman (Eds.), Evidence-based practice: An implementation guide for healthcare organizations (p. 155). Sudbury, MA: Jones and Bartlett.]

Appendix F

SWOT Analysis

Strengths	Weaknesses
• Support from mentor, Diabetes Educator, project site managers and CEO; organizational support • Having over 20 years of clinical practice experience • Working as a nurse instructor and continuing education • Strong belief in/support of mission • Strong community ties • Evaluation tool with proven reliability/validity	• No diabetes educational program • Limited diabetes resources • Limited number of staff
Opportunities	**Threats**
• Enhance nurses' knowledge and improve patient outcomes • Organization could adopt educational program as best practice for educating nurses on diabetes management. • Collaboration with other health care providers	• Heavy workload for nurses • Nursing shortages • Scheduling conflicts • Decrease job satisfaction

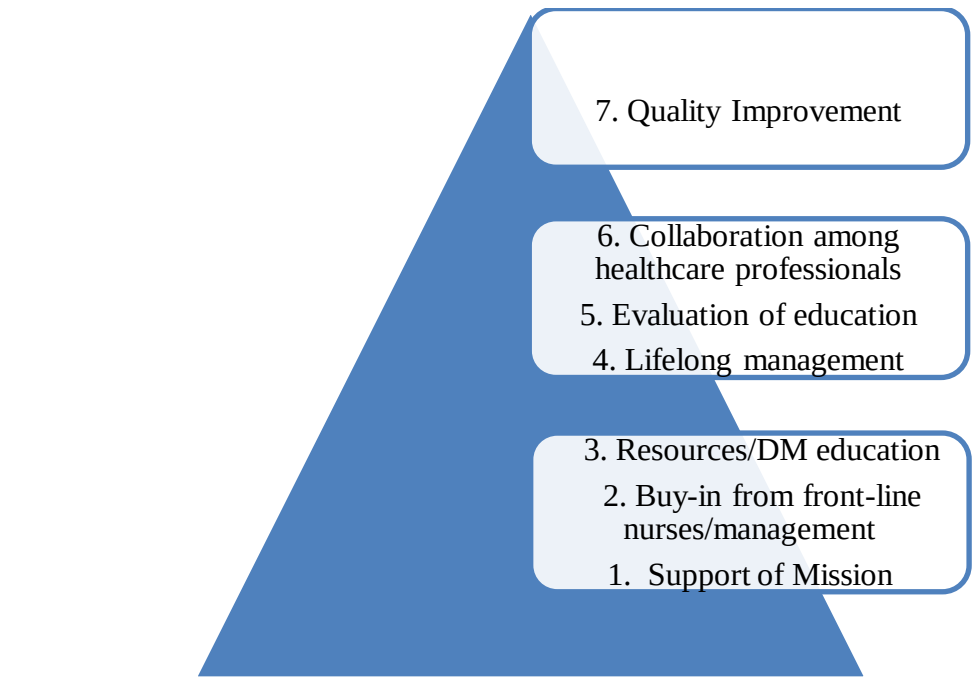
Appendix G

Driving and Restraining Forces

Driving Forces	**Restraining Forces**	**Strategies**
• Need to enhance nurses' knowledge on DM management • Need to provide evidence-based/safe care to diabetics • Need to improve practice standards	• Nurse time constraints • Workload • Limited staff participation • Increase Unit Census	• Flexibility to accommodate scheduling • Providing creative and innovative educational sessions • Providing evidence-based DM education to enhance nurses' knowledge

Appendix H

Sustainability



Appendix I

Budget and Resources

Researcher Costs			**Costs to Replicate**	
Staff time to attend educational session (n=65)	No cost volunteered time or during work hours		Staff time to attend educational session (n=65)	$46,212.72
Diabetes Educator	No cost, researcher provided		Diabetes Educator	$1,100.00
Paper and Printing	$75.00		Paper and Printing	$150.00
Facility/Supplies	Donated by facility		Facility/Supplies	Donated facility (Supplies added with paper and printing)
DKT evaluation tool	Free use		DKT evaluation tool	Free use
Total costs	$75.00		Total costs	$42,462.72

Appendix J

Logic Model

RESOURCES	**ACTIVITIES**	**OUTPUTS**	**OUTCOMES**	**IMPACT**
In order to accomplish our set of activities we will need the following:	*In order to address our problem or asset we will accomplish the following activities:*	*We expect that once accomplished these activities will produce the following evidence of service delivery:*	*We expect that if accomplished these activities will lead to the following changes in 1-3 then 4-6 years:*	*We expect that if accomplished these activities will lead to the following changes in 7-10 years:*
Participation of nursing staff. Buy-in from nurse managers, Diabetes Educator, and chief executive officer. Access to meeting rooms on medical-surgical, PCU, CCU, and OB units. Obtain IRB approval for project. Paper and printing provided by investigator. AV/computer resources per facility donation. The American Diabetes Association. The Michigan Diabetes Research and Training Center. The Diabetic Shoppe in Charleston, Mississippi.	Determine workload and scheduling conflicts with nurse manager Secure conference rooms with AV/computer resources. Print educational resources for the nurses as well as the pre-test and post-test. Provide nurses with an information sheet on the study. Week 1- 2: Administer pre-test (15 minutes to take). Also obtain demographic data during this time (1 minute to answer). Maintain anonymity with both. Week 3: Plan for educational intervention. Week 4 -7: Educational intervention (45 minutes/multiple sessions) and administer post-test. Share results of the study with unit administration where the research took place after capstone defense.	Quantitative data from pre-test and post-test on nurses' knowledge of management of diabetes in hospitalized patients. Evidence-based teaching materials (handouts, case studies, role playing, web sites) related to diabetes knowledge/skills.	Short-term: Improved nursing knowledge/skills. Evidence-based guidelines for providing quality care to diabetic patients. Increased confidence of nursing staff when caring for diabetic patients. Long-term: Decreased rate of recurrent admissions related to diabetes complications. Increased number of nurses who have the ability to teach diabetics based on EBP.	Decreased diabetes complications in the community. Improved nursing knowledge and skills related to diabetes. Continued management support diabetes program. Engagement with stakeholders for improved population health.

Appendix K

Project Timeline

DNP Capstone Project Schedule	**Date**	**Activities**
Summer, Semester 4	June to July 2015 (ongoing)	Work with mentor
	June to July 2015 (ongoing)	Continue clinical hours
	June to July 2015 (ongoing)	Work on writing project proposal
	August 2015	Submit project proposal
	August 2015	Present project proposal to Chair
		Proposal Hearing
	September 2015	Obtain IRB approval
Fall, Semester 5	Fall 2015 to March 2016	Implement/collect data
Spring, Semester 6	March to June 2016	Analyze data
Summer, 2016	June to August 2016	Write Capstone Project/defend

Appendix L

Educational Outline

Purpose: To examine whether an educational program on diabetes management will improve the nursing knowledge of diabetes management for hospitalized diabetic patients.

Goal: To enhance nurses' knowledge and improve patient outcomes.

Objectives and Sub-Objectives	Content Outline	Method of Instruction	Time Allotted (in min.)	Resources	Method of Evaluation
Following a 45 minute teaching session, the nurse will be able to:					
Express ADA in-hospital guidelines of DM: • **Identify elevated blood glucose on all patients.** • **Multidisciplinary team approach** • **Develop structured protocols for aggressive glycemic control** • **Create healthcare programs caring for all diabetic patients** • **Smooth discharge transition**	**Current ADA in-hospital guidelines of DM.**	**Lecture**	**10**	**Written Handouts**	**Post-testing**
Choose effects of illness/infection on BS level.	**Effects of illness/infection on BS level.**	**Lecture** **Case Study**	**5**	**Written Handouts**	**Post-testing** **Problem-Solving**
Identify signs/symptoms/treatment of hypo/hyperglycemia.	**Signs/symptoms and treatment of hypo/hyperglycemia.**	**Role Play**	**15**	**Written Handouts**	**Post-testing** **Analysis**
Select common types of insulin	**Common types of insulin treatments/reactions.**	**Lecture**	**10**	**Written Handouts**	

treatment/reactions **Express any concerns of DM management.**	**Summarize common concerns exploration of feelings.**	**Discussion**	**5**	**Written Handouts**	**Post-testing** **Questions and answers**

Appendix M

IRB Approval Letter

REGIS UNIVERSITY

OFFICE OF ACADEMIC GRANTS

IRB – REGIS UNIVERSITY

February 22, 2016

Arletha Coffey
P.O. Box 157
Tillatoba, MS 38961

RE: IRB # 16-032

Dear Ms. Coffey:

Your application to the Regis IRB for your project, "The Impact of Diabetes Education on Nurses' Knowledge of In-patient Diabetes Management", was approved as an exempt study on February 9, 2016. This study was approved per exempt study category of research 45CFR46.101.b(#1 and #2).

The designation of "exempt" means no further IRB review of this project, as it is currently designed is needed.

If changes are made in the research plan that significantly alter the involvement of human subjects from that which was approved in the named application, the new research plan must be resubmitted to the Regis IRB for approval.

Sincerely,

Patsy Cullen

Patsy McGuire Cullen, PhD, CPNP-PC
Chair, Institutional Review Board
Professor & Director
Doctor of Nursing Practice & Nurse Practitioner Programs
Loretto Heights School of Nursing
Regis University

cc: Kathleen Whalen

3333 Regis Boulevard, H-4, Denver, CO 80221-1099
REGIS.EDU | O 303-458-4206 | F 303-964-5528 | E oag@regis.edu

Appendix N

Site Approval Letter

THE UNIVERSITY OF MISSISSIPPI MEDICAL CENTER
Grenada

Letter of Agreement

January 12, 2016

To Regis University Institutional Review Board (IRB):

I am familiar with Arletha's research project entitled "The Impact of Diabetes Education in a Hospital Setting". I understand the University of Mississippi Medical Center's involvement to be allowing nurses to participate in an educational session on diabetes management. The study will be conducted by asking nurses to complete a paper and pencil demographic survey and a 23-question multiple choice pre-test of general diabetes knowledge. This will take approximately 15 minutes to complete (Step 1). A 45-minute educational session on diabetic management of the in-hospital diabetic patient, based on the American Diabetes Association current evidence, will be provided. This educational session will be offered multiple times on different dates to give nurses an opportunity to attend a session that is most convenient to accommodate scheduling (Step 2). Following the educational session, the nurses will be asked to take a paper and pencil post-test (same as pre-test) which will take approximately 15 minutes to complete (Step 3). There will be no cost associated with this study to participants.

I understand that this research will be carried out following sound ethical principles and that participant involvement in this research project is strictly voluntary and provides confidentiality of research data, as described in the proposal.

Therefore, as a representative of The University of Mississippi Medical Center Grenada, I agree that Arletha's research project may be conducted at our agency/institution.

Sincerely,

Rhonda Duncan

Rhonda K. Duncan, CNO
Chief Nursing Officer
Nursing Admininstration
University of Mississippi Medical Center-Grenada
960 Avent Dr.
Grenada, MS 38901
Phone: 662-227-7004| Fax: 662-227-6518
Email: rkduncan@umc.edu

Appendix O

CITI Training Certificate

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)
COURSEWORK REQUIREMENTS REPORT*

* NOTE: Scores on this Requirements Report reflect quiz completions at the time all requirements for the course were met. See list below for details. See separate Transcript Report for more recent quiz scores, including those on optional (supplemental) course elements.

- **Name:** Arietha Coffey (ID: 4669037)
- **Email:** coffe977@worldclass.regis.edu
- **Institution Affiliation:** Regis University (ID: 745)
- **Institution Unit:** Nursing

- **Curriculum Group:** Human Research
- **Course Learner Group:** Social Behavioral Research Investigators and Key Personnel
- **Stage:** Stage 1 - Basic Course

- **Report ID:** 15240532
- **Completion Date:** 02/07/2015
- **Expiration Date:** 02/06/2018
- **Minimum Passing:** 80
- **Reported Score*:** 100

REQUIRED AND ELECTIVE MODULES ONLY	DATE COMPLETED
Belmont Report and CITI Course Introduction	02/07/15
History and Ethical Principles - SBE	02/07/15
The Federal Regulations - SBE	02/07/15
Assessing Risk - SBE	02/07/15
Informed Consent - SBE	02/07/15
Privacy and Confidentiality - SBE	02/07/15
Regis University	02/07/15

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid independent Learner.

CITI Program
Email: citisupport@miami.edu
Phone: 305-243-7970
Web: https://www.citiprogram.org

Appendix P

Permission to use DKT

Webmail **a22h_coffey@hughes.net**

RE: Request Permission to use DKT

From : Sandy Hardy <skhardy@med.umich.edu> Mon, Jul 06, 2015 10:12 AM
Subject : RE: Request Permission to use DKT
To : 'ARLETHA coffey' <a22h_coffey@hughes.net>

Good morning Arletha,
thank you for your inquiry regarding our DKT survey instrument. Please feel free to use any of our survey instruments on the website. We just ask that you cite our center as appropriate as follows: "the project described was supported by Grant Number P30DK092926 (MCDTR) from the National Institute of Diabetes and Digestive and Kidney Diseases."

Should you have any additional questions, please let me know.

Thank you,
Sandy

~~~~~~~~~~~~~~~~~~~~~~~~~~
Sandy Hardy, MBA, Administrator
University of Michigan
Michigan Diabetes Research Center (MDRC)
Michigan Center for Diabetes Translational Research (MCDTR)
1000 Wall Street
Brehm Tower Room 6107
Ann Arbor MI 48109-5714
(tel) 734.764.6103
(fax) 734.647.2307

If you have an urgent matter, please contact Pam Campbell at pamcamp@umich.edu or call my cell 734.218.0132

http://www.med.umich.edu/mdrtc/index.htm

Remember to cite the Michigan Diabetes Research Center (MDRC) and/or the Michigan Center for Diabetes Translational Research(MCDTR) in publications:

"The project described was supported by Grant Number **P30DK020572** (MDRC) from the National Institute of Diabetes and Digestive and Kidney Diseases" OR the project described was supported by Grant Number **P30DK092926** (MCDTR) from the National Institute of Diabetes and Digestive and Kidney Diseases."
~~~~~~~~~~~~~~~~~~~~~~~~~~

From: ARLETHA coffey [mailto:a22h_coffey@hughes.net]
Sent: Friday, July 03, 2015 12:00 PM
To: Hardy, Sandy
Subject: Fwd: Request Permission to use DKT

From: "ARLETHA coffey" <a22h_coffey@hughes.net>
To: skhardy@med.umich.edu
Sent: Wednesday, June 24, 2015 3:58:15 PM
Subject: Request Permission to use DKT

Dear Ms. Hardy,
My name is Arletha Coffey. I am a DNP student at Regis University in Denver, CO. For my Capstone Project, I am planning to implement an educational intervention on diabetes management for nurses in a hospital setting. I am requesting permission to utilize and modify your Diabetes Knowledge Test (DKT) Survey Tool. I feel that this tool will be very helpful to pursuing my project goal. Please respond at your earliest convenience.
Thanking you in advance,
Arletha Coffey
PO Box 157
Tillatoba, MS 38961
(662)-647-8820

****
Electronic Mail is not secure, may not be read every day, and should not be used for urgent or sensitive issues

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Appendix Q

Demographic Survey

Please circle the correct response. Attachment to pre-test: test results confidential; do not include name.

1. Gender: What is your gender? Male or Female

2. Qualifications: What is the highest degree or level of school you have completed?

Licensed Practical Nurse

Associate Degree

Bachelor's Degree

Master's Degree

Doctoral Degree

3. Experience: What are your years in practice?

Less than 1 year	11-15 years
1-5 years	16-20 years
6-10 years	21 or more years

4. Longevity: How long have you worked on this unit?

Less than 1 year	11-15 years
1-5 years	16-20 years
6-10 years	21 or more years