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Using Simulation to Improve Skills, Confidence, and Satisfaction Related to Diabetes Education

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Abstract

Diabetes mellitus is the seventh leading cause of death in the U.S. and affects 30.3 million people (Centers for Disease Control and Prevention [CDC], 2019). Research suggests that patients often have a limited knowledge and insight into self-management of diabetes mellitus (DM). Acceptance of the disease, insufficient knowledge, and noncompliance are the examples of key factors that affect the progress of the disease. Nurses play a key role in the delivery of diabetes education which can improve compliance. Simulation can be used to improve the nursing skill sets for diabetes education. The purpose of this project was to implement evidence-based diabetes education through simulation to staff nurses to improve nurses' skills, confidence, and satisfaction while improving patient outcomes such as length of stay and readmission for diabetic complications. Findings indicate that participants given the diabetes education intervention, improved in knowledge and skill. These results indicate that there was improved knowledge of nurses after receiving diabetes management education. Simulation education is effective in increasing nurse competencies in the care of diabetic patients and the potential to improve patient outcomes.

Keywords: diabetes management, knowledge level, evidence-based diabetes education, simulation

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Introduction

Diabetes is a complex, chronic illness requiring continuous medical care. Worldwide, the number of individuals with diabetes is growing at an unprecedented rate and is expected to surpass 550 million by 2030 (Burke, Sherr, & Lipman, 2014). In the United States (U.S.), more than 29 million Americans have diabetes and about 86 million more are on the verge of the disease (National Institutes of Health [NIH], 2014). From 2000 to 2017, diagnosed diabetes in Kentucky adults has nearly doubled from 6.5% (198,052) to 12.9% (442,500 or 1 in 8). Kentucky ranks 7th highest in the U.S. for diabetes prevalence. In 2016, Kentucky had the 4th highest mortality rate due to diabetes in the nation. This is an increase in ranking from 14th in 2014 (2019 Diabetes fact sheet, 2019). Clearly, there is a diabetes epidemic and Kentuckians are at increased risk.

Diabetes management is a team effort. Management involves constant assessment and modification of the treatment plan by health professionals, as well as daily compliance to therapy by the patient (Oyetunde & Famakinwa, 2014). Although the healthcare team directs the treatment, it is the patient who must manage the daily intricacies of the therapeutic regimen. Diabetes patient education is central to achieving active participation in management of diabetes (Contreras et al., 2017). This participation is critical to optimal health outcomes and preservation of quality and quantity of life.

Inadequate knowledge in diabetes management among patients or the healthcare team can have negative consequences. From a healthcare organization perspective for example, hospital length-of-stay, and readmission rates are said to increase if diabetic symptoms are not managed well at the bedside (Obirikorang et al., 2016). Improving knowledge related to the care of diabetic patients can improve quality of care which aligns with the Institute of Medicine

(IOM) goals and outcomes for education. The IOM defines health care quality as "the degree to which health care services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge." (Agency for Healthcare Research and Quality [AHRQ], 2018). According to leading health care experts, the United States health care system needs to address the triple aim of improving the patient experience of care, the health of populations, and reducing unnecessary costs (Donahue et al., 2018). This alignment sets up the accomplishment of a quadruple aim which is good quality and good experience for the diabetic population while preserving the energy of the health care team (Institute for Healthcare Improvement [IHI], 2017).

Nurses play a significant role in promoting diabetes care by providing up-to-date, evidence-based care and support. Unfortunately, evidence suggests that nurses working in hospitals have knowledge deficits related to diabetes (Yacoub et al., 2015). Disease self-management is an essential component of care for patients with most chronic conditions. Patients cannot perform daily self-management tasks if they have poor understanding of the disease process, medications used, or the practical tasks they need to accomplish to care for themselves. Health education is, therefore, a vital preventive element in the patient visit (Ritsema, Bingenheimer, Scholting, & Cawley, 2014). The challenge then becomes how to ensure that nurses are competent to safely care for patients, remain up to date on the latest evidence, and can incorporate technology into their daily practice (Walker & Stevenson, 2016). Time and dedication can seamlessly incorporate innovation, delivering this evidence-based information to the nurses is the first step in effective self-management by the patient.

The purpose of this project was to implement a simulation-based educational offering to enhance application of knowledge and skills when taking care of a diabetic in-patient. Simulation

is embraced as a component of continuing education and an effective means of systematically validating competencies in a controlled environment. Simulation provides the opportunity for participants to react to high risk situations without any risk to patient safety (Williams-Ashman, 2018). In turn this could improve nursing confidence and nurse/patient satisfaction. The goal is to improve health outcomes for the diabetic patient, this is more feasible if the nurses are competent themselves.

Context of the Problem

The role of nurses in caring for and educating patients with diabetes has dramatically changed with recent trends and the increase in incidence and prevalence of diabetes (Alotaibi, Gholizadeh, Al-Ganmi, & Perry, 2017). Effective management of diabetes is crucial to reduce the long-term complications of diabetes and to control the onset of associated chronic diseases. It has been shown that patients' outcomes improve when they receive up-to-date, complete and accurate information about diabetes and its care and management (Alotaibi et al., 2017).

Hospital bedside nurses are expected to provide the "survival skills" education but are often unprepared and overwhelmed with many other conflicting responsibilities (Krall, Donihi, Hatam, Koshinsky, & Siminerio, 2016). These responsibilities include work overload, time pressure, difficulty in communication with patients, their limited self-knowledge regarding new therapies and tools, and confusion regarding teaching expectations serve as barriers to successfully carrying out this responsibility. As a result, education tends to be inadequate and fragmented (Livne, Peterfreund, & Sheps, 2017). In a study by Krall et. al., (2016) nurses viewed teaching diabetes patients as part of their job but reported barriers as articulated. In addition, the nurses' fear that patients will ask questions that they cannot answer, thus potentially jeopardizing patient trust (Krall et al., 2016).

As the number of patients entering the hospital with diabetes increases, registered nurses (RNs) will be faced with the complex health care needs of these patients and will be ill-equipped to deliver optimal care. Several authors discovered nurses' knowledge of diabetes management improved after receiving an educational intervention on diabetes management (Abduelkarem & El-Shareif, 2013); Holmes & Dyer, 2013; Modic et al., 2014; Yacoub et al., 2015). Yacoub et al. (2015) further noted the nurses' actual knowledge of diabetes is positively correlated with perceived knowledge, perceived competence, and level of education. Diabetes requires additional knowledge of medication, glucose monitoring, physical activity, and nutritional status. These conditions further increase economic and financial burdens of health care (Yacoub et al., 2015).

The ability to stay current with evidence-based practice (EBP) presents a challenge for most bedside nurses. Nursing care for patients with diabetes includes ongoing glucose and electrolyte management, appropriate medication administration, and a thorough examination of the underlying cause of hyper/hypoglycemia to impact life-style changes (Woda et al., 2019). According to Renolen et al., (2018) barriers such as lack of time, knowledge, and skills have been reported as the most common individual barriers among nurses in staying current with EBP. Another barrier identified by nurses is the risk of losing the workflow. Losing the workflow implies the loss of oversight and control of work tasks, which could have serious impact on patients and the work of colleagues (Renolen, Hoye, Hjalmhult, Danbolt, & Kirkevold, 2018). Barriers at the level of the individual professional may include the individual's attitude, perceptions, knowledge and practices related to EBP. Organizational barriers may include a lack of managerial support for EBP implementation, resistance to change, unavailability of resources,

and poor facilitation and support for the implementation of EBP (Jordan, Bowers, & Morton, 2016).

Diabetes Standards

The American Diabetes Association (ADA) (2019) asserts 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. In this project, the ADA will serve as the primary guideline.

The ADA guideline recommendations on intervention content and delivery are significantly associated with improved glycemic control (Dunkley et al., 2014). Diabetic patients face both acute and chronic health threats. Blood glucose must be monitored carefully for adequate, safe treatment. The American Diabetes Association's (ADA's) "Standards of Medical Care in Diabetes," referred to as the Standards of Care, is intended to provide clinicians, patients, researchers, payers, and other interested individuals with the components of diabetes care, general treatment goals, and tools to evaluate the quality of care (American Diabetes Association [ADA], 2019).

Patient-centered care is an increasingly important theme in clinical practice recommendations. There are several additions to the ADA Standards of Care (2019) that encourage the personalization of diabetes treatment, including an emphasis on shared decision making and consideration of social context in treatment decisions. Patient-centered communication such as actively listening, eliciting patient preferences, and assessing literacy should be utilized by all members of a diabetes management team to improve patient health

outcomes. Because risks and benefits associated with glycemic targets change over the course of a patient's life, a recommendation was added to reevaluate targets over time. The Standards of Care include a table to aid in assessing hypoglycemia risk associated with treatment including use of insulins, impaired kidney function, long duration of diabetes, and several other risk factors are listed as key considerations when choosing a pharmacologic agent (ADA, 2019).

To minimize the risk to patients, The Joint Commission provides hospitals with guidance and certification for inpatient diabetes management (Arnold et al., 2016). The requirements for certification can serve as a guide to all hospitals on how to improve care and decrease risk for patients with diabetes. Hospitals that seek to acquire certification must have specific staff education requirements: 1) written blood glucose monitoring protocols; 2) treatment plans for hypoglycemia and hyperglycemia; 3) data collection on incidences of hypoglycemia; 4) patient education on self-management of diabetes (The Joint Commission, 2019).

Protocols have been developed to prevent and manage inpatient hypoglycemia, but there are challenges in implementing and enforcing such protocols (Destree, Varcellino, & Armstrong, 2017). ia partnering organization has a policy to provide protocols for the early recognition and treatment of hypoglycemia in patients with diabetes (Appendix A). Policies are needed because they set a general plan of action used to guide desired outcomes and is a fundamental guideline to help make decisions. In the healthcare environment specifically, policies should set the foundation for the delivery of safe and cost-effective quality care (Destree et al., 2017).

Consequences to the Patient

Patients with the worst control (HbA1c ≥ 10%; 86 mmol/mol) have a 30% higher risk of myocardial infarction compared to those with HbA1c between 7 and 8% and a fourfold increased risk of microvascular complications (McBrien et al., 2017). Episodes length of hospital stay and

increase the rate of hospital mortality in diabetic patients. In a study by (Borzi et al., 2016), the risk factors for hypoglycemia in type 2 diabetic patients hospitalized in internal medicine units (IMUs) in Italy was studied. There was a significantly longer length of stay in patients with hypoglycemia compared to those with no hypoglycemia (12.7 + 10.9 versus 9.6 + 6.5 days). In-hospital mortality rate was 8.8% for patients who experienced hypoglycemia compared to 4.8% in those without hypoglycemia (Borzi et al. 2016). This project will therefore emphasize management of hypoglycemia and overall improved glucose control.of hypoglycemia increase

Proposed Evidence-Based Intervention

Practicing nurses are increasingly challenged with higher acuity patients in intensely technical and evolving clinical environments. As they engage in diabetes education, they may be ill-prepared. High-fidelity simulation-based learning programs have demonstrated the ability to bridge the gap between theory and practice, increase learners' ability to synthesize knowledge, and promote learner insight (Lucas, 2014). Simulation is valued for its ability to provide realistic, context-rich experiential learning in a safe environment. From standardized patients, to low and high-fidelity mannequins, and now the virtual world (e.g. vSim), each context provides a slightly unique perspective and can facilitate learning and evaluation of patient care situations along the continuum of care (National League of Nursing [NLN], 2019). Incorporating simulation into diabetes education focusing on glycemic control can enhance nurses' understanding of the ADA standard of care guidelines and increase confidence with diabetes management. The proposed intervention is simulation-based diabetes management focusing on glycemic control and assessment of medical surgical nurses on an inpatient medical surgical unit.

The learning modalities chosen for this intervention address the needs of adult learners. Education, in any form, is dependent on the engagement of the learner or student to be

physically, mentally and emotionally involved in learning (Choi et al., 2017). In health professions education (HPE), the aim is for graduates to possess knowledge, exhibit skills, and demonstrate attitudes and behaviors that are paramount to providing high-quality medical care. Healthcare simulations focus on the engagement of the learner through activities that simulate clinical situations in order to maximize students' interest, attention and learning (Choi et al., 2017). Simulation and case scenario learning, based on a solid theoretical framework, can promote critical thinking and skill acquisition in the practicing nurse, as well as increase comfort level and confidence, which leads to improved care at the bedside.

This project has shown that experienced nurses and patients can benefit from simulation on diabetes management and glycemic control. The simulation scenario was developed using the ADA guidelines for glycemic control and operationalized using Melnyk's seven steps of evidence- based practice (EBP). The seven steps include 1) cultivate a spirit of inquiry within an EBP culture and environment; 2) ask the PICO(T) question; 3) critically appraise the evidence; 4) integrate the best evidence and patient preference in making a change; 5) evaluate outcomes; and 6) disseminate the outcome. When EBP is delivered in a context of caring and a culture as well as an ecosystem or environment that supports it, the best clinical decisions are made that yield positive patient outcomes (Melnyk & Fineout-Overholt, 2015).

Theoretical Framework

The theoretical framework for this project will be guided by Knowles' Adult Learning Theory (ALT) (Appendix B). Theory is a set of related propositions, which should be able to describe, explain, predict, or control the phenomena. Learning theories have tried to provide explanations about learning and their application. Learning theories can be used individually, group-wise or at a community level, not only for understanding and learning new things, but also

for problem solving, changing the health habits, constructive communication, control emotions and affecting behavior development (Aliakbari, Parvin, Heidari, & Haghani, 2015). The theoretical framework is often used in designing continuing education for the adult learner. Adult learning theory emphasizes a focus on interactivity and learner involvement in the process, rather than didactics. Compared with youth, adults have a greater need for the learning experience to be relevant to their own job situation, and they prefer to learn through a task or problem-centered orientation (Sperl-Hillen et al., 2013).

The field of adult learning was pioneered by Knowles (1970), whose andragogy model is based on four assumptions related to the concept that adult learners have the ability, need, and desire to control and be responsible for their learning (Knowles, 1970). Andragogy, in practical terms, means that adult education must concentrate more on the method more than the lessons. And the most useful of these include self-evaluation, simulations, role playing and case studies. Instead of assuming the usual role of a lecturer or grader, instructors take on the function of a resource person or facilitator (Knowles, 1984).

Simulation is often used in nursing education as a teaching methodology. Simulation is rooted in adult learning theory. Three learning theories, cognitive, social, and constructivist, explain how learners gain knowledge with simulation experiences (Aliakbari et al., 2015). Simulated educational designs are characterized by the ability of a participant to be engaged in tasks as if it were a real-world experience. Simulations are a proven method of provide training, experience, and improving safety to overcome worry in real patient situations due to incomplete knowledge and experience (Sperl-Hillen et al., 2013). With realistic clinical scenarios, simulation-based educational interventions in nursing can train novice as well as experienced

nurses, helping them develop effective non-technical skills, practice rare emergency situations, and providing a variety of authentic life-threatening situations (Kim, Park, & Shin, 2016).

Literature Review

A review of literature was conducted to answer the PICO question, "Does diabetic education simulation improve nurse's competency of diabetic management and improve application of knowledge through patient teaching?" Key words used to search for relevant articles included diabetes mellitus, nurses' knowledge of diabetes, diabetes education, glycemic control, simulation education, and diabetes self-management. Scholarly databases searched included Google Scholar, MEDLINE, PubMed, the Cumulative Index of Nursing and Allied Health Literature (CINAHL), and the Cochrane Library. After searching many abstracts and articles related to the project, 118 articles were revealed. The search was narrowed to 45 useable articles, ranging from 2013 to 2019. There were 49 articles that were unrelated to the project purpose or irrelevant to the PICO that were excluded. A total of 24 articles were included in the final review and key articles discussed. An Evidence Table is included in the appendices of this paper (Appendix C). The following websites were also reviewed. The American Diabetes Association (ADA), the Centers for Disease Control (CDC), and Healthy People 2020. Melnyk's rapid critical appraisal of evidence was used to evaluate the most relevant literature.

Research Supporting Education of Nurses

In a descriptive correlation study, Modic et al. (2014) found that nurses' knowledge on in-patient diabetes management principles was low. The study was conducted in a large 1200 bed health care center in the Midwest with a convenience sample of 2250 registered nurses. Level of knowledge related to diabetes was assessed via pretest immediately prior to a 4-hour diabetes management course and again at the completion of the course. The course included

content on insulin therapeutics, hyperglycemia, hypoglycemia prevention and management, and diabetes survival skill. The nurses completed the Diabetes Management Knowledge Assessment Tool (DMKAT), a 20-item questionnaire, as a pre-test/post-test. The knowledge portion of the DMKAT included 20 multiple choice questions and measured nurses' knowledge in four content areas of diabetes management presented in the class: hyperglycemia, insulin therapeutics, hypoglycemia prevention and management, and diabetes survival skill teaching. A paired t-test was used to examine differences in diabetes management knowledge before and after the Diabetes Management Educational Program. Pearson's correlation was conducted to determine if there was a relationship between comfort level or familiarity and diabetes management knowledge. The results found no correlation between neither comfort (r = .002; p = .912) nor familiarity (r = -.013; p = .556) and diabetes management knowledge; there was a correlation between comfort and familiarity (r = .706; p < .001). There was a significant [t (2238) = 90.59; p < .001] increase in scores from pretest to posttest. 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. Thus, discriminant validity of individual questions is not known. Findings from this study suggest that the nurse may not be aware of their knowledge deficits since they had high levels of comfort and familiarity despite low levels of knowledge (Modic et al., 2014).

A retrospective observational study by Lipska et al. (2014) compared hospital admissions for hyperglycemia and hypoglycemia for Medicare beneficiaries from 1999 to 2011. The hypothesis of the researchers was that the use of glycemic control practices would reduce the rate of hyperglycemia and in turn increase the incidence of hypoglycemia. During the study period, diabetes quality care metrics rewarded target-based lowering of glucose levels based on

HbA1c. Using incentives to increase tight glucose control practices placed patients at risk for hypoglycemia and other treatment complications. The study looked at five outcome measures: hypoglycemia hospitalization rates, hyperglycemia hospitalization rates, 30-day mortality post-hospitalization, one-year mortality post-hospitalization, and 30-day all-cause readmission rates. Overall, the results showed that over a 12-year period, the change in treatment targeting lowering blood glucose levels had a positive effect on hyperglycemia rates but a negative effect on rates of hypoglycemia admissions for Medicare beneficiaries. According to authors, care guidelines for patients with diabetes must be examined to improve quality and prevent hypoglycemia in all patients, and such changes would especially benefit those older than 75, African Americans, and women enrolled in Medicare (Lipska et al., 2014).

A cross sectional study by Hu et al. (2018) investigated the current diabetes management for older adults, nurses' knowledge of diabetes care, and the factors associated with nurses' knowledge of diabetes care for older adults in long-term care facilities. The study was conducted from July to December 2015. A questionnaire about nurses' knowledge was developed, and then descriptive statistics and a multiple linear regression was used. All RNs from five long-term care facilities (LTCFs) in northern Taiwan were invited to participate in the study. The inclusion criteria were RNs who had a nursing licensure and had worked in these participating LTCFs for at least three months. RNs who did not provide direct, professional nursing care or who did not have experience with diabetes care for adults aged 65 or above in LTCFs were excluded. A total of 50 surveys within five LTCFs were distributed, and 41 surveys were returned (response rate of 82%). The results of this study contribute to diabetes care practice for the elderly in LTCFs, who have great care needs that have been overlooked. RNs play critical and essential roles in providing proper diabetes care in LTCFs for older adults. However, RNs have insufficient

diabetes care knowledge in terms of older adults, which is a clinical concern (Hu, Yang, Chuang, & Liu, 2018). Continuing education on proper diabetes care for older adults should be provided periodically to RNs. Study findings could be used to inform the development of effective diabetes education for RNs who deliver care for older adults with diabetes in LTCFs (Hu, Yang, Chuang, & Liu, 2018).

Collectively these studies support the importance of improving and providing diabetes education for nurses. If hypoglycemia episodes are not recognized for their severity of complications by nurses, these complications can be reduced or controlled by health care providers working together to use the most current evidence-based practices. Health care organizations need to compare the cost of educating RN's on diabetes with the risk of potentially severe outcomes related to hypoglycemia. The time has come to encourage advanced nursing knowledge on diabetic care and the use of current evidence-based practice measures to improve the care and outcomes of patients with diabetes while they are in the hospital (Ortiz, 2016).

Research Supporting Patient Teaching

A study by Dorland and Liddy (2014) conducted a retrospective observational study to compare the effectiveness of two distinct diabetes education programs in improving clinical outcomes in patients (N=80) with type 2 diabetes. The two diabetes education classes evaluated were "the ABC's of Diabetes" (one two-hour didactic teaching session) and "Conversation Maps (three highly interactive weekly classes, six hours total). Eligible participants (N=32) had their charts reviewed and outcome measures (glycosylated hemoglobin levels (HbA1c), low density lipoprotein (LDL), systolic blood pressure (SBP), diastolic blood pressure (DBP), and weight) recorded one year prior to and six months following the class. The study demonstrated a statistically significant ($p = < 0.05$) trend towards improved glycemic control for participants in

both programs, despite differences in class duration and format. Limitations to this study included sample size due to patient attrition and limited access to clinical data. Length of follow-up was limited to 6 months due to logistical issues leading to cancelled courses. The results of this study demonstrate that shorter sessions using didactic teaching methods were equally effective in producing improvements in diabetes (Dorland & Liddy, 2014).

Grillo et al. (2016) completed a randomized control trial (RCT) study with 136 patients with type 2 diabetes mellitus to evaluate the effect of a structured group education program administered by a primary care nurse. The patients were randomized into two groups: 1) intervention group (n=68) had a structured five-week educational course and reinforcements every four months for one year, and 2) control group (n=68) had diabetic group meetings with the nurse, but no structured diabetes education was provided. The course content included identification of modifiable risk factors for type 2 diabetes mellitus, non-pharmacological treatment, emphasizing diet and exercise, pharmacological therapy, including mechanism of action and side effects of glucose- lowering medications, an overview of chronic diabetes complications, and foot care. Diabetes knowledge was measured with a 22-item questionnaire addressing the information discussed in the meetings. The questionnaire was applied at baseline, after the educational course (five weeks), and at the end of the study (12 months). The score on type 2 diabetes mellitus knowledge increased in both groups, with a higher increase in the intervention group-baseline. The main limitation in this study was the care provided to the control group. This may have been a conservative bias, since the control group may have received some informed education on diabetes. In this study a structured educational course delivered in group format is a useful tool to improve knowledge of diabetes and prevent a progressive increase in A1C in type 2 diabetes mellitus patients (Grillo et al., 2016).

Synthesis of Literature

The overall strength of the review of the literature supports a shorter more structured educational intervention on diabetes management, glycemic control, and education for nurses. The retrospective study by Dorland and Liddy (2014) demonstrated that shorter sessions using didactic teaching methods were equally as effective as the longer sessions in producing effective improvements in diabetic teaching. This was a consideration when planning the project. Also, Grillo et al. (2016) showed that a structured educational course delivered in group format was a useful tool to improve knowledge and prevent a progressive increase in A1C. Thus, the planned intervention included a group component. Nurses' may not be aware of their knowledge deficits since they had high levels of comfort and familiarity (Modic et al., 2014). Guidelines for patients with diabetes need to be examined to improve quality and prevent hypoglycemia in all patients (Lipska et al., 2014). There may also need to be emphasis on older adults (Hu et al., 2018). Collectively, these results will guide plans for a change in the current provision of diabetes education. These changes will help health care professionals, particularly nurses, need to be provided with appropriate training opportunities to enable them to fulfill the requirements of their position as an influence on both knowledge and practice (Alotaibi et al., 2017).

Application to Evidence-Based Nursing Practice

Improving diabetes care in the United States is critical because diabetes rates are increasing dramatically, particularly among minority and low-income populations. Because the number of hospital admissions for individuals with diabetes is expected to grow, it will be imperative for nurses to have knowledge and expertise to act on the recommended standards of care (Yacoub et al., 2015). The American Diabetes Association (ADA) "Standards of Medical Care in Diabetes" includes ADA's current clinical practice recommendations and is intended to

provide the components of diabetes care, general treatment goals and guidelines, and tools to evaluate quality of care (American Diabetes Association [ADA], 2018). Numerous interventions to improve adherence to the recommended standards have been implemented. However, a major barrier to optimal care is a delivery system that is often fragmented, lacks clinical information capabilities, duplicates services, and is poorly designed for the coordinated delivery of chronic care (ADA, 2018).

Better understanding of evidence-based practices can help nurses in caring for patients with diabetes and positively influence care outcomes (Yacoub et al., 2015). Empowering the patient with diabetes to be an active participant in his or her care requires a shift away from the traditional, acute-care model of health care delivery common in the U.S. Beyond providing general knowledge of diabetes care, for self-management to be effective, it is essential to tailor both the treatment and the education to the needs of the individual. In this era of evidence-based practice, it is important to provide patient-centered care.

Agency Description

Setting

This project was conducted at a 410-bed acute care hospital in rural western Kentucky. The partnering organization has a special emphasis on community outreach and training students to provide medical care in rural areas. Overall, this facility offers 37 points of care. Specialized, comprehensive services include the Jack L. Hamman Heart & Vascular Center for heart care, including electrophysiology, the Merle H. Mahr Cancer Center and mother and baby care, including the Centering Pregnancy® prenatal program – the only one of its kind in Western Kentucky and neonatal intensive care unit (NICU) (Baptist Health Madisonville, 2018).

In 2015, the hospital partnered with the local Community College to invest in an Interprofessional Simulation Hospital located in the hospital facility. The simulation center provides opportunities to enhance critical thinking and teamwork skills in a safe hospital environment. Nursing educators use the simulation hospital to train nursing students in skills and critical thinking scenarios. The nursing education department uses the simulation hospital to improve continuing education opportunities and competencies. The simulation hospital is equipped with two patient rooms and one emergency/surgical suite with five high fidelity mannequins; including two adult patients, one pediatric patient, one infant patient, and one obstetric patient. This partnership will allow for on-going simulation beyond this project. Practice-education partnerships can provide a unique framework for multi-institutional nursing education. Human patient simulation is a creative way for students and staff nurses to improve clinical reasoning and refine psychomotor skills in a safe and controlled environment.

Target Population

The target intervention population was a convenience sample of registered nurses (RNs) who work on a 30-bed medical-surgical unit. The project investigator (PI) will use the 4-West nursing unit. It was identified as having the most diabetic patient admissions. The nursing director discussed a concern about the time lapse from measuring blood sugar and the nurse administering insulin coverage. For example, the blood sugar is obtained prior to breakfast and insulin coverage is not given until an hour or so after breakfast has been served.

Another concern that has been expressed is acknowledgement of hypoglycemia and how to manage the symptoms. According to Krall et al, (2019) interest in determining effective ways for staff nurses to provide basic diabetes self-management education (DSME) and address transition on discharge is mounting. Despite reports on effective inpatient education programs,

no standardized, evidence-based programs have been developed for training bedside nurses in diabetes education and transition. Improving nurse's education skills on diabetic management can improve patient outcomes, decrease adverse events, and align with both Joint Commission and ADA goals (Krall et al., 2016). Improving nurses' education and skills on diabetes management can improve patient outcomes and decrease adverse events.

Congruence of Project with Organization

It is the mission of Baptist Health Madisonville to demonstrate the love of Christ by providing and coordinating care and improving health in the community (Baptist Health Madisonville, 2018). Their objective is to bring excellent care to the people of Kentucky with patient-related goals revolving around safety, quality outcomes, and positive patient experiences. Incorporating simulation-based diabetes education and glycemic control assessments will ensure patient safety in diabetes patients receiving education and self-management. Simulation using diabetes education to instruct and educate on glycemic control will build upon the organization's vision and values to meet the objectives of the ADA guidelines which is to provide safe, quality nursing care.

Key Stakeholders

Any person or institution directly or indirectly affected by the operation of the healthcare industry is considered a stakeholder. Stakeholders in this project include customers/patients, employees/healthcare providers, creditors, shareholders and the government. The key stakeholders are the patients, nurses, nurse management, and hospital management. Stakeholders are affected by change in systems, policies and practices in the healthcare industry. Collaboration among stakeholders is important to a successful project outcome.

Project Design

Purpose

This project was an evidence-based practice (EBP) project in which a quality improvement plan, program evaluation, and educational intervention was completed. It is the bedside nurse that spends the most time and effort managing symptoms of the diabetic patient during a hospitalization (Alotaibi et al., 2017). It is imperative for the acute care nurse to acquire a competency level of diabetes management that exhibits evidence-based practice, regardless of length of work experience, for patients to receive excellent care. Despite their years of experience, studies report that nurses are managing the care of patients without an adequate level of knowledge related to the clinical decisions necessary in caring for diabetic patients (Alotaibi et al., 2017). Inadequate knowledge of up-to-date treatment methods that promote best clinical decisions in diabetes management can directly affect the quality and safety of diabetic patients. Hospital length-of-stay, and readmission rates are said to increase if diabetic symptoms are not managed well at bedside (American Diabetes Association, 2018).

The purpose of this quality improvement project was to:

- Develop educational simulation scenarios based on ADA guidelines
- Pilot the simulation scenarios
- Assess nurses' application of skill and confidence during the simulation scenarios
- Evaluate the simulation for nurse satisfaction and process improvement

Institutional Review Board (IRB) Submission Process

The CEO at Baptist Health Madisonville completed a letter of mutual agreement (Appendix D). The project was implemented after receiving notification on January 22, 2020 from Baptist Health Madisonville review board that the project was reviewed and deemed exempt. After the organization had agreed to utilize the Eastern Kentucky University (EKU) IRB of record, an

application for Exempt Review was completed from EKU (Appendix E). CITI Training was completed on January 18, 2019 (Appendix F). The approval from EKU was communicated with the organization. EKU policies were followed for collection, storage, and destruction of data.

Implementation Plan

Development of Scenario

The first objective was development of simulated cases in diabetes management based on American Diabetes Association (ADA) evidence-based guidelines for in-hospital nursing and concerns voiced by the unit director. The educational outline consisted of current ADA guidelines of diabetes, effects of illness and infection on blood sugar level, hypoglycemia and hyperglycemia signs, and common types of insulin treatments and insulin reactions. Healthcare providers and nurses need to adhere to specific clinical diabetes guidelines when caring for these patients in the hospital setting (ADA, 2018). The patient scenario focused on hyperglycemia that requires insulin coverage. The simulation unfolded with the patient experiencing hypoglycemia symptoms. (Appendix G). With this unfolding simulation it was important to understand the importance of time management with insulin coverage.

Recruitment

A voluntary, convenience sample of nurses was recruited (N=10). To implement this project, the PI attended unit meetings to discuss the DNP project. A flyer advertising the dates and times of the sessions was posted at the nurses' workstations and in the nursing units (Appendix H). A cover letter with consent was sent out to participants to explain that participating in data collection will be voluntary and that no data forms will contain personal identifiers (Appendix I). There was no penalty for not participating in the project. Participants had additional opportunity to ask questions concerning the project.

Orientation to Intervention

Implementation of the project took place during February of 2020 on five prescheduled dates, with classes held throughout the day to accommodate nurses. Participants completed a demographic survey and diabetes management knowledge assessment tool (DMKAT) questionnaire. After completion of the demographic survey and DMKAT, nurses were provided a brief tour of the Interprofessional Simulation Hospital. All participants were scheduled for the simulation-based diabetes glycemic control education to accommodate the nurse's schedules.

Pre-Simulation Session

After completion of the orientation, each participant participated in a 30-minute, instructor-led, classroom educational session conducted by the project leader. The educational outline consisted of hospital policy and protocols, current ADA in-hospital guidelines of diabetes, effects of illness and infection on blood sugar level, symptoms and treatment of hypo/hyperglycemia, common types of insulin treatments, and insulin reactions.

Simulation Session

The planned intervention is to utilize the simulation hospital to deliver training and assess impact on skill, confidence, and satisfaction. In order to accomplish this goal, the following learning objectives were addressed:

- Review the common signs and symptoms of hypoglycemia
- Outline treatment options for the conscious and unconscious patient per protocol
- Verbalize appropriate and timely blood glucose rechecks per protocol
- Demonstrate how to address a hypoglycemia event
- Demonstrate management of insulin
- Evaluate the simulation session

The participants provided patient care in a simulated environment with a clinical scenario that included review of common signs and symptoms of hypoglycemia, treatment options per protocol, timely blood glucose rechecks, addressing a hypoglycemic event, along with insulin administration. The simulation scenario was recorded to add perspective to how they performed rather than how they think they performed. Recording can also be useful in modeling both technical skills and behavior. The scenarios ensured nurses understanding of important assessments that should be made and proper interventions to improve the patients' status. The project leader assessed each nurse utilizing the Creighton Competency Evaluation Instrument (C-CEI) during their simulation (Appendix J).

Simulation ensures nurses are put in situations like what they will experience on the unit. Simulation allows nurses to demonstrate competency on a human simulator with the ability to ask questions and remediate as needed without causing patient harm (National League for Nursing, 2015). Embedded errors will be incorporated into the patient scenarios to ensure nurses understand the importance of patient safety during the hypoglycemic episode. Creating simulation scenarios that highlight deficits can close the gap and allow nurses to become well-versed and educated in the best evidence to manage these patients (Sperl-Hillen et al., 2013).

Debriefing

Following the simulation, nurses watched their performance during debriefing and highlighted areas in need of improvement. During debriefing the project leader reviewed any safety standards and policies that need clarification. Approximately two weeks after the simulation education the participants completed the DMKAT assessment post- test. All data collected was in aggregate form and de-identified. The goal of this project was to see that nurses

benefit from repetition on knowledge in a nonthreatening environment and increase their knowledge of diabetes management.

Evaluation of Simulation Session

Following the debriefing, the participants completed an evaluation of the simulation educational session along with a self-evaluation after watching the recorded session (Appendix K). Evaluation in education involves collecting and using information to determine whether the education and/or teaching provided is successful and achieves the desired learning outcomes. The results of evaluations, the outcomes of expert-delivered patient-centered care, and the results of quality improvement projects all represent internal evidence that is gathered by nurses and other healthcare professionals on an ongoing basis as an integral and important component of professional practice.

Follow-up Survey

Approximately two weeks after the simulation education, a brief three question survey was sent to each participant (Appendix L). Following a teaching simulation one of the most important aspects is to collect feedback to learn about the needs and expectations from the participants. The most important information collected from post-simulation surveys is whether use of what they have learned improved patient outcomes.

Benchmark Data

Benchmarking data in healthcare is important to improve efficiency, quality of care, patient safety, and patient satisfaction. Benchmarking is a useful tool to identify strengths and weaknesses, allowing an action plan for improvement. A suggestion plan approach to quality improvement would be to collect the following patient outcome data; number of episodes of hypoglycemia, impact on length of stay, and impact on readmission rates (Appendix M).

Measures and Instruments

Demographic Survey

The demographic survey was given to each participant after reading the cover letter and consent. Permission was granted from Dr. Mary Beth Modic to use the demographic survey and DMKAT (Appendix N). Demographic data was collected on age, qualifications or highest degree or level of school completed, experience or number of years in practice, longevity or number of years working on current unit, questions concerning barriers to caring for diabetic patients, specialty areas, and work status (Appendix O). A self-assessment survey also asked questions on self-assessment, self-assessment on comfort, and self-assessment on familiarity (Appendix P).

Diabetes Management Knowledge Assessment Tool (DMKAT)

The objective was evaluate a change in the nurses' knowledge and understanding of diabetic management of the hospitalized patient using the Diabetes Management Knowledge Assessment Tool (DMKAT) (Appendix Q). The DMKAT was developed by Mary Beth Modic at the Nursing Institute of the Cleveland Clinic in Cleveland, Ohio, and has been used to examine bedside nurses' knowledge level of inpatient diabetes management principles (Modic et al., 2014). The 20 multiple choice questionnaire measures nurses' knowledge of hyperglycemia, insulin therapeutics, hypoglycemia prevention and management, and diabetes survival skill teaching. The DMKAT was given before and after the simulation-based diabetes education training.

The DMKAT is divided into five sections including demographics, self-assessment, self-assessment of comfort, self-assessment of familiarity, and diabetes knowledge. The demographics section contains questions to help describe the sample. The self-assessment section contains two questions related to the nurse's teaching skill and knowledge about diabetes

management. Responses are indicated on a ten-point Likert scale with answers ranging from poor to exceptional. The self-assessment of comfort includes eight questions related to the nurse's comfort with diabetes management. Responses are indicated on a ten-point Likert scale with answers ranging from very uncomfortable to very comfortable. Scores could range from 0 to 80, with higher scores indicating a higher level of comfort. The self-assessment of familiarity includes six questions related the nurse's knowledge of diabetic hospital policies and resources. Responses are indicated on a ten-point Likert scale with answers ranging from very unfamiliar to very familiar. Scores could range from 0 to 60, with higher scores indicating a higher level of knowledge regarding policies and resources. The diabetes knowledge sections includes 20 multiple-choice questions that measure nurses' knowledge in content areas such as hyper/hypoglycemia prevention and management, insulin therapeutics, and diabetes survival skills teaching of the patient. Each of these questions weighed one point, allowing for scores 0 to 20, with higher scores indicating more diabetes knowledge. The content validity DMKAT was assessed and reported as .95 using a modified two-stage Delphi technique (Modic et al., 2014).

Creighton Competency Evaluation Instrument (C-CEI)

To assess diabetes education competency, the PI assessed the nurses in groups of two during the simulation using the Creighton Competency Evaluation Instrument (C-CEI). The C-CEI was developed for the National Council of State Boards of Nursing National Simulation Study (NCSBN NSS) as an evaluation instrument for both simulation and traditional clinical experiences (Hayden, Keegan, Kardong-Edgren, & Smiley, 2014). Five nursing programs participated in the validity and reliability testing of this instrument. The C-CEI has inter-rater reliability of 79.4%. Cronbach's alphas were above .90 and considered highly acceptable (Hayden et al., 2014). The C-CEI has a total of 23 items that are scored as (1) demonstrates

competency or (0) does not demonstrate competency. The C-CEI allows situation-specific evaluation on four categories: assessment, clinical judgement, communication, and patient safety. If an item is not relevant to the simulation scenario, it is designated “not applicable”.

Data Analysis Plan

After creating codebooks of the instruments, data analysis of the results were compiled into a spreadsheet by the PI using Excel. The data was then transferred and analyzed using the Statistical Package for the Social Science (SPSS) version 26 software.

Descriptive statistics was used to identify nurses’ actual and perceived knowledge of diabetes and evaluate the Demographic survey. The PI assessed each nurse’s simulation performance utilizing the C-CEI. One C-CEI was completed per each simulation session. This was not a measure of minimal competency, and nurses were not required to achieve a certain score on the C-CEI. Paired sample *t* test was used to measure the difference between the pretest and posttest scores of the DMKAT. Qualitative responses on all instruments were pooled and then reviewed for themes.

Resources

The PI worked closely with Dr. Molly Bradshaw and Dr. Gina Purdue as they were the project advisors. At the partnering organization, the PI worked with multiple people on this quality improvement project. Christy Littrell is the unit director of 4-West, data was collected from her regarding current practice on diabetes education. Diana Jackson is the director of oncology services and interim chief of nursing. Diana served as the preceptor throughout the DNP project. Shannon Allen is the director of the Interprofessional Simulation Hospital and assisted in developing diabetes education/glycemic control scenarios, plan implementation days,

and ensure proper equipment was stocked prior to implementation. The nurses on 4-West were the participants in the implementation.

Results

Demographic Survey `

As shown in Table 1, a convenience sample (N=10) of nursing staff on 4 west participated in the educational program. All 10 participants (100%) completed the demographic survey. The survey included age, education, years of experience, and competence in caring for a diabetic patient using 0-10 Likert scale. The age of the participants ranged from 25- 49 years with a mean age of 31.8 ± years. Years of experience ranged from 1-23 years with a mean of 6.1 ± years. Level of education indicated that 60% were prepared at the Baccalaureate level and 40% had an Associate degree in nursing. Self-rated competency in taking care of a diabetic patient ranged from 5-9 with a mean score of 7.6 ± on the Likert Scale.

Table 1

Demographic Survey Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Age	10	25.00	49.00	31.8000	7.64199
How competent do you feel taking care of a patient with diabetes	10	5.00	9.00	7.6000	1.17379
Years of nursing experience	10	1.00	23.00	6.1000	6.19049
Education	10	1.00	2.00	1.6000	0.51640
Valid N (listwise)	10				

The self-assessment components on the demographic survey focused on overall knowledge of diabetes and teaching skill of diabetes. A Likert scale of 0-10 was used, with 0 = poor and 10 = exceptional. Most of the participants 60% chose ineffective insulin regimen and

lack of coordination between blood glucose monitoring as the greatest obstacle/barrier to managing blood glucose in the hospital. The findings are summarized in the table below.

Table 2

Demographic Self-Assessment Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Rate your overall knowledge of diabetes management.	10	5.00	8.00	6.8000	1.03280
Rate your overall teaching skill (managing symptoms, BGM, taking medications)	10	6.00	9.00	7.5000	0.97183
Valid N (listwise)	10				

On the comfort level of assessment, the lowest comfort level rate was given to administering IV insulin infusions (m = 3.9) and the highest comfort level (m = 8.9) was given to administering subcutaneous insulin. This finding is not surprising because the participants are from a medical surgical unit and do not frequently administer insulin IV. The findings are summarized in the table below.

Table 3

Demographic Assessment of Comfort Descriptive Statistics

	N	Mean
Comfort in administering subcutaneous insulin.	10	8.9000
Comfort in teaching patients about insulin administration.	10	8.8000

Comfort in administering IV insulin infusions.	10	3.9000
Comfort in caring for patients with insulin pumps.	10	6.0000
Comfort in managing hyperglycemia.	10	8.6000
Comfort in managing hypoglycemia.	10	8.3000
Comfort in teaching patients how to prevent and manage low BS at home.	10	8.2000
Comfort in teaching patients about blood glucose monitoring.	10	8.6000
Valid N (listwise)	10	

The participants rated most familiarity with insulin pump policy (m = 7.0) and the least familiarity of (m = 5.7) with intravenous insulin. Another low scoring familiarity (m = 6.5) was resources available for teaching patient survival skills. Survival skills are an essential part of diabetic education and an important resource for nurses. This finding supports my project and the need for continuing education on diabetes management. The findings are summarized in the table below.

Demographic Assessment of Familiarity
Descriptive Statistics

	N	Mean
Familiarity with diabetes management policy.	10	6.8000
Familiarity with hypoglycemia prevention and management policy.	10	6.8000

Familiarity with insulin, intravenous administration on med-surg unit's policy.	10	5.7000
Familiarity with insulin pump policy.	10	7.0000
Familiarity with available resources for teaching patients about survival skills.	10	6.5000
Valid N (listwise)	10	

Creighton Competency Evaluation Tool (C-CEI)

The C-CEI tool was used by the PI for evaluation and included the four categories: assessment, communication, clinical judgement, and patient safety. This tool was completed directly after the simulation education session. All participants received 100% on assessment, communication, and clinical judgement. Six nurses (60%) did not use two patient identifiers and five nurses (50%) did not use standard precautions (handwashing) in the patient safety category. The findings was a mean of .40± with a standard deviation of .516 in the patient safety category.

Table 5

Creighton Clinical Evaluation Instrument

	N	Minimum	Maximum	Mean	Std. Deviation
Assessment	10	1	1	1.00	.000
Communication	10	1	1	1.00	.000
Clinical Judgment	10	1	1	1.00	.000
Patient Safety	10	0	1	.40	.516

Creighton Competency Evaluation Instrument Chart

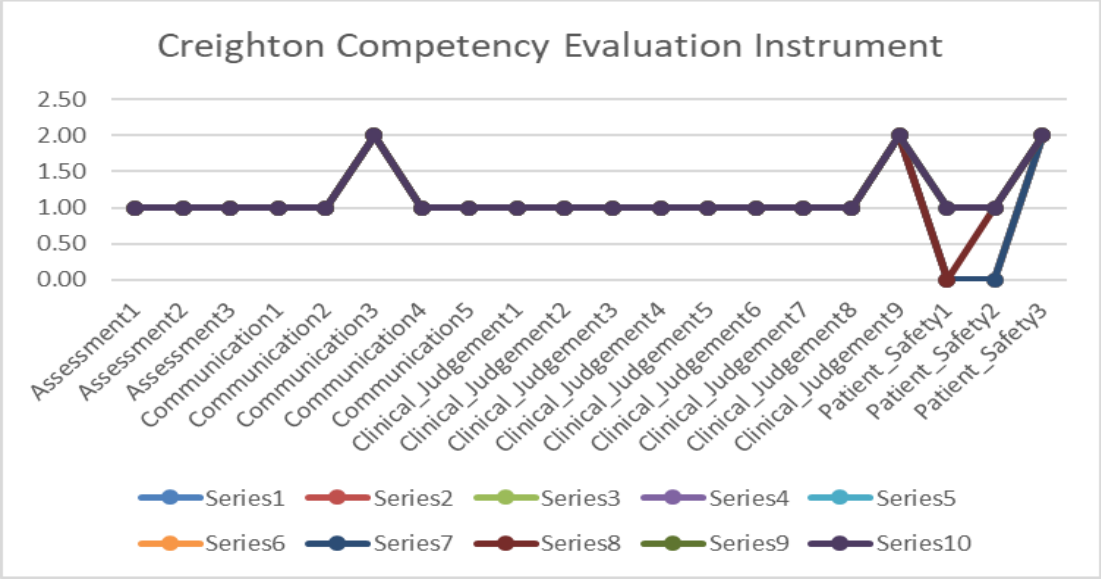

Figure 1: 2-D line chart with markers to show trends of C-CEI results during simulation education.

Diabetes Management Knowledge Assessment Tool (DMKAT)

As shown in Table 6, the Paired Samples t-test revealed a statistically significant *p* value (0.002). This was not due to random error. The *t* value, which is -4.333, showed significant difference between population means. The mean difference score is -1.30000, indicated the pre-test scores were slightly lower than the post-test. Other results of the Paired Samples test include: the standard deviation (SD) of 0.94868, which signifies the variability between sample means, and the population mean lies between -1.97865 and -0.62135. as the confidence interval (CI).

In summary, on average, participants given the diabetes education intervention, improved their overall mean scores from (M = 12.2000, SE = 0.71181) to (M = 13.5000, SE = 0.58214). This difference, 1.30000, 95% CI [-1.97865, -0.62135], was significant t (9) = -4.333, p = 0.002, and represented a large-sized effect, d = 0.944. These results indicate that there was improved knowledge of nurses after receiving diabetes management education. The results are summarized in the table and figure below.

Table 6

DMKAT Paired Samples t-test

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	Score before education - Score after education	-1.30000	0.94868	0.30000	-1.97865	-0.62135	-4.333	9	0.002

DMKAT Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Score before education	12.2000	10	2.25093	0.71181
	Score after education	13.5000	10	1.84089	0.58214

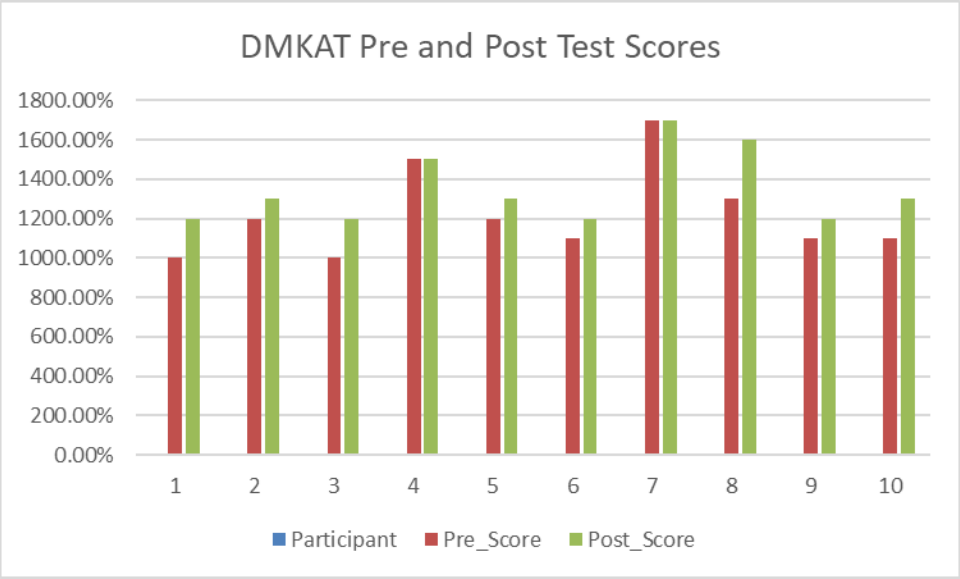

Figure 2: Bar chart to compare DMKAT pre and post test scores for each participant.

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 7, there was significant relationship between the variables experience (number of years as a nurse) and education (nursing degree) and the variables pre-test and post-test. Pre-test scores to post-test scores showed a strong correlation (0.912) with a significant *p* value (0.000). This means if the score is better on the pre-test, the higher the score will be on the post-test. Cronbach's alpha revealed the internal reliability of the DMKAT tool. A result of 0.7 or higher is acceptable.

Table 7

Pearson's Correlations

		Score before education	Score after education	Years as a nurse	Education degree
Score before education	Pearson Correlation	1	0.912**	-0.273	0.076
	Sig. (2-tailed)		0.000	0.446	0.834
	N	10	10	10	10
Score after education	Pearson Correlation	0.912**	1	-0.307	0.234
	Sig. (2-tailed)	0.000		0.388	0.516
	N	10	10	10	10
Years as a nurse	Pearson Correlation	-0.273	-0.307	1	-0.299
	Sig. (2-tailed)	0.446	0.388		0.401
	N	10	10	10	10
Education degree	Pearson Correlation	0.076	0.234	-0.299	1
	Sig. (2-tailed)	0.834	0.516	0.401	
	N	10	10	10	10

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

Discussion

The minimum expectation of ten people was met for this study. There was an increase in the outcomes from the DMKAT pre and posttest scores. This shows the 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 for all persons diagnosed with diabetes or at risk for diabetes (Healthy People 2020, 2019).

The findings of this project 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 project included basic evidence-based information necessary to provide the best care to patients 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 PI assessed each nurse's simulation performance utilizing the C-CEI. This was not a measure of minimal competency, and nurses were not required to achieve a certain score on the C-CEI. Instead, results were reviewed during debriefing to enhance quality and safety during patient care. An area of surprise was the low scores on the C-CEI in the patient safety category. Six nurses did not use patient identifiers and five of the nurses did not wash their hands.

Debriefing provided reinforcement and reflection after the simulation-based diabetes education. Through, discussion, the participants reflected upon their experience and identified what was learned through the clinical scenario. Nurses indicated that this educational simulation served as a review of prior knowledge, stating "A very good refresher" and "Very informative and helpful."

As this project shows, education in diabetes in the hospitalized patient is important due to the ever changing and increasing evidence for best practice in the management of diabetes. To be effective and provide a safe environment for the hospitalized diabetic patient, education cannot be a onetime occurrence, but needs to be on going. Based on the results of this project and the gaps that persist in nurses' knowledge, diabetic education should be included in nurses' annual competencies, with educational updates provided throughout the year as recommendations from governing agencies become available. Increasing the knowledge of nurses in diabetes management will increase the quality and safety of patient care and improve patient outcomes.

Limitations

Limitations of the project included a small sample size and the involvement of only one organization. The project was voluntary, so many nurses did not want to give the time for the project. Overall, the usefulness of this project 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. With, another limitation being that nurses completed their education and simulation during their work shift, if the nurse was having a stressful day, they may not have put their time and attention into the simulation.

In addition, reliability of the results on the post-tests could also be skewed as the participants were given the post-test two weeks after the simulation and were in a non-proctored setting. If this project is replicated, the PI recommends administering the pre-and post-tests in a proctored setting to ensure reliability.

Implications of Findings

The findings of this project suggested there was a reasonable knowledge gap pertaining to diabetes management for nurses who are currently caring for patients with diabetes in the

hospital setting. The ADA (2019) reported inadequate knowledge implementations can affect the quality and safety of hospitalized patients, often causing increased length of stay and readmission rates.

Recommendations for decreasing hypoglycemic events include the identification of additional resources, such as management support, physician collaboration, and time availability. In addition to knowing what to do and how to do it, nurses need the time to put their knowledge and skill into practice and a supportive environment can accomplish this. Nurses and physicians need to be on the same page when it comes to following the latest recommendations from regulatory agencies for the prevention of hypoglycemia in the hospitalized patient. Therefore, physicians as well as nurses need education on the latest recommendations from regulatory agencies.

The future actions by this PI is to collaborate with nursing leadership and the educational department at this facility to assist with continuing a diabetes management educational program for new hires and annually with skills day. Measures must be taken to prepare nurses for providing quality care to patients with diabetes. Creating a continuous environment of learning will allow the nurses to gain knowledge, skill, and confidence in diabetes education and will assist with decreasing hospital length of stay and readmission rates. The usefulness of this project is its increased awareness of the need for continuously updated knowledge.

Conclusion

The findings for this project answered the project question to the affirmative by indicating that simulation can improve nurse's skills, confidence, and satisfaction in the care of the hospitalized patient at risk for a hypoglycemic event and potentially decrease the number of hypoglycemic incidences associated with the hospital. The difference between the means (pre-

test M = 12.2000, post-test M = 13.5000), suggest that there was a gain in knowledge and skill, with nurses able to take the knowledge gained and apply it to a new situation. In addition, participant's evaluations indicate a gain in knowledge and that the gain in knowledge had a direct relationship with the intervention. Nurses play a critical role in caring for patients with diabetes and recognizing the potentially serious complications of the disease, if it is not managed appropriately. Annual training/education on diabetes management will allow the nurse to feel confident with the knowledge to provide the best up-to-date education to their patients and improve outcomes.

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Appendix A

Baptist Health Madisonville Hypoglycemia Policy

BAPTIST HEALTH®

Policy		
Category Clinical	Orig. Effective Date 6/00	Revised & Effective 11/10, 11/13, 11/16
Policy # 	Pages 4	

TITLE/SUBJECT	*Hypoglycemia*

PURPOSE To provide protocols for the early recognition and treatment of hypoglycemia in patients with diabetes.

SCOPE Baptist Health Madisonville

AUTHORIZATION Nursing Practice Council, Pharmacy

POLICY

A. Each member of the interdisciplinary team is expected to recognize the clinical manifestations of hypoglycemia.
B. Unless specific physician orders are given for hypoglycemia, treatment protocols will be followed.
C. All patients with diabetes taking medication for diabetes shall receive instructions about the causes, signs, treatment including diet, and prevention of hypoglycemia.

Hypoglycemia is blood glucose below 60 mg/dl. It is the most common acute complication for persons with diabetes. Common causes of hypoglycemia include excessive medication, alcohol ingestion, inadequate food intake or delayed intake and excessive exercise. Excessive oral medication as well as insulin may cause hypoglycemic episodes. The severity of hypoglycemic episodes may vary greatly and is defined by blood glucose readings <60 mg/dl and symptoms.

PROCEDURE

STEPS	KEY POINTS
A. Recognize the clinical manifestations of Hypoglycemia: 1. Tachycardia 2. Sweating 3. Nausea/hunger 4. Pallor 5. Numbness or tingling around the mouth 6. Headache 7. Weakness 8. Nervousness, Restlessness, Anxiety 9. Visual Disturbances 10. Thick Speech 11. Confusion 12. Personality Change 13. Drowsiness, Lethargy 14. Seizures 15. Unconsciousness	1. Early recognition of the clinical manifestations is essential to providing prompt treatment and preventing progression of hypoglycemia. 2. Other physiologic signs include: • Shallow respirations with normal rate • Subnormal or elevated temperature • Moderate to severe distress • Cool, diaphoretic skin • Pale coloring • Dilated pupils

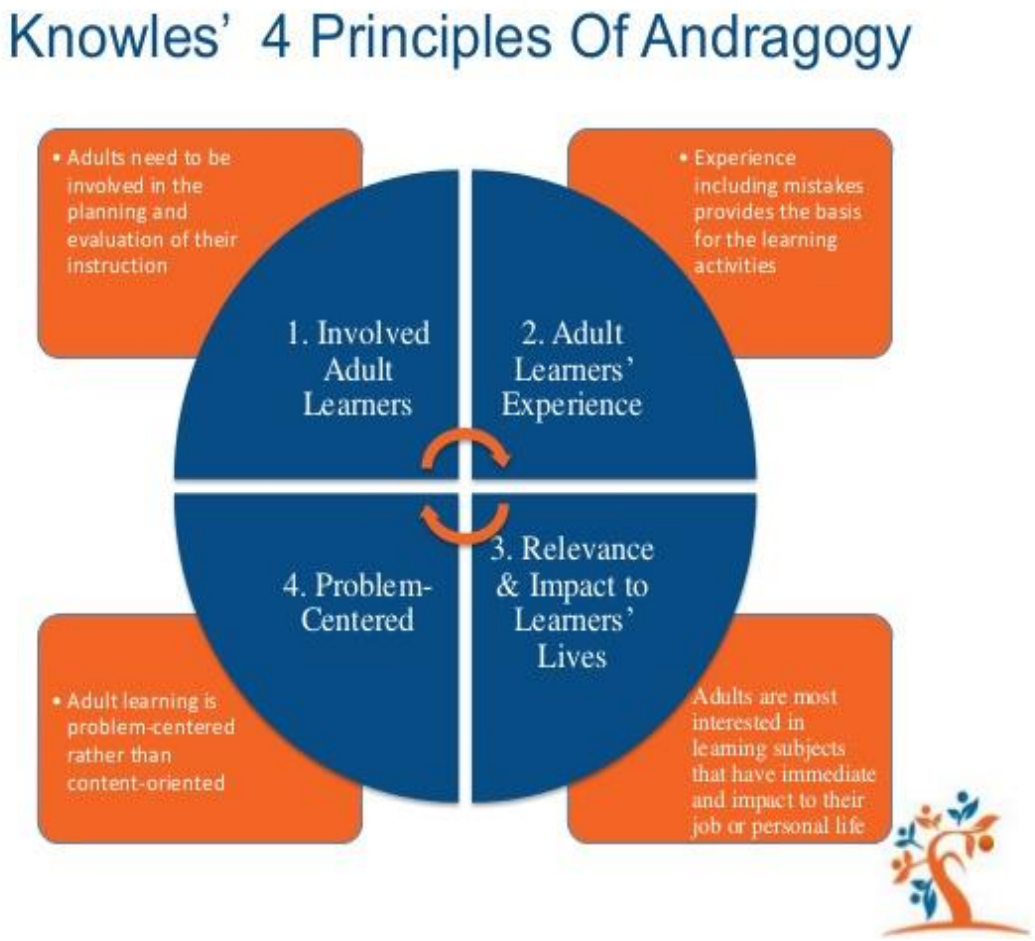
STEPS	KEY POINTS
B. A fingerstick blood glucose test will be performed immediately on any patient Suspected of having a hypoglycemic reaction. (See Glucose ***Determination***, Policy and Procedure).	1. A blood glucose value less than 60 mg/dl indicates hypoglycemia.
C. For the patient with blood glucose less than 60 mg/dl and conscious (able to swallow) who is symptomatic or asymptotic:	NOTE: If fingerstick blood glucose is to low to read on glucometer, notify lab for need for serum blood glucose to verify reading, before giving any medications.
1. Give 15 grams of carbohydrate (4 oz. juice or soda, 8 oz. Low-fat milk, 3 Glucose tablets, one half tube of glucose gel) po STAT.	1. Eating/drinking 15 grams of carbohydrate should raise the Blood glucose level 30 to 45 mg/dl. NOTE: Do not use milk or orange Juice for dialysis/renal patients. Because renal dialysis patients need to avoid foods high in potassium/Sodium/phosphorus. NOTE: For patients taking Acarbose (Precose) use only oral glucose gel, tablets, or low-fat milk. Acarbose (Precose) blocks the absorption of complex carbohydrates (sucrose) from the small intestine. Glucose gel, tablets or milk do not contain sucrose.
2. Observe patient and assess vital signs and level of consciousness.	2. Changes in vital signs or level of consciousness may indicate a further drop in blood glucose.
3. Repeat blood glucose after 15 minutes. Carbohydrate absorption starts to occur within 15 minutes. If no improvement in blood glucose: a) Repeat 15 grams Carbohydrate po b) Notify physician. c) Observe patient and re-assess. If symptoms improve: a) Give carbohydrate and protein snack (peanut butter and crackers, fruit and milk) if no meal within 1 hour. Instruct the patient/family about the causes, signs, treatment, and prevention of hypoglycemia.	3. Re-testing of blood glucose determines appropriate evaluation of treatment response. 4. Instruction is needed by all individuals taking medication for diabetes.
D. For the patient with blood glucose less than 60mg/dl, symptomatic and unconscious(unable to swallow): If the patient has an IV: a. Administer Dextrose 50%-50ml IV, push STAT. b. Notify physician. NOTE: If hypoglycemia is not related to administration of "oral antidiabetic medications	1. The administration of oral treatment in an unconscious patient may cause choking. Administration of D50%-50ml IV will raise the blood glucose within 1-2 minutes. 2. Re-testing of blood glucose determines appropriate evaluation of treatment response

STEPS	KEY POINTS
(i.e. sulfonylurea's, glitazones)" notify physician prior to administration of Dextrose 50%-50ml IV	
c. Observe the patient closely and assess for level of consciousness and vital signs,	3. To monitor patient's overall condition
d. Repeat blood glucose after 15 minutes.	
e. Reassess vital signs and level of consciousness.	
1. If symptoms improve:	
a. Give carbohydrate and protein snack if no meal within 1 hour.	4. Some individuals require additional carbohydrate to raise blood glucose. This combination of foods prevents blood glucose from falling back into the hypoglycemic range.
If the patient does not have an IV:	
a. Administer Glucagon 1 mg IM STAT (Adults). Start IV.	5. Giving Glucagon IM will raise blood glucose about 20-30mg/dl within 5-10 minutes and allows prompt treatment when a patient does not have an IV. An IV should be started to provide access for use of Dextrose 50% if blood glucose continues to drop.
b. Observe patient closely; assess vital signs and level of consciousness. Place patient on side.	
	NOTE: The use of Glucagon may cause nausea and vomiting. Placing the patient on his/her side will prevent choking.
c. Notify physician.	1. To obtain additional orders as necessary and to notify the physician of patient's condition and potential for critical condition.
d. Repeat blood glucose in 15 minutes, Assess vital signs, level of consciousness.	
If no improvement and patient remains unable to swallow after 15 minutes:	2. Dextrose 50% will raise blood glucose in 1-2 minutes.
a. Administer Dextrose 50%-50ml IV STAT.	
b. Notify physician	3. For additional orders as necessary and to notify of potential critical condition.
c. Continue to observe and assess closely.	4. The physician may change the treatment based upon the patient's blood glucose.
d. Initiate orders as given.	
If symptoms improve:	
a. Follow with carbohydrate and protein snack if no meal within 1 hour.	1. This combination of foods will keep blood glucose from falling back into the hypoglycemic range.
b. Instruct patient about the cause, signs, treatment, and prevention of hypoglycemia.	2. To prevent future hypoglycemic episodes
1. Document the hypoglycemic reaction completely in the clinical record, including the patient's signs and symptoms, blood glucose values, treatment administered, and patient's	

STEPS	KEY POINTS
condition following treatment. 2. Document patient teaching in the Clinical Record .	

Appendix B

Knowles' Adult Learning Theory



Appendix C

Evidence Table

Citation	Study Purpose	Design/ Method	Sample/ Setting	Major Variables Studied and their Definitions	Measurement of Major Variables	Data Analysis	Findings	Appraisal Worth to Practice
Article 1 Dorland, K. & Liddy, C. (2014). A pragmatic comparison of two diabetes education programs in improving type 2 diabetes outcomes. *Biomedical Research International*, 7, 186, doi:10.1186/1756-0500-7-186.	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.	Retrospective Observational study	80 participants enrolled in 2 DM classes. 39 in the "ABC's of DM" class and 41 in the "Conversation Map's" class. The sample consists of patients with T2DM at 2 academic family health team (FHT) sites in Ottawa, Ontario.	IV1-ABC's of Diabetes IV2-Conversation maps IV1-A1C- drop of 1.1% in A1C was statistically significant with a p value of 0.004. IV2-Weight- There was a statistically significant decrease in weight 6 months after the ABC's diabetes class p=0.049.	The ABC's of Diabetes class (one 2hour didactic teaching session); The Conversation Maps class (3 highly interactive weekly classes, 6 hours in total); The Clinical Outcomes were glycosylated hemoglobin levels (HbA1c), low density lipoprotein (LDL), systolic and diastolic blood pressure, and weight.	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, -tailed, t-test compared the change in outcomes between the 2 classes. The Mann Whitney U test for comparison of normality 2 related to change in HbA1c from pre to post 3 months in the Conversation Maps class.	Decrease in weight observed 6 months after the ABCs class (p=0.028), 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. Statistical analyses were carried out using SPSS 20.0. No significant difference between the 2 DM education classes.	The mean HbA1c before the diabetes classes in this sub-group was 9.2% and 3 months after the class the mean had dropped to 8.1%.This drop of 1.1% in HbA1c was statistically significant with a p value of 0.004.This study indicative of the goal that most DM treatment methods is to reduce HbA1c.Limitations: This study shows how diabetes education is beneficial to lowering glycemic levels, improving patient health, and increase nurses' knowledge.
Article 2	This study investigated the current	Cross sectional survey	41 nurses from five long-term care facilities in	A questionnaire was developed	The survey questionnaire was found to	All analyses were performed	The findings showed that RNs who	The results of this study contribute to

Hu, S. H., Yang, Z. L., Chuang, Y., & Liu, M. F. (2018). Registered nurses' knowledge of medical care for older adults with diabetes in long-term care facilities in Taiwan. *Collegian*, *25*. https://doi.org/10.1016/j.colegn.2017.07.003	diabetes management for older adults, nurses' knowledge of diabetes care, and the factors associated with nurses' knowledge of diabetes care for older adults in long-term care facilities.		Northern Taiwan were enrolled. The study was conducted from July to December 2015.	by the researchers and was comprised of three sections: demographic information, current diabetes care in the LTCF, and RNs' knowledge of medical care for older adults with diabetes.	have good content validity (validity index 0.83) and a good reliability analysis (KR-20, α=0.77). The questionnaire was developed based on "Standards of Medical Care in Diabetes-2013". Questions were multiple choice, with only one correct answer per question. The minimum score was 0 and the maximum was 10, with a higher score indicating better knowledge of diabetes care for the elderly.	using IBM SPSS statistical software. Data processing methods included descriptive and inferential statistics with statistical significance at $\alpha = 0.05$. Data were analyzed, using descriptive statistics and multiple linear regression analysis.19.0 The multiple linear regression analysis showed that the diabetes continuing education course was the only factor associated with nurses' diabetes care knowledge score ($\beta = 0.528$, $p = 0.007$), after controlling for their experience in acute care ($\beta = 0.11$, $p = 0.484$) and LTCFs ($\beta = -0.345$, $p = 0.059$) and their highest educational degree ($\beta = 0.237$, $p = 0.155$).	work in LTCFs did not have enough knowledge of medical care for older adults with diabetes, which might be a threat to the quality of care and care outcomes. The study results revealed that older adults received inconsistent diabetes care. Even in the same facility, physicians might visit older adults with diabetes at different periods of time, and nurses might check older adults' HbA1C at various intervals, indicating a lack of protocol or best evidence to support the best practice provided to manage older adults with diabetes.	diabetes care practice for the elderly in LTCFs, who have great care needs that have been overlooked. RNs play critical and essential roles in providing proper diabetes care in LTCFs for older adults. However, RNs have insufficient diabetes care knowledge in terms of older adults, which is a clinical concern. Continuing education on proper diabetes care for older adults should be provided periodically to RNs. Study findings could be used to inform the development of effective diabetes education for RNs who deliver care for older adults with diabetes in LTCFs
Article 3 Grillo, M. F., Neumann, C. R., Scain, S.	The aim of the study was to evaluate the effect of a structured	Randomized clinical trial	Sample included 137 patients with type 2 diabetes mellitus randomized into	The intervention group received a structured diabetes self-	RCTs and quasi experimental studies. Data (for each	Students' t-test and chi-square test were used to compare	A benefit from the intervention was a reduction in	The effect size for this study was .2, small effect.

F., Rozeno, R. F., Beloli, L., Perinetto, T., ... Leitao, C. B. (2016). Diabetes education in primary care: A randomized clinical trial. *Cadernos De Saude Publica, 32*. https://doi.org/10.1590/0102-311X00097115	group education program administered by a primary care nurse in patients with type 2 diabetes mellitus.		2 groups. Inclusion criteria: Adults 18-80 years of age with type 2 diabetes and HbA1c > 7%, attending the primary care unit at least once in the 6 months prior to screening, willing to attend the 5-week course. Exclusion criteria: history of active infection, chronic corticosteroid use, unstable angina or myocardial infarction in the last 3 months, advanced renal disease, heart failure, cirrhosis, alcohol abuse, illicit drug use, dementia, current pregnancy, breastfeeding, current cancer, or any disease that might affect survival in the subsequent 5 years.	management education course that consisted of weekly 2-hour meetings for 5 weeks (10 participants/group) with reinforcement meetings every 4 months for one year. The course content included; identification of modifiable risk factors, non-pharmacological treatment, emphasizing diet and exercise, pharmacological therapy, overview of chronic diabetes complication, and foot care. The control group had the same frequency as the intervention group, but no structured diabetes education was provided.	study) extracted on the number of participants, sample intervention, study design, and type of control. Each article was analyzed for relevant intervention characteristics population, duration of intervention, setting of, 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.	baseline continuous and categorical variables. General linear model (GLM) for repeated measurement was used to analyze changes in the outcomes during the trial. A sample of 136 patients was required to detect a 0.5% difference in HbA1c, considering the repeat measurement design, 80% power, and 5% alpha error. Statistical significance was set at $p<0.05$ (two-tailed). IBM SPSS 18.0 and Stata were used for the analyses.	distress associated with diabetes mellitus; patients participating in the structured course had a larger decrease in the PAID score in 12 months when compared to baseline (intervention: -34±22 vs. controls: -26±18, p = 0.017). Levels of not vary during the evaluation period: baseline – 83.6% vs. 88.3% (p = 0.61); 4 months – 76.1% vs. 88.3% (p = 0.11); 8 months – 77.6% vs. 88.3% (p = 0.16); and 12 months – 83.6% vs. 86.7% (p = 0.80). physical inactivity between the intervention and control groups did	The results support the idea that structured educational interventions are associated with better outcomes than open-ended models.
Article 4 Modic, M. B., Vanderbilt, A., Siedlecki, S. L., Sauvey, R., Kaser, N., & Yager, C. (2014). Diabetes management unawareness:	The purpose of this study is to examine nurses' comfort, familiarity, and knowledge of inpatient diabetes management principles and to explore	Descriptive Study	The study was conducted in a large 1200 bed health care center in the Midwest. Participants included registered nurses in all specialties except the operating room	DV: (1) age and level of knowledge, (2) level of knowledge based on education or years of experience, (3) difference in nurses' self-rated comfort	Comfort was defined as a sense of confidence in performing a skill or using knowledge and was measured by summing the score of eight items.	A paired t-test was used to examine differences in diabetes management knowledge with pre and posttest before and after the Diabetes	Using Pearson's correlation, a negative correlation (r = −.182; p b .001) between age of the nurse and level of knowledge demonstrated	Significant [t (2238) =90.59; p<.001] increase in pre-test (x=11) to post-test (x=20). Findings suggest that nurses do not

What do bedside nurses know? *Applied Nursing Research*. https://doi.org/10.1016/j.apnr.2013.12.00	areas where knowledge gaps persisted even after completing a 4-hour educational intervention.		and neonatal intensive care unit. The course resulted in a convenience sample of 2250 nurses.	and level of knowledge, and (4) is there a gain of knowledge after a diabetes course. IV: (1) Pre-assessment test (2) lectures (3) strategic questioning (4) case studies (5) post-test (6) Diabetes Management Knowledge Assessment Tool (DMKAT).	Comfort scores could range from 0 to 80 with higher scores indicating greater levels of comfort. Construct validity was assessed using principle component analysis with varimax rotation, which confirmed a one-factor solution. Reliability of this scale was .87. Data was analyzed using SPSS version 19.0.	Management Educational Program.	on the DMKAT, with scores decreasing as age increased. Using Spearman's correlation, age was correlated with education level (r = −140; p b .001) and with years of nursing experience (r = .759; p b .001). Pearson's correlation found no correlation between neither comfort (r = .002; p = .912) nor familiarity (r = −.013; p = .556) and diabetes management knowledge; correlation between comfort and familiarity (r = .706; p b .001).	feel comfortable and are not adequately prepared to make patient care decisions or provide survival skill education for patients with diabetes in the hospital.
Article 5 Lipska, K. J., Ross, J. S., Wang, Y., Inzucchi, S. E., Minges, K., Karter, A. J., ... Krumholz, H. M. (2014). National trends in US hospital admissions for hyperglycemia and hypoglycemia among	To characterize changes in hyperglycemia and hypoglycemia hospitalization rates and subsequent mortality and readmission rates among older adults in the United States over a 12-year period, and to compare these results according to age, sex, and race.	Retrospective Observational Study	Data from 33 952 331 Medicare fee-for-service beneficiaries 65 years or older from 1999 to 2011.	Hospitalization rates for hyperglycemia and hypoglycemia, 30-day and 1-year mortality rates, and 30-day readmission rates. The study examined the following characteristics of patients admitted for hyperglycemia and hypoglycemia	Accordingly, we sought to characterize rates of hospital admissions for hyperglycemia and hypoglycemia during the period of time when glycemic control improved, using a 100% sample of Medicare beneficiaries	To analyze whether changes over time in the primary outcomes (hyperglycemia and hypoglycemia hospitalizations, mortality and readmission rates) were statistically significant, we used the Mantel-Haenszel χ^2	Hospital admission rates for hypoglycemia now exceed those for hyperglycemia among older adults. Although admissions for hypoglycemia have declined modestly since 2007, rates among black Medicare	The study was based on hospital admissions for short-term complications of DM suggests a differential effect of changes in DM treatment on rates of severe hyperglycemia and hypoglycemia and provides a strong argument for

Medicare beneficiaries, 1999 to 2011. *JAMA Intern Med, 174*. https://doi.org/10.1001/jamainternmed.2014.1824				in each year: age (65–74, 75–84, and ≥85 years), sex, race (white, black, other), and the presence of 20 key comorbidities.	from 1999 to 2011. Using nationally representative survey data from the Centers for Disease Control and Prevention, we performed additional analyses to estimate rates of hospitalizations among Medicare beneficiaries with DM, because DM prevalence increased over the study period.	test. We then fitted a generalized linear mixed-effects model with a Poisson link function, adjusting for age, sex, and race All analyses were performed using SAS statistical software (version 9.3; 64-bit version; SAS Institute Inc). $P < .05$ (2-sided test) was considered statistically significant. To facilitate data presentation, patient characteristics were reported in 2-year intervals over the study period.	beneficiaries and those older than 75 years remain high. Hospital admissions for severe hypoglycemia seem to pose a greater health threat than those for hyperglycemia, suggesting new opportunities for improvement in care of persons with diabetes mellitus.	incorporating hypoglycemia into future assessments of DM quality measures.

Appendix D

Statement of Mutual Agreement

Statement of Mutual Agreement for DNP Project

The purpose of a Statement of Mutual Agreement is to describe the agreement between a designated clinical agency and the DNP student regarding the student's DNP project.

I. General Information

Student Name: __Greshin Markwell_____

Project Title: Using Simulation to Improve Skills, Confidence, and Satisfaction Related to Diabetes Education____

Agency: _Baptist Health Madisonville_____

Agency Contact: _Denise Dunn_____

II. Brief description of the project

- Evidence-based intervention
- Expected project outcomes (products, documents, etc.)
- On-site Activities (DNP student role, required meetings, access to agency records, non-disclosure expectations)
- Products resulting from the DNP project with potential market value.
  Any products produced from collaboration with the agency must be discussed with the student, DNP Project Advisor, and appropriate agency representative. The ownership of intellectual property rights must be determined prior to the implementation of the project.

Diabetes mellitus is the seventh leading cause of death in the U.S. and affects 30.3 million people (Centers for Disease Control and Prevention [CDC], 2019). Research suggests that patients often have a limited knowledge and insight into self-management of diabetes mellitus (DM). Acceptance of the disease, insufficient knowledge, and noncompliance are the examples of key factors that affect the progress of the disease. Nurses play a key role in the delivery of diabetes education which can improve compliance. Simulation can be used to improve the nursing skill sets for diabetes education. The purpose of this project is to implement evidence-based diabetes education through simulation to staff nurses to improve nurses' skills, confidence, and satisfaction while improving patient outcomes such as length of stay and readmission for diabetic complications. The purpose of this quality improvement project is to:

- Develop educational simulation scenarios based on ADA guidelines
- Pilot the simulation scenarios
- Assess nurses' skill and confidence during the simulation scenarios
- Evaluate the simulation for nurse satisfaction and process improvement

III. Agreement of written and oral communication

- Reference to clinical agency in student's academic work, publications, and presentations
- Restrictions on discussion of any project or agency details
- Formal agency approval needed for any publicly shared findings.

A voluntary, convenience sample of nurses will be recruited (N=30). To implement this project, the PI will attend unit meetings to discuss the DNP project. A flyer advertising the dates and times of the sessions will be posted at the nurses' workstations and in the nursing units. A cover letter with consent will be sent out to participants to explain that participating in data collection will be voluntary and that no data forms will contain personal identifiers. There will be no penalty for not participating in the project. Participants will have an additional opportunity to ask questions concerning the project.

The planned intervention is to utilize the simulation hospital to deliver training and assess impact on skill, confidence, and satisfaction. In order to accomplish this goal, the following learning objectives will be addressed:

- Review the common signs and symptoms of hypoglycemia
- Outline treatment options for the conscious and unconscious patient per protocol
- Verbalize appropriate and timely blood glucose rechecks per protocol
- Demonstrate how to address a hypoglycemia event
- Demonstrate management of insulin
- Evaluate the simulation session

All data collected will be in aggregate form and de-identified. The goal of this project is to see that nurses benefit from repetition on knowledge in a nonthreatening environment and increase their knowledge of diabetes management.

IV. Required Signatures:

_____ _____

Student Date

_____ _____

DNP Project Advisor Date

_____ _____

Agency Representative Date

Appendix E

IRB for Exemption Approval

BAPTIST HEALTH
MADISONVILLE

PHONE: 270.825.5100 FAX: 270.825.5204
900 Hospital Drive Madisonville, KY 42431

January 22, 2020

Greshin Markwell DNP Student
Eastern Kentucky University

Re: Using Simulation to Improve Skills, Confidence, and Satisfaction Related to Diabetes Education

Dear Ms. Markwell,

January 22, 2020 Baptist Health Madisonville Institutional Review Board Chairman reviewed by expedited review the following items in reference to the listed study:

- Study Protocol
- Eastern Kentucky University (EKU) waiver letter
- CITI Program Course certificates (2)
- EKU IRB Application for Expedited Review form

The Chairman noted that the study is an educational assessment project with minimal risk to participants. The human subjects involved are the nursing staff who will participate in a pre-test, a simulation session, and a post-test. The purpose of this project is to implement evidence-based diabetes education through simulation to staff nurses to improve nurses' skills, confidence, and satisfaction, with resulting improved patient outcomes for diabetic patients.

The Chairman determined this study to be exempt of IRB oversight based on criteria set forth by OHRP (45 CFR 46.104 (d) (1)), Research, conducted in established or commonly accepted educational settings, that specifically involves normal educational practices that are not likely to adversely impact students' opportunity to learn required educational content or the assessment of educators who provide instruction. This includes most research on regular and special education instructional strategies, and research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

Consent is waived (45 CFR 46.117 (c)(1)) An IRB may waive the requirement for the investigator to obtain a signed informed consent form for some or all subjects if it finds any of the following: (ii) That the research presents no more than minimal risk of harm to subjects and involves no procedures for which written consent is normally required outside the research context. The consent of the subjects is implied by their participation.

As written, no further IRB review is required for this study. Should changes be made to this study, review is required by this IRB.

Should you have any questions, please contact the IRB Coordinator at 270 824-3735.

Sincerely,

William McCann

William McCann, M.Div., Chairman
Baptist Health Madisonville Institutional Review Board

Appendix F

CITI Training

Appendix G

Hypoglycemia Simulation Teaching Template

Patient Background	
Patient Demographics	
Last Name: Green	First Name: Doug
Gender: Male Age: 47 Ht: 69 in. Wt.: 196 lb. Ethnicity: Caucasian	
Language: English	
History of present illness: Doug Green is a 47-year-old male (DOB 4/20/1972) with a history of Type II Diabetes, who has been admitted to the medical surgical unit with an ulceration on his right foot. His blood glucose level on admission is 473. He tells you that he takes NPH insulin 40 units every morning and Regular insulin with each meal and at bedtime. He states that he takes his NPH insulin at 6:00 am every day.	
Primary Medical Diagnosis:	
Central Nervous System	
Cardiovascular	Hypertension
Pulmonary	
Renal/Hepatic	
Gastrointestinal	
Musculoskeletal	
Integumentary	Ulceration on right foot
Endocrine	Type II diabetes
Social History	Single; smokes 1 pack per day for 20 years; social drinker
Medication Allergies	NKDA
Food/Other Allergies	NKA
Home Medications	NPH insulin 40 units every morning Regular insulin sliding scale with meals and bedtime Lisinopril 40 mg daily

Simulation Learning Objectives
1. Synthesize assessment information to recognize deterioration in a diabetic patient in a simulation.
2. Implement evidence-based practice in the care of a diabetic patient focusing on hypoglycemia in a simulation.
3. Apply knowledge and skills to intervene when complications develop with hypo/hyperglycemia.
4. Apply critical judgement when caring for a patient with hypo/hyperglycemia symptoms.
Prebriefing

Discussion prior to implementing the simulation:

1. Read and discuss patient scenario
2. Compare and contrast Type I Diabetes and Type II Diabetes.
3. Compare and contrast hypoglycemia and hyperglycemia.
4. Discuss the signs and symptoms of hypo/hyperglycemia.
5. Discuss appropriate nursing interventions to treat hypo/hyperglycemia events/episodes.
6. Discuss Baptist Health Madisonville (BHM) hypoglycemia policy.
7. Discuss different types of insulin and their actions (Rapid-acting, Short-acting, Intermediate-acting, and Long-acting).
8. Discuss the importance of checking blood sugar and the timing of insulin administration for sliding scale. (Should be administered 20-30 minutes before a meal).
9. Discuss why Doug's blood sugar is elevated.

Major symptoms related to hypoglycemia are tremors, palpitations, nervousness, sweating, hunger, and weakness that can progress to seizures or coma.

The goal of therapy is to safely increase blood glucose levels. This can be accomplished with oral intake of carbohydrate foods such as orange juice if the patient is conscious, or administration of parenteral dextrose solutions.

Scenario

9:00 am- Doug has just arrived to the medical surgical floor. Current vital signs: 152/92, 82, 18, 97%RA, 98.9F. Blood sugar 473 upon admission.
Dr. notified and coverage provided (Novolin R 10 units sliding scale).

It has been 2 hours and 20 minutes since insulin coverage Novolin R peaks in 2-3 hours.

Nurse goes in to patient's room to assess @ 11:20am			
Monitor/Simulator	Patient Dialogue	Nurse Actions	Cue/Prompt
15 Minutes (2 nurses)			

Patient is shaky and sweating.	"I don't feel good, something is wrong."	Wash hands Introduce self Assess allergies Identify patient	Nurse should know to check blood sugar.
		After talking with patient, nurse should check blood sugar.	Blood sugar 68
	After blood sugar obtained. "Why is my blood sugar so low?"	Nurse should discuss with patient why blood sugar is low and the effects of infection on BS. Nurse should know Doug is showing signs of hypoglycemia and follow BHM hypoglycemia protocol.	If he remain conscious, Doug should swallow about 15 grams of carbohydrate, such as 4 oz. of fruit juice, or 2 sugar cubes. If he loses consciousness before the carbohydrate can be swallowed, then glucose or glucagon must be given parenterally. After the immediate hypoglycemia crisis is treated, Doug should be given a meal or snack to prevent secondary hypoglycemia.
		Nurse should recheck blood sugar after interventions.	Blood sugar 108
	"What is making my blood sugar go up and down?" "I take my insulin as prescribed."	Nurse should discuss the different insulins and peak time along with how infection	

		will increase blood sugar.	
Debriefing			

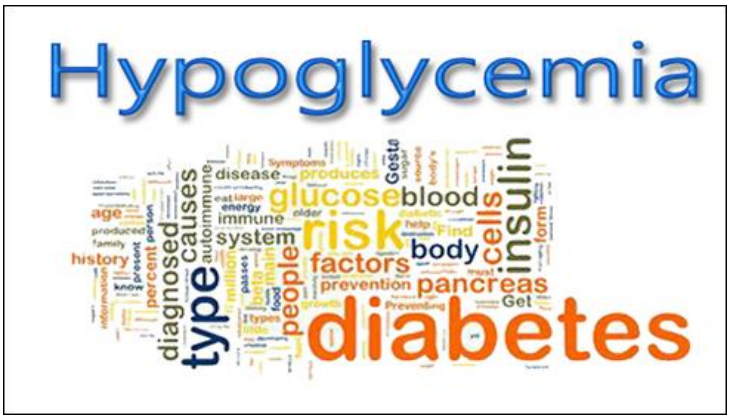
Debriefing/Guided Reflection Questions for this Simulation:

1. Did you miss anything on the patient history that would affect his care?
2. How does the patient's medication regimen affect his health or wellness?
3. What did you notice about your patient upon entering the room?
4. Did you have sufficient knowledge to interpret and respond to this situation?
5. Based on your observations, what is of highest priority for the patient?
6. What is the most important thing you learned from this case?

Appendix H

Hypoglycemia Flyer

Hypoglycemia Treatment in Adult Diabetic Patients: What Every Nurse Needs to Know



Simulation Educational Sessions- TBA

4 West Nurses

Baptist Health Simulation Hospital

For More Information Contact Greshin Markwell at: Greshin_markwell1@mymail.eku.edu

Appendix I

Cover Letter

Using Simulation to Improve Skills, Confidence, and Satisfaction Related to Diabetes Education

Greshin Markwell, MSN, RN
Doctor of Nursing Practice Student
Eastern Kentucky University
Department of Baccalaureate & Graduate Nursing

Hello,

I am a Doctor of Nursing Practice student at Eastern Kentucky University's Department of Baccalaureate and Graduate Nursing. You are invited to participate in an evidence-based capstone project. This project will fulfill some of the requirements necessary for my degree completion. The purpose of the project is to implement a simulation education session focusing on hypoglycemia and the importance of insulin coverage to diabetic patients. As a participant in the Capstone Project, you will be asked to complete a brief demographic survey to include your role in the project, age, education and years and months of experience as an RN. You will also be asked to complete a Diabetes Management Knowledge Assessment Tool (DMKAT) at the beginning of the simulation education session and 2 weeks after the simulation session. The surveys will take approximately 15 minutes to complete. Your responses will be anonymous and study results will be reported only as aggregate (group) data with no identifying information. The aggregate results from the project will be shared in written and oral presentation about the project.

• *Your participation in this project is voluntary. You are under no obligation to participate and you may withdraw from the project at any time. Your participation, completion of the surveys is not a requirement or a condition employment, benefits or services from Baptist Health Madisonville. The project involves no foreseeable risks or harm to you or your position within the organization.*

If you have any questions about this project, please contact me at Greshin_markwell1@eku.edu or my faculty advisor, Dr. Molly Bradshaw at Molly.Bradshaw@eku.edu. Questions or concerns about your rights as a study participant may be directed to the office of Sponsored Programs, Jones 414/Coats CPO 20, Eastern Kentucky University, Richmond, KY. I look forward to working on this project and appreciate your consideration as a future participant.

Sincerely,

Greshin Markwell MSN, RN
Eastern Kentucky University
DNP Student

Appendix J

Creighton Competency Evaluation Instrument (CCEI)

Student Name: _____ Staff Nurse Instructor Name: _____	0= Does not demonstrate competency 1= Demonstrates competency NA= Not applicable			Date: ___/___/___ MM / DD / YYYY
ASSESSMENT	Circle Appropriate Score for all Applicable Criteria - If not applicable, circle NA			**COMMENTS:**
1. Obtains Pertinent Data	0	1	NA	
2. Performs Follow-Up Assessments as Needed	0	1	NA	
3. Assesses the Environment in an Orderly Manner	0	1	NA	
COMMUNICATION				
4. Communicates Effectively with Intra/Interprofessional Team (TeamSTEPPS, SBAR, Written Read Back Order)	0	1	NA	
5. Communicates Effectively with Patient and Significant Other (verbal, nonverbal, teaching)	0	1	NA	
6. Documents Clearly, Concisely, & Accurately	0	1	NA	
7. Responds to Abnormal Findings Appropriately	0	1	NA	
8. Promotes Professionalism	0	1	NA	
CLINICAL JUDGMENT				
9. Interprets Vital Signs (T, P, R, BP, Pain)	0	1	NA	
10. Interprets Lab Results	0	1	NA	
11. Interprets Subjective/Objective Data (recognizes relevant from irrelevant data)	0	1	NA	
12. Prioritizes Appropriately	0	1	NA	
13. Performs Evidence Based Interventions	0	1	NA	
14. Provides Evidence Based Rationale for Interventions	0	1	NA	
15. Evaluates Evidence Based Interventions and Outcomes	0	1	NA	
16. Reflects on Clinical Experience	0	1	NA	
17. Delegates Appropriately	0	1	NA	
PATIENT SAFETY				
18. Uses Patient Identifiers	0	1	NA	
19. Utilizes Standardized Practices and Precautions Including Hand Washing	0	1	NA	
20. Administers Medications Safely	0	1	NA	
21. Manages Technology and Equipment	0	1	NA	
22. Performs Procedures Correctly	0	1	NA	
23. Reflects on Potential Hazards and Errors	0	1	NA	

Appendix K

Hypoglycemia Simulation Evaluation	Strongly Agree 4	Agree 3	Disagree 2	Strongly Disagree 1
Did the overall simulation experience enhance your critical thinking skills?				
Did the simulation educators provide effective teaching and learning strategies during the simulation experience?				
Was the simulation environment conducive to learning?				
The simulation was designed for my specific level of knowledge and skills.				
Did the de-briefing exercise help you to make connections and highlight important aspects of caring for patients with hypoglycemia?				

Nurse Self-Evaluation

Please answer the following questions concerning your performance in this simulation.

1. How did you feel throughout the simulation experience?

2. What do you think went well?

3. If you were able to repeat this, how would you handle it differently?

4. How will you be able to apply what you have learned today in practice every day?

Appendix L

Follow-up Survey

Hypoglycemia Simulation Follow-up Feedback

Approximately two weeks ago you participated in an educational simulation on hypoglycemia. Please take a few minutes to complete this follow-up survey.

Questions	Responses
Was the simulated session beneficial?	Yes No
Have you been able to apply what you learned?	Yes No
Do you feel that this simulation has helped you better prepare to take care of diabetic patients? Please explain or give example.	

Appendix M

Benchmark Data

BENCHMARK DATA SPREADSHEET

Patient	# of Hypoglycemic Episodes Documented	Were Episodes Resolved Per Protocol	Length of Stay (LOS)	Readmission Within 30 Days
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
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22				
23				
24				
25				
26				
27				
28				
29				
30				

Appendix N

Permission to use Demographic Survey & Diabetes Management Knowledge Assessment Tool (DMKAT)

Modic, Mary Beth <MODICM@ccf.org>
Wed 9/18/2019 7:43 PM
To: Markwell, Greshin M (Madisonville) <greshin.markwell@kctcs.edu>

2 attachments (224 KB)
Glucose Excursions-Pre-Assessment- DMKAT_.doc; Glucose Excursions-Pre-Assessment- DMKAT_ANSWERS.doc;

Hello Nurse Markwell,

I have attached the DMKAT and the same with the highlighted answers.

You have my permission to modify the demographic section and the sections of comfort and familiarity without seeking additional permission. Moreover, you have my permission to replace Apidra with the rapid acting insulin that is used at the organization in which your are conducting your study without seeking additional approval.

Good luck with your study.

Sincerely,
Mary Beth Modic

Appendix O

Demographic Survey

Demographics

Directions: Please take a few minutes to respond to the following: answer the following questions by placing an X in the box that best describes you or filling in the blank for each question posed.

Age: _____ Education: □ ADN □ BSN □ Other

Specialty: □ Behavioral Health □ Cardiac Stepdown □ Critical Care □ ED □ Medicine □ Neuro □ Oncology □ Ortho □ PACU □ Surgical □ Pediatrics □ Other_____

Status: □ Part Time □ Full Time □ Weekend Option □ PRN

Years in practice: _____ Number of years on current unit: _____

Attendance at in services/continuing education in which diabetes was the focus:

□ None

□ Within the last 6 months

□ More than 6 months but less than 1 year ago

□ More than 1 year ago but less than 2 years ago

□ More than 2 years ago

Number of patients with diabetes you care for on a weekly basis:

□ None

□ 1-2

□ 2-5

□ 6-10

□ > 10

Appendix P

Self-Assessment Survey

How competent do you feel in caring for a patient with diabetes?

0 = NOT COMPETENT to 10 = VERY COMPETENT. Circle the number that BEST describes you.

0.....1…….2…….3…….4…….5…….6…….7…….8…….9…….10

The greatest obstacle/barrier to managing blood glucose in the hospital: **Check all that apply**

□ Personal knowledge deficit □ Hand-off communication

□ Unclear glucose targets □ Unfamiliar with hospital policies

□ Ineffective insulin regimen □ Lack of coordination between BGM (Blood Glucose Monitoring) Insulin Administration and Meal Delivery

□ Other:

_____ _____

Choose a number for each question.

1. Rate your overall knowledge of diabetes management (knowledge and side effects of glucose lowering agents, action and duration of different insulins, managing of high and low blood sugars, lifestyle modifications, etc.)

0 = None to 10 = Expert

0.....1…….2…….3…….4…….5…….6…….7…….8…….9…….10

2. Rate your overall teaching skill (instructing patients about managing symptoms, taking medications correctly, when to notify their physician, blood glucose monitoring, etc.) – 0 = Poor to 10 = Exceptional

0.....1…….2…….3…….4…….5…….6…….7…….8…….9…….10

3. General level of comfort in administering subcutaneous insulin

0.....1…….2…….3…….4…….5…….6…….7…….8…….9…….10

4. General level of comfort in teaching patients about insulin administration

0.....1…….2…….3…….4…….5…….6…….7…….8…….9…….10

5. General level of comfort in administering IV insulin infusions

0.....1…….2…….3…….4…….5…….6……...7…….8…….9…….10

6. General level of comfort in caring for patients with insulin pumps

0.....1…….2…….3…….4…….5…….6…….7…….8…….9…….10

7. General level of comfort in managing hyperglycemia (hyperglycemia is defined as a blood sugar >150 mg/dl)

0.....1…….2…….3…….4…….5…….6…….7…….8…….9…….10

8. General level of comfort in managing hypoglycemia (hypoglycemia is defined as a blood sugar <70mg/dL by the American Diabetes Association, ADA)

0.....1…….2…….3…….4…….5…….6…….7…….8…….9…….10

9. General level of comfort in teaching patients how to prevent and manage low blood sugars at home (low blood sugar is defined <70 mg/dL by the ADA)

0.....1…….2…….3…….4…….5…….6…….7…….8…….9…….10

10. General level of comfort in teaching patients about blood glucose monitoring (correct use of the meter, frequency and timing of glucose checks, and disposing of lancets and strips)

0.....1…….2…….3…….4…….5…….6…….7…….8…….9…….10

11. General level of familiarity with diabetes management policy

0.....1…….2……...3…….4…….5…….6…….7…….8…….9…….10

12. General level of familiarity with hypoglycemia prevention and management policy
0.....1…….2…….3…….4…….5…….6…….7…….8…….9…….10

13. General level of familiarity with Insulin, Intravenous administration on medical/surgical unit's policy

0.....1…….2…….3…….4…….5…….6…….7…….8…….9…….10

14. General level of familiarity with Insulin Pump policy (Patient's own medical device)

0.....1…….2…….3…….4…….5…….6…….7…….8…….9…….10

15. General level of familiarity with available resources for teaching patients about SURVIVAL SKILLS (Symptom Management, Medication and Insulin administration and Blood Glucose Monitoring)

0.....1…….2…….3…….4…….5…….6…….7…….8…….9…….10

Appendix Q

Diabetes Management Knowledge Assessment Tool (DMKAT)

1. Infections may be more difficult to treat during hyperglycemia because:

a. macrophages lose their chemotaxic action
b. hypercoagulation occurs
c. insulin secretion increases
d. lipolysis slows healing

2. Neutrophil impairment begins to take place at what glucose level:

a. 300 mg/dL
b. 240 mg/dL
c. 180 mg/dL
d. 150 mg/dL

3. Glargine (Lantus®) is:

a. Prandial insulin
b. Basal insulin
c. Correctional insulin
d. Mixed insulin

4. Diabetes Survival Skill Education (education necessary for patient to be safe at home) includes:

a. Eating healthy; being physically active; coping effectively
b. Taking medication; monitoring blood glucose; managing symptoms
c. Counting carbohydrates; reducing risks, injecting insulin
d. Knowing resources, eliminating sweets from diet, exercising 30 minutes a day

5. Treatment for hypoglycemia should be initiated at a blood glucose:

a. Less than 40 mg/dL
b. Less than 50 mg/dL
c. Less than 60 mg/dL
d. Less than 70 mg/dL

6. When converting from a continuous IV insulin infusion to subcutaneous insulin, start subcutaneous basal insulin approximately:

a. 2 hours before stopping the infusion

b. At the same time as stopping the infusion
c. 1 hour after stopping the infusion
d. No need for basal insulin

7. Basal insulin accounts for _____ % of daily insulin requirements:

a. 25
b. 30
c. 50
d. 75

8. Patients with an illness such as flu or fever should be instructed to:

a. Stop insulin because of decreased caloric intake
b. Limit food and drink due to nausea and vomiting
c. Monitor blood glucose every 2-4 hours
d. Begin antiemetic's

9. A novice nurse on a medical unit asks you to explain hypoglycemia unawareness. You respond:

a. "This is a term used to explain patient's lack of knowledge in treating hypoglycemia"
b. "It describes the phenomenon of adrenergic surge that occurs in hypoglycemia."
c. "This occurs when someone injecting insulin loses consciousness due to a low blood sugar."
d. It is "A condition in which a person with diabetes does not experience the usual early warning signs of hypoglycemia."

10. The individual with diabetes at home who requires glucagon administration is:

a. 14-year-old mildly confused and diaphoretic
b. 27-year-old nonresponsive and shaky
c. 35-year-old disoriented and complaining of hunger
d. 4-year-old crying and pale

11. The BEST nursing intervention to prevent hyperglycemia in hospitalized patients with diabetes is:

a. administer basal and supplemental insulin even when patient is NPO
b. administer prandial/bolus insulin for tube feedings
c. initiate supplemental insulin when glucose >250 mg/dL
d. initiate an IV Insulin infusion when glucose exceeds 200mg/dL

12. Sharp medical waste (syringes, lancets) from the home should be disposed:

a. into home waste/trash
b. into a hard-sided container with a screw-on lid
c. into an empty aluminum can
d. into a plastic pop bottle

13. The most appropriate treatment for mild hypoglycemia in a conscious and un-sedated patient is:

a. 12 oz. can regular soda
b. 4 oz. juice
c. 8 oz. juice with 2 packets of sugar
d. 3 packages of graham crackers

14. Continuous IV insulin administration is the preferred method of treating DKA or HHS because an IV insulin infusion:

a. brings down the glucose more quickly than the subcutaneous route
b. sustains normal glucose once target glucose is achieved
c. facilitates insulin stacking
d. is more effective in regulating velocity of glucose change

15. All the following insulin orders require clarification EXCEPT:

a. Lantus® 10 units at 0700, Levemir ® 7 units at 0700 and 1730
b. NovoLog ®5 units before meals, Novolin R 28 units at 0700 and 2200
c. NovoLog ® 6 units and NPH 15 units at 0700 and 1730
d. NovoLog 8® units before meals, Correctional Scale #2 with Novolin R

16. You should instruct your patient with newly diagnosed Type 2 diabetes, using oral glucose lowering agents, to do self-blood glucose monitoring (SBGM):

a. before breakfast, and before and 2 hours after the largest meal of the day
b. before bedtime only
c. three times per week at different times
d. before breakfast only

17. After treatment and the patients recheck, a blood glucose rose from 45 mg/dL-65 mg/dL. The next course of action is to:

a. call the physician and hang an IV of D5 W
b. wait another 15 minutes and recheck
c. give another 15 grams of carbohydrates
d. administer an amp of D50

18. All the following contribute to development of hyperglycemia in the hospitalized patient EXCEPT:

a. vasopressors
b. holding insulin for normal glucose
c. tube feedings
d. nutrition interruption

19. Patients should be instructed to notify their physician with:

a. one unexplained glucose of < 70 mg/dL
b. two fasting glucoses >126 mg/dL
c. blood glucose >150 mg/dL for one week
d. two consecutive glucoses of 180 mg/dL

20. Your patient takes insulin glargine (Lantus®) at bedtime and insulin glulisine (NovoLog®) insulin with meals.

	Breakfast before mg/dL	Lunch before mg/dL	Dinner before mg/dL	Bedtime before mg/dL
Tuesday	86	58	97	78
Wednesday	126	62	89	74
Thursday	111	66	92	80
Friday	420		172	

As you review the blood glucose levels, you know that the insulin dose that needs to be adjusted is:

a. bedtime Lantus®
b. morning NovoLog®
c. lunchtime NovoLog®
d. dinner NovoLog®

Appendix R

Project Timeline

DNP Timeline	October 2019	November 2019	December 2019	January 2020	February 2020	March 2020	April 2020
Submission of IRB	Will submit last week of October	Allowing time for IRB approval					
Attend meetings, Recruit participants		Once IRB approved will place flyers at nursing station to promote project.	Will meet with unit director to present project at unit meetings				
Implement project				Will begin implementing project and scheduling.			
Schedule Simulation dates					Would like to have all participants scheduled for simulation this month if time and schedules allow.		
Complete post-test analysis						2 weeks after simulation will send out post DMKAT test. Once all have been received, will begin analysis.	
Report results to EKU and BHM							Complete data analysis and present results to EKU and BHM. Results will be added to final paper presentation.