



5-2013

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EVALUATING THE NEED FOR DIABETES CONTINUING EDUCATION IN RURAL
PRACTICING NURSES

by

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An Independent Study

Submitted to the Graduate Faculty

of the

University of North Dakota

in partial fulfillment of the requirements

for the degree of

Master of Science

Grand Forks, North Dakota

May

2013

PERMISSION

Title Evaluating the Need for Diabetes Continuing Education in Rural Practicing Nurses

Department Nursing

Degree Master of Science

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Abstract

Nurses in rural areas are often given the responsibility to educate those they provide direct care for about diabetes management. To execute this important task, nurses need to be equipped with current and accurate knowledge about the disease, and they must also be confident in their abilities. However, there are barriers to a successful nurse-patient educational relationship present among practicing nurses. Nurses are often found to have deficient knowledge about diabetes, making them less likely to produce positive patient outcomes.

A review of literature regarding the level of diabetes knowledge that nurses possess was conducted and found to be surprisingly limited in quantity given the increased prevalence of this disease. According to this review of literature, the most common knowledge deficiencies included: initial management of hypoglycemia, understanding the etiology of type 1 and type 2 diabetes, blood glucose monitoring, diet, and actions of diabetes medications. These educational needs were incorporated into a one-hour educational presentation delivered to practicing nurses at a rural Midwest hospital.

After surveying participant nurses before and after the presentation, it was found that nurses felt more knowledgeable and confident related to their ability to educate patients following the intervention. Prior to the education session, surveys showed that nurses felt like they knew enough about the disease to teach patients, but they expressed that there were areas where they were not comfortable.

This project raises concern regarding the lack of diabetes knowledge common among nurses and reinforces the need for identifying and delivering effective educational modalities for nurses.

Keywords: diabetes, diabetes mellitus, nursing, continuing education, knowledge deficit, knowledge

Introduction

Diabetes Mellitus was the second leading cause of hospitalization in 2009 accounting for 12% of admissions, second only to patients with circulatory disease (Centers for Disease Control (CDC), 2011a). In the United States, diabetes affects 25.8 million people, or 8.3% of the entire population (CDC, 2011b). These statistics signify a need for nurses to be well prepared to recognize and address the needs of a growing epidemic. In 2009, it was estimated that 22% of all hospital inpatient days were incurred by patients with diabetes (Moghissi et al., 2009). Patients who are admitted for other reasons and have diabetes as a comorbid condition are at risk for developing further complications related to diabetes. It is important for nurses to be able to manage the care of this population in order to foster better patient outcomes and reduce hospitalization rates that can potentially be avoided by diabetic complications. To achieve better patient compliance, nurses need to recognize the opportunity to optimize teachable moments as they arise (Gerard, Griffin, & Fitzpatrick, 2010). In order to provide the best possible interventions implemented by acute care nurses, their levels of knowledge and confidence in managing those with diabetes must be evaluated.

Nurses in the acute care setting are expected to be able to teach patients, use skillful interventions, and evaluate a multitude of patient outcomes in many diverse situations. Diabetes is just one chronic disease that lends itself to requiring all of these nursing skills. The ability of a nurse to deliver quality care depends largely on his or her understanding of the illness. Delivering quality care defines the services provided by professional nurses. "When nurses lack knowledge and patients simultaneously have increasing needs related to diabetes, having limited resources regarding diabetes management results in undesirable patient outcomes" (Gerard et al., 2010, p. 161).

The question that needs to be asked in this situation addresses the potential benefits gained through formalized continuing education. Specifically, education related to diabetes management by rural nurses in acute care that directly care for patients with diabetes. The intervention for consideration is continuing education specifically designed to focus on diabetes management for nurses. It is important to compare whether this intervention achieves a desirable and necessary outcome versus nurses who do not engage in this educational forum. The preferred outcome is to determine if the level of knowledge and confidence increases in nurses who receive diabetes continuing education. Therefore, this question is posed for this document: Does implementing elective continuing diabetes education to acute care nurses increase their level of knowledge and confidence related to diabetes management? To preface this question, focus will be given to identification of the need for increased diabetes education among this population.

Purpose

The primary purpose of this independent project is to identify the leading diabetes knowledge deficits among rural acute care nurses based on an evidence based literature review, and to develop a brief educational session to address these identified areas to bolster knowledge and confidence. The reasoning behind this purpose is twofold. First, diabetes is a prevalent disease occurring in the acute care setting. Diabetes is the seventh leading cause of death in the U.S. led by other conditions such as heart disease that are exacerbated by the disease (Centers for Disease Control [CDC], 2011a). And secondly, nurses need to be able to understand the disease to be able to properly identify potential problems, educate patients, and foremost, to provide competent care. According to Fowles and Rosheim (1999), "Hospital admissions for individuals with uncontrolled diabetes are often due to limited or inappropriate information about the disease" (p. 136). Furthermore, the rural acute care nursing population demands more intense focus given the increased role they must fulfill in an environment that is regularly subject to decreased resource

availability. One diabetes educator from a rural facility commented “nurses often report that they are uncomfortable teaching patients with diabetes about their disease because of a lack of *current* diabetes continuing education” (L. Bach, personal communication, November 20, 2012).

Significance

At the onset of the selection of the topic that resulted in the development and institution of this project, the perspective of this author regarding the potential diabetes knowledge deficit among nurses surfaced through a personal experience. A patient presented to the emergency department of a rural hospital seeking care for what was found to be hypoglycemia after diagnostic evaluation was completed. The patient, a type 1 diabetic, was alert with signs indicative of hypoglycemia confirmed by blood glucose testing in the immediacy. No emergent intervention was deemed necessary if this patient was able to consume something that would result in blood glucose elevation. This particular patient was experiencing nausea, so oral intake was questionable and parental intervention may have been necessarily considered. As the nurse caring for this patient addressed the situation, she offered the patient a ham and cheese sandwich. Refusing this intervention secondary to nausea and the perception that this would aggravate gastrointestinal symptoms, this patient requested something in the form of a liquid to try first. The nurse persisted by requesting that the patient at minimum just consume the cheese portion of the sandwich. It was apparent at this point that the nurse suffered from a knowledge deficit related to the initial management of hypoglycemia that is consistent with a study done by Gerard, Griffin, and Fitzpatrick (2010). This experience has led this author to further investigate the potential need for further basic diabetes education as part of a model for continuing education. According to a study conducted by Lockwood, Gladish, and Hiss (1986), the greatest problem facing patients with diabetes from their perspective was managing and understanding their diet. Furthermore, when nurses and healthcare providers were asked what they perceived was the greatest problem facing

those with diabetes, the response was overwhelmingly educating patients about diet (p. 31). At the outset of the review of literature, several studies consistently identified the need for continuing diabetes education with focus given to multiple areas of actual diabetes knowledge deficiency.

Nurses play an integral role in educating patients with diabetes. The successful long-term management required to avoid complications of diabetes is heavily correlated to the education those patients receive about the disease. "Diabetes education is the cornerstone of care for all individuals who want to achieve successful health-related outcomes... Nurses in all settings need to be skilled in teaching and supporting patients in their lifelong journey to succeed with long-term control" (Gerard, Griffin, & Fitzpatrick, 2010, p. 160). With the increasing prevalence and incidence of diabetes, it should be understood that those who have the most influence over teaching patients about diabetes should be well equipped. With nurses being the primary resource for patients with diabetes seeking education, nurses need to be prepared to fulfill that responsibility competently (Fowles & Rosheim, 1999).

Rurally, patients with diabetes, as well as nurses, are faced with additional challenges. Essentially, both patients and nurses have less access to formalized diabetes education due to a lack of specialists available. From the patient's perspective, when there are limited diabetes specialists available, they must rely on nurses and other healthcare providers to disseminate much needed information about their disease. This simply places more pressure on nurses to be able to fill that role to be both a specialist and generalist in their nursing practice. Historically, rural populations generally have less access to physicians, specialists, and formal health education. In addition, "rural residents are less likely to visit a medical provider, receive specialist care or receive adequate post-hospitalization home health care" (Dabney & Gosschalk, 2003, p. 110). With regard to the availability of education offered to nurses and patients from a diabetes specialist, one study of Medicare patients found that there were 13 specialists per 100,000 urban residents and 1 per 100,000 rural residents (Zgibor & Songer, 2001). Decreased access to diabetes education for both

nurses and patients requires creative but purposeful methods by which to provide such needed information. Rural nurses will continue to be challenged with the task of filling the diabetes education gap that exists in such areas. Properly preparing these nurses demands further research into effective methods by which current formalized education can be delivered.

It is the expectation of this author to engage practicing nurses in an educational based forum to evaluate whether diabetes education is perceivably needed, and if the brief education delivered positively impacts their nursing practice. To evaluate both the perceived desire for more education, and whether the education was of value to impact nursing practice, a survey was conducted prior to the educational session as well as two weeks following. The need for additional diabetes education for practicing nurses is apparent through current literature. As will be discussed based on a review of literature, the need for continuing diabetes education for nurses is an essential area requiring attention. Several studies have found a similar trend denoting needed areas of educational support (Eaton-Spiva, & Day, 2011; Drass, Muir-Nash, Boykin, Turek, & Baker, 1989; El-Deirawi & Zuraikat, 2001; Gerard, Griffin, & Fitzpatrick, 2010; Griffis, Morrison, Beauvais, & Bellafontaine, 2007; Sen, 2005; Uding, Jackson, & Hart, 2002; Young, 2011). Many of the studies have correlated perceived diabetes knowledge and actual knowledge. The results of these studies will be examined later, but the common theme among them indicates that **nurses often perceive themselves as more knowledgeable about diabetes than they actually are**. Consistently, nurses have been largely deficient in similar areas regarding diabetes pathophysiology, treatment options, teaching, and care delivery. It is expected that with the implementation of continued diabetes education, nurses will be able to more confidently address the dynamic needs of the patients they directly care for, subsequently resulting in better health outcomes.

The problem in this important nurse-patient relationship is twofold. First, several studies to be discussed represent the view that nurses are ill prepared to effectively educate patients about their diabetes. These studies identified consistent basic diabetes knowledge deficiencies that impact

the survival skills of those they are charged with teaching. Secondly, many if not most nurses do not feel competent or confident in their ability to teach patients about their diabetes. When nurses in one study were asked about the biggest barriers to their educating a patient about diabetes, the top responses included: lack of time, patients with diabetes already know as much if not more than we do, and patients are not interested in the education we have to offer (Moriarity & Stephens, 1990, p. 33). In more recent literature, the perceived nursing barriers remained largely unchanged. This review reported that the complexity of diabetes education delivered to patients is seen by nurses as too time consuming given other responsibilities. Furthermore, concern related to the competence of generalist nurses to be able to deliver diabetes education was cited as a considerable reason to not have nurses teach diabetic inpatients at all (Nettles, 2005). With nurses lacking basic knowledge about diabetes compounded with a lack of confidence in teaching, a serious gap in communication between nursing and patients with diabetes exists.

To address both knowledge and confidence among nurses, it seems apparent that increasing their level of education about diabetes management is the proper course of action. An obvious desired outcome from any intervention regarding this issue would be to increase the knowledge and confidence among nurses so that they are better prepared and more likely to put that knowledge into practice. In order to accomplish this task, a theoretical approach to learning and subsequent behavior change is deemed appropriate. For one to learn and apply what they have learned, one must first believe that there is something to be gained. Many studies to be discussed later have shown that nurses for the most part perceive their knowledge about diabetes to a greater extent than the level of knowledge they actually possess. This provides a challenge in the learning process because the nurse in this case must recognize that there is value to seeking additional continued education about diabetes. In an effort to meet the important educational needs of nurses, this project aims to approach this situation by emphasizing the importance of further education, delivering information identified as being deficient among most nurses, and evaluating whether nurses found

the information important enough to change their practice. If this intervention is found to be effective in the long term, it could support the need for further research into continuing education and the outcomes as they affect patients can be further evaluated.

Theoretical Framework

Inherent in the purpose of this project is the concept of placing potential value on diabetes education. In particular, evaluating methods in which practicing nurses will desire, receive, and implement knowledge delivered is a key component to the preferred outcome of this comprehensive approach. It is not only the goal of this author to assure that practicing nurses gain confidence and knowledge regarding diabetes management, but subsequently enhance their ability to disseminate what they know through patient education. So to this effort, an educational theoretical approach is deemed appropriate. Education may be the overall goal, but addressing the content through methods of focusing on learning behaviors is essential to attain a permeating and desirable outcome that can be to the benefit of both the nurse and the patients they provide direct care for. To utilize a formalized theoretical framework to this compilation of evidence review and educational implementation, the Transtheoretical Model (TTM) can be applied. The TTM was developed as an integrative model to focus on behavioral change through a thoughtful educational process (Prochaska & DiClemente, 1983; Prochaska, DiClemente, & Norcross, 1992; Prochaska & Velicer, 1997). This model involves the following concepts, or stages that this theory proposes to achieve a desired change: precontemplation, contemplation, preparation, action, and maintenance. This theory will be applied here to provide a framework by which not only nurses can benefit, but patients as well in the realm of behavioral change through education. The steps of this theory have guided this project because of its focus on evaluating the need or desire for change, and the goal that the information received through an educational venue will be maintained through practice

implementation.

Precontemplation

In the context of this project, and as the first stage of the TTM, precontemplation represents the initial step in behavior change. In this stage, the intended learner or individual really has no conscious desire or awareness that a deficit exists, or that there is a reason that any action needs to be taken (Prochaska & Velicer, 1997). This project addresses this stage by raising an awareness of the nursing knowledge deficits regarding diabetes as identified through literature review. This was accomplished by simply advertising the educational session that was to be provided within the facility aiming to educate nurses. The hope was that nurses would begin to ponder their perceived need for this type of education. Once they read the rationale for implementing this session within the disseminated advertisement, it is thought that they began to find some value in it even if they did not foresee themselves individually as the target audience initially. This approach leads to the next stage of the TTM where contemplation takes place.

Contemplation

During the stage of contemplation, commitment to change is yet a premature expectation. Rather, individuals at this point begin to weigh the costs and benefits associated with the new information they had received regarding the content and purpose. Knowing that individual nurses would not enthusiastically commit to desiring this educational opportunity based on a brief summation of research presented in an all-employee email, nursing management was involved in the promotion of the class. The nursing supervisors collectively maintained awareness among the staff nurses regarding the value of the upcoming class by citing areas of practice within the facility that could benefit from further diabetes awareness. Seeing how this could be potentially beneficial, the next stage of the TTM was entered.

Preparation

In this stage, individual nurses begin to commit to change through recognition of the need for the information proposed. To engage the nurses and to help solidify commitment to the change process, a survey was made available to all practicing nurses within the facility. This survey, in brief, intended to explore how confident nurses felt they were related to diabetes management and provision of direct care. In addition, the survey also elicited the nurses' perceptions regarding the need for such an intervention. Once faced with their own perceptions and realizations about diabetes knowledge, it is thought that the nurses who identified a potential benefit would commit to attending the voluntary educational session. Prochaska (1994) postulates that one of the most imperative factors in effecting change is that the individual believes that the change is needed or at least beneficial (p. 48). Accomplishing this stage leads to the stage of action.

Action

This is the critical stage within the TTM. In this stage, individuals engage in the behavior modification, in this case, receiving and processing the education delivered in a didactic setting. The deliverable portion of this project as described later in this document, was a PowerPoint presentation with interactive learning exercises. Once the information was delivered, the next stage of the change process as outlined in the TTM is entered.

Maintenance

In this stage of the change process, individuals are faced with maintaining not only the implementation of the knowledge they received, but they also must try to avoid relapsing. In this case a relapse would be characterized by the perceptions of the individual nurses to find the information not of significant value, and would subsequently begin to omit the education received

from their practice. Therefore, to evaluate this stage, a follow-up survey similar to the initial survey was implemented to gather the perceptions and current practice implementations being held by the nurses. This information was compiled and subjectively and objectively evaluated to ascertain the efficacy of the delivered education with regard to how it was perceived to benefit nurses in the areas of knowledge and confidence in dealing with diabetes management. Essentially, this evaluation process aimed to give a glimpse into how this education intervention was perceived as well as how it could potentially affect behavioral change.

Theoretical Framework Summary

The TTM framework used to guide this project aimed to facilitate a processed approach to evaluate the rationale and efficacy of an educational intervention. The theory, more a model, operates on the assumption that people do not change behaviors quickly and decisively. Rather, change in behavior, especially habitual behavior, occurs continuously through a cyclical process (Prochaska & Velicer, 1997). Navigating through the sequential stages of precontemplation to maintenance, the evaluation of this project's impact on a behavioral change was realized. Each stage was addressed with a specific outcome in mind that was to be accomplished prior to engaging in the subsequent stages. The goal of precontemplation was to determine if a particular learner had the desire to engage in any behavioral change. The contemplation stage addressed raising awareness among nurses to consider committing to a change through education. Logically, the next stage, preparation, established an actual commitment to behavior change as a result of the raised awareness received in the previous stages. Action was the next phase of the theoretical model in which participants actually underwent an intervention to potentially achieve the behavioral change they initially found to be of value. Finally, the impact of the intervention related to how it affectively changed a nurse's behavior was evaluated as part of the maintenance stage of the TTM. Overall, this framework provided a logical flow by which this educational intervention could be

applied and evaluated. Behavioral change through education necessitated a theoretical approach to provide incremental goals and to reduce random approaches to attain a defined outcome.

Definitions

To decrease ambiguity and to provide clarity to key terms and concepts referred to within this project, several definitions are provided. Major terms requiring clear definition as used throughout this document include: continuing education, rural, type 1 diabetes, and type 2 diabetes. Since the focus of this project is to determine how continuing education affects the practice of rural nurse's ability to interact with those with type 1 and type 2 diabetes, the included terms must be well delineated.

Continuing education. The definition of continuing education was adapted from the Washington State Nurses Association (2012). The definition is used in the context of nursing and is defined as follows:

“systematic professional learning experiences obtained after initial licensure designed to augment the knowledge, skills, and judgment of nurses and enrich nurses' contributions to quality health care.... The education should relate to the nurse's area of professional practice or areas identified through reflection and self-assessment for professional growth and development”.

To highlight, continuing education for nurses focuses on enriching their knowledge base following the initial training and education required to attain their nursing license.

Rural. The term rural can represent meanings from differing perspectives including socioeconomics and population density. For the purposes of this document, the definition provided by the U.S. Department of Agriculture was used. “A rural geographic area is an open settlement of less than 2500 residents” (U.S. Department of Agriculture, 2004). To be more specific in the use of this term, nurses who provide care for patients in an area defined previously are considered to be

nurses practicing in a rural region.

Type 1 Diabetes. Differentiation of type 1 and type 2 diabetes is essential when evaluating the education deficits outlined in this document. This project uses the following definition of type 1 diabetes. Type 1 diabetes is a metabolic disorder characterized by a severe insulin deficiency resulting from the idiopathic or autoimmune destruction of pancreatic beta-cells producing hyperglycemia (Dunphy, Winland-Brown, Porter, & Thomas, 2011). The major point nurses must comprehend about this form of diabetes is that insulin administration is essential to maintain life.

Type 2 Diabetes. This form of diabetes is defined as a group of heterogeneous forms characterized by sufficient circulating endogenous insulin, resistance to insulin action, and an inadequate compensatory insulin secretion response (Dunphy et al., 2011, p. 877).

Process

The Harley E. French Library of the Health Sciences was used to complete a literature search and review to address a specific clinical question. The initial search included multiple databases including PubMed, CINAHL, Cochrane, and Medline Plus. The terms used for this search included *nursing knowledge, diabetes mellitus, nursing knowledge deficit, and education.*

In the CINAHL database search that was conducted, the search terms previously stated were further defined through using CINAHL headings and were included as major concepts. This CINAHL search initially returned 222 articles prior to modifying the CINAHL headings that then resulted in a twenty-five article return. These results were filtered to only include articles that were peer reviewed and in the English language. Of these articles, five were chosen for further review and consideration as support for the intended clinical question.

Next, a PubMed search was conducted using medical subject headings (MeSH). Further limitations on the search included humans, clinical trial, comparative study, nursing journals, and English. The term *nursing* was further defined using MeSH to be defined as the profession of

nursing. The term *diabetes* was defined to include all affected by diabetes mellitus despite which pattern of the disease they had. In addition, the term *education* was used and defined as nursing continuing education using MeSH. One article from the PubMed database search was added for further review. After reviewing the reference lists of the selected articles, studies and other relevant literature were selected and critique of these articles will be included. It should be noted that there are a small number of more current studies in this area. However, many of those studies were from outside of the U.S. and Canada and were felt to not reflect upon the training and practice of those practicing in the rural regions of the U.S.

Identification of learning needs through literature review. After narrowing the literary content through the search process previously outlined, a compilation of urgent educational needs areas and nursing implications were included. Although many of the studies reviewed did not identically identify the same deficiencies in the same order, the research was relatively consistent as to which areas nurses could benefit most from continuing education. As will be discussed in greater detail through the review of literature, the most significant nursing knowledge deficits related to diabetes management included: the etiology of both type 1 and type 2 diabetes, understanding the effects and administration of diabetic medications, blood glucose monitoring, and the treatment of hypoglycemia, and a closely connected deficiency in understanding the nutritional aspects of those with diabetes. With these particular areas identified, the developed educational session focused on presenting this information in a manner that could be integrated into nursing practice.

Presentation development. In order to address the diabetes knowledge deficits identified within the literature, the major focus of this project was to develop a one-hour diabetes education course to be delivered to a group of acute care nurses in a rural hospital setting. This population is undisputedly the most critical patient-nurse connection that will impact the long-term outcomes of those with diabetes in a rural setting. According to Fowles and Rosheim (1999), almost every patient (99.5%) that received information about managing their disease, received that information

from a nurse (p. 3). This course included a PowerPoint presentation accompanied by lecture and interactive class participation (see Appendix A). The goal of the course development was to deliver evidence-based information pertaining to the most significant nursing diabetes knowledge deficits identified in literature.

Pre-survey administration. In an attempt to evaluate the perceived need for instituting this presentation, and to assess if nurses found the information potentially valuable to their practice, a survey was delivered immediately before the presentation (see Appendix B). This survey aimed to identify if nurses felt confident in their diabetes management knowledge, and if they perceived that there was value to participating in an educational forum.

Educational session delivery. Using the prepared PowerPoint presentation to augment a one-hour interactive lecture session, information related to the knowledge deficiencies among nurses was delivered. A general overview of the class content was provided, followed by a review of diabetes etiology, medications, glucose monitoring, basic nutrition, and initial management of hypoglycemia. During the lecture, class participants were involved with hands-on demonstrations depicting and clarifying certain aspects of the disease. The method utilized for these demonstrations included the use of objects to represent glucose molecules, insulin, and target cells. These hands-on visual aids helped to explain and solidify key concepts in the pathophysiology of diabetes, and the mechanism of action of various medications used to treat the disease. As new concepts were introduced, these visual aids were consistently used to further address those with visual learning styles. At the end of the lecture, time was provided for discussion related to the content of the presentation. The class participants were informed that a follow-up survey would be delivered to them in approximately two weeks.

Post-survey administration. Two weeks following the presentation, a follow-up survey was distributed to the class participants. This survey was similar to that of the pre-class survey with the addition of two questions related to the nurses' perceptions regarding increased knowledge and

confidence following the educational session. The initial survey aimed to determine whether nurses found diabetes education potentially valuable, and to evaluate if they were initially confident in their ability to help patients manage their diabetes. The follow-up survey addressed the same points and attempted to gain the nurses' perspective as to if the education was deemed valuable, and if their confidence to engage patients regarding their diabetes management was improved (see Appendix C). Some conclusions could be made through the gathered responses as to whether or not the information delivered was being implemented, identifying a successful change in behavior.

Analysis of data. The intended goal of this project was not to determine the best method by which to deliver continuing diabetes education, but rather to determine the perceived need for further education to increase knowledge and confidence among nurses. To that point, the evaluation of this intervention focuses almost entirely on the survey responses. Although the survey questions were subjective in nature, a Likert scale was used to add objectivity to the findings. A comparison of survey responses prior to the educational session and those following the intervention was done to determine if there was a perceived benefit to engaging in an educational intervention similar to the one delivered as part of this project. Since the initial survey set out to determine a potential need for further education, it made sense to determine if that need was met to any extent through a follow-up survey. Was there an increase in knowledge? Was that knowledge beneficial to nursing practice? And was there a gain on confidence following the intervention? These questions can begin to be answered through survey comparison.

Review of Literature

In an attempt to address the question posed for this project related to identifying the need for diabetes continuing education among rural practicing nurses, the review of literature outlines key concepts that further support the educational intervention developed. A major portion of the literature included is grounded in the work done by previous researchers in a quest to address a

similar question. Therefore, much of the included literature consists of studies conducted to evaluate the level of perceived and actual diabetes knowledge held by practicing nurses. Furthermore, themes emerge through these studies depicting consistently repeated areas of knowledge deficit among nurses providing direct care for those with diabetes. The leading areas of knowledge deficiency from each study are included and consequently identify an alarming trend noting an unchanging list of nursing skills that are not felt to be adequate in the opinions of the researchers. These knowledge shortcomings were made apparent through the consistent use of a knowledge test developed to measure what nurses actually know about the basics of diabetes management. To further support the unchanging theme of knowledge deficits, the scores of the knowledge evaluation tool reveal consistent subpar results on behalf of the nurses in the respective studies. The studies are presented in chronological order to intentionally highlight the fact that despite subtle changes in each of the similar studies, nurses continue to underperform in the same areas related to diabetes management.

In a logical progression from identifying the knowledge deficits apparent among nurses, an examination of several continuing education studies was reviewed. Since an educational intervention is a large component of this project, determining the potential efficacy of such an intervention was deemed essential. Although the efficacy of specific educational modalities was not reviewed in depth, the implementation of any diabetes continuing education was found to be beneficial in addressing the needed improvement in basic diabetes management.

Identifying Nursing Knowledge Deficiencies

To gain a specialized perspective offered by diabetes educators and direct care practitioners, one study conducted by Sen (2005) aimed to identify the continuing education needs of practicing nurses providing self-care management education to patients with type 2 diabetes. The sample consisted of sixty-two diabetes educators and two hundred twenty-two direct care practitioners. The

participants in the study all belonged to the New York State Nurses Association and were sent a questionnaire developed to gather information about the perceived educational needs among practicing nurses caring for diabetics. This cross-sectional study revealed the following recommendations: (1) improved knowledge about types of insulin and insulin administration, (2) increased knowledge about prevention of diabetes complications, (3) increased knowledge of current drugs for patients with diabetes, (4) increased knowledge of food and diabetic/other drug interactions, and (5) a greater commitment by practicing nurses to patient education (p. 33). This opinion survey was not based on the actual evaluation of nurses' knowledge, but rather reflected the observations made over time by those surveyed. This study is limited by its very nature of being non-randomized, no controls, and it had a relatively small sample size that was exclusive in its geographic location. However, this study does echo findings from other studies identifying nursing knowledge deficits in these very areas of suggestion.

One study reviewed pertaining to the perceived and actual knowledge related to diabetes was completed in 1989 (Drass, Muir-Nash, Boykin, Turek, & Baker, 1989). This particular study is referenced by almost all other studies conducted in this area of research since its time. The study was conducted at a five hundred forty-bed research teaching hospital that offered one of the largest study samples of all similar research undertakings. Two hundred twenty-seven of the seven hundred practicing registered nurses providing direct care for diabetic patients voluntarily engaged in this study. Participants were given a questionnaire to ascertain their perceived level of knowledge in differing areas related to diabetes management and the disease process. Secondly, their actual level of knowledge was evaluated using an adaption of the Diabetes Basic Knowledge Test developed by Scheiderich, Freibaum, and Peterson (1983). The findings of this study proposed that there was an inverse correlation indicating that the more staff nurses perceived that they knew about diabetes, the less they actually did know (Drass et al., 1989, p. 354). This study also identified topical deficiencies by evaluating test questions most frequently answered incorrectly to include: blood

glucose monitoring, action and duration of insulin, initial treatment of hypoglycemia, common injection sites, etiology of diabetes, and the effects of oral hypoglycemic medications (p. 354). Specifically regarding the initial management of hypoglycemia, nurses were found to be deficient in basic nutritional knowledge as it relates to glucose management. This particular study as mentioned previously, has likely been a catalyst for future study as evidenced by its presence as a reference in many more studies. It is important to note that there have been multiple studies that have used this study design and failed to find such a striking inverse correlation across practicing nurses in general. This may be in part related to the fact that other areas of nursing outside of hospital nurses have been studied with the same tools.

A follow-up of the Drass study occurred in Michigan at yet another group of medical-surgical hospitals. This time, 127 voluntary participants underwent the same methods as conducted in the study performed by Drass (Gossain, Bowman, & Rovner, 1993). This sample represented only 59% of the hospital nurses, once again qualifying as a smaller convenience sample without comparison groups. One difference here was the addition of a demographic questionnaire to identify age, experience, training, and personal exposure to diabetes. The sample was largely made of nurses providing direct care for diabetic patients, but also included outpatient nurses who were generally not involved with diabetes management or education at discharge. The results of this study were somewhat different from the original Drass study. The leading nursing knowledge deficiencies included perioperative management, "sick day" management, effects and actions of oral hypoglycemic medications and insulin, and blood glucose monitoring (p. 216). Although etiology of diabetes was not listed as one of the incorrectly answered areas, it represented the third highest discordance between perceived and actual knowledge. To clarify, the nurses thought they understood the etiology more than they actually did.

Continuing with research undertakings that compared perceived competence and actual levels of knowledge among nurses, the following study closely mimics the Drass study outlined

previously. Although the same format of questioning nurses about their perceived knowledge and then testing their actual knowledge remains the same, it is the setting and samples that tend to differ. Spurred by inadequate diabetes instruction due to a lack of knowledge among nurses, Baxley, Brown, Pokoray, and Swanson (1997), repeated Drass' study method among thirty-two nurses at a rural hospital that volunteered to be part of the study. The findings of this cross-sectional study were relatively consistent with those noted in the Drass study. One noteworthy difference is that the inverse relationship between actual and perceived knowledge did not exist even though the composition of the population was similar, albeit smaller (p. 96). The deficiencies among nurses involved in the testing were again identified as blood glucose monitoring, effects of oral hypoglycemic medications, initial management of hypoglycemia, action and administration of insulin, and the etiology of diabetes (p. 97). It is interesting to note that despite the passage of almost a decade since the Drass study, the knowledge deficits among practicing nurses remain unchanged.

In 2001, the concept of evaluating perceived and actual knowledge still had not faded. El-Deirawi and Zuraikat (2001) continued to recognize the important role that nurses fulfill in the quality management of those with diabetes. Subsequently, they aimed to determine once again, if nurses felt like they knew more about diabetes than they actually did. One aspect that this study evaluated in the demographics collected from the voluntary participants, was how little exposure to diabetes education these nurses had since entering practice. The findings of this study once again identified leading deficits to include initial management of hypoglycemia, blood glucose monitoring, insulin injection sites, and the etiology of diabetes (p. 9). With the findings similar to previous renditions of this repeated study, one stated implication from this study stands out boldly. El-Deirawi and Zuraikat suggest "nurses are not knowledgeable enough about diabetes to be actively involved in diabetes education and to provide patients with the skills needed for survival" (p. 10).

The Drass et al. study design has been duplicated with minor adjustments in statistical analysis and demographic inclusions. However, the self-assessment tool and diabetes knowledge test have remained unchanged except for minor updates in clinical guideline recommendations. Other studies found quite similar findings including Jayne and Rankin (1993) who implemented the study on ninety-nine nurses from various units at a university medical center. Participants here had an average Diabetes Basic Knowledge Test (DBKT) score of 74% with 70% as an arbitrary passing score. Leggett-Frazier et al. (1994) conducted the study among a long-term care nursing sample of fifty-nine nurses. The mean DBKT score among those participants was 67%. Findlow and McDowell (2001) performed the study among two hundred sixty-eight staff registered nurses in a large UK city teaching hospital who had a mean score of 69%. Among these studies, the top deficiencies varied only slightly from those identified in previous similar studies suggesting that nurses lack this common knowledge despite the setting in which the study is performed.

In the latest rendition of the perceived versus actual knowledge studies, Gerard, Griffin, and Fitzpatrick (2010) repeated the original Drass study method because they recognized the rapidly growing diabetes epidemic in the United States. Drass cited that in 1989, there were eleven million people with diabetes (Drass et al., 1989). In this most recent study, 23.6 million people were cited as having diabetes, with 54 million considered to have prediabetes (p. 160). The study was performed in a three hundred five-bed community hospital that did not employ an inpatient diabetes educator. The sample consisted of ninety-three acute care registered nurses who provided direct care to patients with diabetes. Using almost identical methodology, the findings of this study found significant differences between perceived and actual knowledge in various tested areas, but did not find a significant correlation as purported in the Drass study twenty-one years previous. Additional findings continued to reflect the same deficient areas of knowledge among nurses, although not necessarily in the ranked order. The mean score tabulated during this study was 68%. Deficiencies in this study included actions of medications, the initial treatment of hypoglycemia, the etiology of

diabetes, meal planning, and blood glucose monitoring. The results of this study at the time of its completion were used to recommend that hospitals make it a priority not only to provide regular diabetes education to those that ultimately teach patients, but also to recommend hiring an inpatient diabetes educator.

Outside of the perceived versus actual knowledge study concept, there have been other studies performed to assess the diabetes knowledge practicing nurses demonstrate. A needs assessment carried out in Northern Ontario was developed to identify the specific continuing education needs of nurses providing direct care for those hospitalized with a listed diagnosis of diabetes (Griffis, Morrison, Beauvais, & Bellefontaine, 2007). This research was not dubbed a study but rather a needs assessment with fifty-two diabetes educators in the area developing its assessment tool. 152 acute care nurses participated in completing the knowledge test developed by the educators. It is important to note that this test was mailed out to the participants and was strictly an unobserved convenience sample. The results of the test revealed that the top deficiencies in knowledge ranked in order included: understanding therapeutic glucose goals, medications, etiology of diabetes, health monitoring, symptoms of hypoglycemia, and nutrition. Although the most correct responses were attributed to nutrition, the respondents had a mean score of 58% in the area of nutrition (p. 373). Information gathered was used to develop continuing education modules to be disseminated throughout the region focusing on nursing education.

Although this project focuses exclusively on the diabetes knowledge and confidence among nurses, an interesting study was conducted that included resident physicians, resident surgical physicians, and registered nurses (Rubin, Moshang, & Jabbour, 2007). This was a low quality study consisting of a convenience sample of 163 participants made up of residents and nurses. A questionnaire was developed by a group of endocrinologists, internal medicine physicians, and a nurse diabetes educator. This questionnaire was administered at the end of presentations and meetings not associated with information related to diabetes. The results of the twenty-one item

questionnaire showed a mean score from all participants of 61%. Family practice residents scored 64%, surgical residents scored 44%, and registered nurses scored 66%. All participants scored lowest in the area of correct fasting glucose range, insulin pharmacokinetics, and treatment of severe hypoglycemia (p. 18). This study, although not of high quality or reproducibility, demonstrates a lack of knowledge among not only nurses, but also those whom nurses sometimes rely on for additional information and orders regarding patients with diabetes.

Examining Continuing Education

With overwhelming literature existing that identifies a decreased competency among nurses to adequately understand the basics required for successful management of patients with diabetes, evaluating methods by which nurses can increase their knowledge and confidence on the subject is warranted. "The efficacy of patient education largely depends upon the accuracy of the intervention provided" (Jayne & Rankin, 1993, p. 497). It is important to equip nurses with the needed education if they are expected to confidently and competently provide the best care and teaching for the patients they provide direct service for. Several studies examined potential methods by which to disseminate diabetes education to nurses as well as supporting rationale to do so. One such study by Uding, Jackson, and Hart (2002) set out to evaluate nursing knowledge about diabetes as well as determine the usefulness of an educational intervention to deliver the information (p. 298). The study design included developing a computer based educational module and a forty-five minute lecture based on a review of literature that identified areas of knowledge deficit (Drass et al., 1989; Jayne & Rankin, 1993; Leggett, Turner, & Vincent, 1994; Baxley et al., 1997; & McDonald et al., 1999). Seventy-two registered nurses volunteered to be in this study and participated in a pre-test/post-test knowledge evaluation using Scheiderich's Diabetes Basic Knowledge Test. The sample scored 68% on the evaluation prior to the intervention and 84% following (p. 302). One advantage to this study was the fact that it included random selection from the convenience sample

and instituted both a research and control group. This evidence tends to support the use of an educational intervention and provided motivation for further research into effective teaching modalities for practicing nurses.

Although any accurate diabetes education undertaken by nurses would be beneficial, one study found that utilizing a computer-based module alone was not as effective as modalities that included face-to-face interaction (Eaton-Spiva & Day, 2011). Eaton-Spiva and Day conducted a study to determine the efficacy of a computer based learning (CBL) module to deliver diabetes education to practicing nurses. A descriptive quasi-experimental design was implemented for this particular study that included a convenience sample of five hundred forty-one nurses who completed the CBL. 44% completed the pretest and only 9% completed the posttest (p. 286). All participants were voluntary and there was no incentive provided which could explain the low completion of the posttest. The study found no statistical difference in knowledge or skill after the intervention. When surveyed after the intervention, nurses stated that they overall did not feel confident about their ability to teach patients about diabetes (p. 288). This study brings attention to the thought held by Drass et al. (1989) where she believed nurses would not engage in learning unless they perceive they have something to learn (p. 355).

A consensus statement released by the American Association of Clinical Endocrinologists and the American Diabetes Association (Moghissi et al., 2009) stated, "Inpatient providers often have insufficient knowledge about the many aspects of inpatient diabetes care. Thus, education of personnel is essential, especially during the early implementation phase" (p. 1125). These groups recommended that diabetes education be implemented to specifically include information that would: increase the level of understanding related to the diagnosis of diabetes, self-monitoring of blood glucose with explanation of goals, and definition, recognition, treatment, and prevention of hyper and hypoglycemia (p. 1126). This statement led many hospitals to conduct a review of their own needs and the possibility of incorporating diabetes education for staff nurses. With this in

mind, Young (2011) conducted a study that attempted to determine whether didactic or online education would be beneficial for nurses. There was no pretest, but participants were asked to rate what they felt they needed to learn about most. In order of need, the nurses chose: diabetes pathophysiology, medication management, nursing care, hyperglycemia management, and current guidelines including treatment of hypoglycemia (p. 144). A convenience sample of fifty nurses participated in this study voluntarily. The results of the study weighed heavily on the post intervention test scores considering an 80% pass rate. The group that participated in the didactic session scored 89% while the online group scored 95% (p. 145). The comparison is skewed because the online group had the ability to have the information in front of them while they completed the test. However, this study represents a passing score by all groups that is in contrast to nurses surveyed in other pre-intervention studies.

In briefly addressing the potential benefits of continuing education for nurses in general, two articles both supported outcomes offered by delivering education in multiple formats. The two studies evaluated were relatively representative of the larger body of published literature (Bell, Pestka, & Forsyth, 2007; Fleck & Fyffe, 1997). Each evaluated the efficacy of an educational intervention by comparing knowledge before and after different educational intervention modalities. Both studies made use of cross-sectional surveys delivered to convenience samples. The results of the studies were very similar, deducing greater benefit was gained when the education was targeted to an audience that perceived a need. In addition, if the delivery method focuses on content application relevant to the learner, the participant is more likely to retain the information and find it more valuable. This concept once again supports the potential success that can be gained through the use of continuing education for practicing nurses.

Discussion

Interpretation

Once again, the goal of this educational presentation was to determine whether nurses found potential value in receiving diabetes education, and whether they eventually gained knowledge and confidence in their ability to care for patients with diabetes. That being the immediate desired outcome of this project, a secondary focus was to determine if this type of educational intervention could become a mainstay in nursing practice. Continuing education is rooted in many studies that suggest its efficacy. Nursing knowledge is gained through continual learning by way of practice experience and formal education. Since diabetes is such a fast growing and dynamic disease among our population, it causes one to believe that continual focus on staying current should be expected by health professionals. Ferrell (1998) suggests "the half life of nursing knowledge ranges from two to five years". This would demonstrate the vitality of continued professional development. Furthermore, multiple studies including one conducted by El-Deirawi & Zuraikat (2001), found that 62% of practicing nurses had not attended a diabetes in-service in the past two years, and 17.7% had not ever attended an in-service on diabetes (p. 8).

In maintaining the focus of this project, the knowledge and confidence among nurses has evidence of being deficient. Although there has not been a long-term, randomized control study with large sampling, or the identified repeating of a study within the same institution, the quantity of studies with similar results is convincing at minimum. Despite the method used to evaluate nursing knowledge, the deficiencies have been consistently reproduced. Guided by the opinion of diabetes specialists and educators, the minimum amount of knowledge nurses must know to effectively educate and manage patients with diabetes is not being met (Spollett, 2006). The age of some of the studies included as support for this project may not represent a current point of view, but they do support the fact that there has been little if any improvement in the knowledge and confidence among nurses regarding diabetes since 1989. When perceived knowledge is examined, it

is found that nurses feel like they have a fairly good grasp of understanding about the disease process and management. However, when compared with actual knowledge, the results almost always reflect a lower understanding. The same study design originally developed and implemented by Drass et al. (1989) has been repeated many times, most recently in 2011. The findings almost mirror the results of Drass's original study. Consistently, nurses lack knowledge in the areas of: the etiology of diabetes, understanding insulin and oral medications, initial treatment of hypoglycemia, diet, and blood glucose monitoring. Using these repeated and consistent findings, the development of a didactic educational session seemed more than appropriate. It is important that nursing find a way to break the cycle of knowledge deficit in this area. This project attempts to begin that process by instituting an intervention and evaluating its efficacy.

As a major component in this project, the one-hour didactic presentation accompanied by a PowerPoint presentation was pursued based on the apparent success of similar educational implementations found in research. Continuing education provided to nurses solely through self-guided computer based learning modules have had some success but with less than impressive participation (Eaton-Spiva & Day, 2011). Didactic sessions with person-to-person communication have consistently produced improvement in diabetes knowledge among nurses. Therefore, the development of this type of an intervention was deemed promising to gain the desired effect of increasing knowledge with a subsequent increase in confidence and skill. An important aspect of this process was to determine if nurses perceived that they could benefit from additional diabetes education, and if they think that they would find a place for this in their practice providing care for patients with diabetes. If nurses found potential value in the content of this presentation, they could stand to gain both more knowledge and certainly more confidence. As discussed earlier, the Transtheoretical model of behavior change finds it imperative that for change to occur, one must recognize that change is necessary to some degree. For engagement in learning, nurses need to be exposed to the information that makes it apparent they at least must consider that they have a

potential knowledge deficiency regarding diabetes, and could benefit from continued education.

Outcome/Dissemination

Implementation of the survey and presentation portion of this project was conducted in December 2012, at Lakewood Health System in Staples, Minnesota. After having a conversation with the hospital director of nursing, the inpatient education nurse, the diabetes educator, and the clinic dietitian, it was decided that they would support this type of education implementation being delivered to the nurses on staff in the hospital. Without a formal needs assessment ever being done regarding nursing knowledge about diabetes within this facility, the dietitian and diabetes educator agreed that there was a significant need for updating nursing knowledge among the practicing staff nurses (K. Coughlin and L. Bach, personal communication, November 21, 2012). Gracious support and availability of resources were given to successfully deliver the presentation. The session was advertised as a voluntary but paid educational meeting for all nurses with specific request made to the registered nurses providing direct care of patients with diabetes. Nurses were to then respond via email to confirm their attendance at least one week prior to implementation. Once they replied with confirmation, a survey was sent to their mailbox within the facility to be returned when they attended the education session. Only RNs were given the survey to stay consistent with the research done for this project being focused on registered nurses. Seventeen registered nurses attended the session, while four licensed practical nurses and two physicians were also present.

The presentation began with an introduction of the presenter followed by the initiation of the PowerPoint augmented lecture. The content began by providing current diabetes facts and statistics followed by a summary of the research findings indicating a consistent lack of diabetes knowledge among nurses. After identifying the leading deficiencies found to exist among nurses, the presentation led off with the first deficiency, the etiology of type 1 and type 2 diabetes and the clinical manifestations. A pathophysiologic approach was used with an interactive demonstration

utilizing visual aids. After finishing that segment, the presentation progressed to the next deficiency identified in literature, understanding insulin and oral diabetes medications. The mechanisms of action were discussed as they related to the content previously expressed in the pathophysiology segment of the presentation. Once medication review was completed, discussion turned to the initial treatment of hypoglycemia. As identified throughout many studies reviewed, this was consistently a topic of knowledge deficit despite the evaluation tool or survey used. In discussing the treatment of hypoglycemia, emphasis was given to important dietary aspects that face those diagnosed with diabetes. An overview of carbohydrates and carbohydrate counting were included. The presentation then ended with the topic found often in literature over the past twenty years as being a consistent area of knowledge deficit, blood glucose monitoring. The presentation then ended with a question and answer period and examples of the Diabetes Basic Knowledge Test were handed out for nurses to test their knowledge voluntarily. Notice was given to the RNs that were in attendance that a follow-up survey would appear in their mailbox in approximately two weeks.

Responses to the pre and post-class survey were tabulated and compared two weeks following the delivery of the presentation. Since a Likert scale was used, the responses were quantified using an average based on the individual survey items. Nine items on the initial survey reflected areas identified as deficient based on the reviewed literature. One question was included to elicit to what degree nurses felt they received adequate education regarding diabetes prior to attending the presentation. The Likert scale was based on the degree in which nurses agreed or disagreed with the provided statements regarding diabetes management. A response of 1 was interpreted as a strong disagreement with the statement, while a response of 4 indicated strong agreement with the statement. Table 1 shows the averaged results among the respondents.

Table 1*Results of the Pre and Post Presentation Surveys*

Topic	Number of Responses	Pre-class Average Likert Score (1-4)	Post-class Average Likert Score (1-4)	% Change
Confident in initial treatment of hypoglycemia.	17	2.94	3.4	+ 16%
Effect of foods on blood glucose.	17	2.53	3.18	+ 26%
Mechanism of action of oral diabetes medications.	17	1.82	2.76	+ 52%
Able to explain pathophysiology of type 1 and type 2 diabetes.	17	2.17	2.71	+ 25%
Understand and interpret A1c levels.	17	2.47	3.0	+ 21%
Explain different insulin injection sites.	17	3.06	3.53	+ 15%
Understand the mechanism of action of various insulins.	17	2.29	2.94	+ 28%
Confidence and ability to teach patients to self manage.	17	2.94	3.18	+ 8%
Recognize signs and symptoms of hypoglycemia.	17	3.24	3.35	+ 3%
Feel nurses receive adequate diabetes education.	17	2.24	1.65	- 26%
Feel increased knowledge has impacted practice.	17	NA	3.88	NA
Feel increased confidence in working with patients with diabetes.	17	NA	3.71	NA

Evaluating an educational instrument was never the goal included in this project, and actual knowledge testing was not conducted. The intention of the surveys included herein was to gain perspective regarding the attitudes of nurses regarding their perceived abilities to manage diabetes, and to acquire insight as to how they would value the inclusion of additional diabetes education. It was realized through the compilation of survey data that nurses did in fact benefit from engaging in the educational presentation. Furthermore, nurses consistently felt that they had found the information beneficial to their current and future practice as evidenced by their post-presentation

survey responses. It is of value to note that there was a 26% change in attitude regarding how these nurses perceived the educational preparation of nurses regarding diabetes. To clarify, the surveyed nurses increasingly felt that the education nurses receive through formal and continuing education was not as adequate as they felt prior to the presentation.

It was not necessarily a detriment to this project, but it would have added support for the need for continuing diabetes education if actual knowledge would have been found to correlate with the perceived increased knowledge and confidence shown in the survey responses. In addition, the educational teaching methods may have produced more significant increases in attitude change had they been delivered more efficiently or with different methodology. Despite the fact that actual knowledge was not addressed, it was made clear through this project that further education in the area of diabetes was deemed largely beneficial to those who participated. In processing the data found on Table 1., one can realize that the greatest positive change occurred in the areas that had low scores initially. In contrast, less positive change was appreciated in areas where nurses initially felt more knowledgeable and confident. Overwhelmingly, the nurses who participated in this educational intervention responded favorably to the content of the presentation and found the information to be highly applicable and beneficial to their daily practice. It was evident that nurses recognized the value of further education, and also realized that they could benefit from engaging in future disease specific educational interventions. The results of this project reflect a positive correlation to the theoretical model applied. It was evident that the nurses involved negotiated through the stages of the TTM from precontemplation to maintenance. They recognized a need and potential value in engaging in a behavioral change, and subsequently found the change in behavior to be worthy of sustaining.

Implications for Nursing

“Nurses play an important role in diabetes education as they constitute the largest group of health care professionals who have a lengthy contact with patients with diabetes. Patients’

knowledge of diabetes and its management depends, to a large extent, on the adequacy and effectiveness of diabetes-related instructions that they receive from healthcare professionals” (Drass et al., 1989, p. 351).

Nurses are expected to be adequate in diabetes related knowledge and skills needed for patient and family teaching (El-Deirawi & Zuraikat, 2001). Common among the discussion portions of many nursing knowledge evolution studies are statements demanding nurses take a more active role in staying current with areas in which they practice. The focus of this project, to reiterate, was to determine whether a brief educational intervention based on commonly identified knowledge deficiencies could increase knowledge and confidence that could permeate the practice behavior of nurses. This outlines an important potential implication for nursing practice. Although this project was delivered to a relatively small group of nurses, it has the potential to raise awareness among similar rural practicing nurse groups in the surrounding area to possibly conduct a needs assessment and educational implementation of their own. The aspects for motivating this change in practice are two-fold. First, nurses could be brought to the awareness that there is in fact something to be gained from engaging in further diabetes education once exposed to the findings presented in fairly recent literature regarding a knowledge deficit common across nursing. Secondly, realizing the simplicity of employing a brief education session that has the potential to change practice in a convenient way could be viewed as a high return on time investment.

An obvious implication for nursing education exists inherently in the concept of this study. Bringing attention to the value of educating nurses on a more frequent and continual basis could potentially change the nursing educational landscape within a health institution. Education rarely, if ever, has a negative connotation and is often valued at least to some minimal extent. This project adds support to the continual evolution of nursing education especially in the realm of current practicing nurses. Diabetes educators and administrators alike perpetually look for ways to improve

efficacy and safety among the nursing staff. This project represents one way in which the education schema could effectively be adapted to staff nurses.

To further permeate institutional change at minimum, brief courses such as the presentation delivered through the implementation of this project could become mainstay policies. Healthcare facilities should find value in creating a more productive and effective staff in the area of educating patients with diabetes. Since patient outcomes rely heavily on the education they receive about their particular disease states, institutional policy implications potentially exist. Following the study performed by Fowles and Rosheim (1999), it was found that 9% of patients that sought diabetes education were denied coverage by their insurance carrier. In addition, the same study revealed that 10.3% of those eligible refused to participate in diabetes education (p. 2). This inherently applies more pressure or importance for nurse to respond to fill that educational void with confidence and competence. Furthermore, as nurses become more confident and effective in providing better patient care through education, policy change could occur over a wider geographical area as others follow the pattern of successful institutional policy incorporating specific diabetes education programs.

To address nursing research implications potentially associated with this project, further research is certainly recommended. After a thorough review of literature on this topic, this author recommends that future research needs to be conducted that focuses on the benefits of better educated nurses in the area of diabetes management through patient teaching and care. There are few quality studies that attempt to link patient outcomes to the level of nursing knowledge. Furthermore, the nursing profession could definitely benefit from additional research in determining the most effective method by which to educate nurses that can be cost and time effective and yet produce beneficial practice outcomes. Although not the focus of this project, the method in which diabetes education is delivered to nurses is a subject currently in debate. A study of nurses's perceptions regarding online continuing education found that almost all nurses consider this method

desirable as it relates to convenience. However, the same study participants felt that a computerized method was not as effective as a live didactic presentation (Karaman, 2011). To reinforce the issue of behavior change, it is apparently not sufficient to simply make educational information available to nurses. Consideration must be given to help nurses identify a need for change to begin the process of behavioral transformation. It has been established in the opinion of this author that diabetes knowledge among nurses in key basic areas has consistently been deficient over the past two decades. If more attention by nursing researchers were done in this area, newer research data could be disseminated throughout the profession resulting in the development of more efficacious educational delivery modalities.

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Key Concepts in Diabetes for Practicing Nurses

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 May 2013

Overview

- Current diabetes facts and statistics.
- Summary of research related to nursing knowledge.
- Etiology of type 1 and type 2 diabetes mellitus.
- Insulin and oral diabetes medication review
- Recognition and initial treatment of hypoglycemia.
- Role of carbohydrates.
- Blood glucose monitoring.
- Discussion

Current Diabetes Facts and Statistics

- Nearly 26 million adults and children in the U.S. have diabetes.
- 79 million are prediabetic or at risk for Type 2 Diabetes
- 33% of the nation has or is at risk for diabetes.
- 22% of all inpatient days are incurred by those with diabetes.

Fowles and Rosheim, 1999
 American Diabetes Association, 2012

Current Diabetes Facts and Statistics

- \$1 out of every \$5 is spent treating those with diabetes
- 35-40% of all decedents have diabetes listed on their death certificate
- 99.5% of patients report receiving their diabetes education from healthcare professionals, mainly nurses.

Fowles and Rosheim, 1999
 American Diabetes Association, 2012

Summary of Research

- Practicing registered nurses consistently scored less than 70% on a test related to basic diabetes management (Gerard et al., 2010)
- Nurses' perception of diabetes knowledge is inversely related to their actual level of knowledge (Drass et al., 1989)
- Consistent areas of knowledge deficit among nurses included:
 - Knowing the etiology of diabetes
 - Understanding insulin and oral diabetes medications
 - Initial treatment of hypoglycemia
 - Role of carbohydrates
 - Blood glucose monitoring procedures and parameters

Young, 2011

Comparison of Type 1 and Type 2 Diabetes Mellitus

Etiology of Type 1 Diabetes

- A metabolic disorder characterized by severe insulin deficiency resulting from beta-cell destruction with subsequent hyperglycemia.
 - Immune-mediated
 - Idiopathic (Less than 10% of cases)
- Pancreas stops producing insulin completely.
- Require insulin replacement therapy.
- Onset is generally abrupt.
- Occurs at any age, although less frequently in those <1 or >30 years of age.

Dunphy et al., 2011

Clinical Manifestations

- Presenting symptoms can include:
 - Polydipsia (increased thirst)
 - Polyuria (increased urination)
 - Polyphagia (increased appetite)
 - Weakness and Weight loss (muscle catabolism and potassium loss)

Dunphy et al., 2011

Clinical Manifestations

- Short term complications are due to:
 - Hypoglycemia (inadequate amounts of glucose to perform cellular functions)
 - Hyperglycemia (glucose is "stuck" in the serum and is not available for cells)
- Long term complications are generally related to microvascular changes causing thickened and narrowed blood vessels.

Dunphy et al., 2011

Etiology of Type 2 Diabetes

- Characterized by a group of metabolic abnormalities:
 - Sufficient endogenous circulating insulin (initially)
 - Resistance to insulin (at the cellular level)
 - Genetic predisposition
 - Acquired due to obesity/aging
 - Increased intracellular lipids and plasma fatty acids
 - Inadequate compensatory insulin secretion
- Insidious onset with often undetected symptoms
- Hyperglycemia is "toxic" to beta-cells resulting in decreased insulin production over time.
- Tends to develop in obese individuals and aging individuals with a genetic predisposition.

Dunphy et al., 2011

Medications Used to Treat Diabetes

Review of Insulin

- Insulin is administered to decrease blood glucose levels by allowing cellular uptake and subsequent cellular function.
- The most common forms of insulin are:
 - Rapid Acting (Humalog, Novolog) - Common
 - Short Acting (Regular)
 - Long Acting (Lantus, Levemir) - Common
 - Intermediate (NPH)
- Insulin can be delivered by injection, infusion pump, and using a sliding scale, or set doses.
- Must be injected subcutaneously (Abdomen, ventrogluteal, triceps region, or over the quadriceps).

Woo & Wynne, 2012

Action of Insulin

Comparison of Equal Amounts of Different Types of Insulin

Onset of action

- Rapid Acting (<15 minutes)
- Short Acting (30-80 minutes)
- Intermediate (2-4 hours)
- Long Acting (3-6 hours)

Insulin should be present with carbohydrate intake and hyperglycemia.

Using basal and bolus insulin attempts to mimic the normal metabolic response

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Oral Diabetes Medication Review

- Biguanides (Metformin)** *Resistance*
 - Increase insulin uptake, decreases hepatic glucose production, decreases intestinal glucose absorption.
- Sulfonylureas (Glimpizide, Glipizide)** *Insulin Deficiency*
 - Increase insulin production and insulin receptors.
- Thiazolidinediones (Actos, Avandia)** *Resistance*
 - Increase use of available insulin, and decrease hepatic glucose production.
- Meglitinides (Brandin, Starlix)** *Insulin Deficiency*
 - Increase postprandial insulin production only.
- DPP-4 Inhibitors (Januvia)** *Insulin Deficiency*
 - Acts on incretin hormone system to increase insulin production.
- GLP-1 Inhibitors - Injectable (Byetta, Victoza)** *Insulin Deficiency*
 - Mimics glucagon like protein attaching to beta-cell receptors to stimulate insulin production.

Woo & Wynne, 2012

Treatment of Hypoglycemia

Treatment of Hypoglycemia

- Symptoms usually present with blood glucose <60 mg/dL
- Brain function impaired when levels fall to <50 mg/dL
- In the conscious symptomatic patient: 15 gram goal
 - 6-12 ounces of orange or fruit juice (15-20 grams CHO)
 - 8 ounces low fat milk (15 grams CHO)
 - Glucose Tablets 4 grams of carbohydrate in each tablet.
 - WAIT 15 minutes
 - Check blood glucose level (>70 mg/dL)
 - Encourage a meal with the inclusion of protein if at goal.
 - If not at goal repeat another 15 gram CHO snack.
- Avoid foods that are high in fats because they will decrease the rate of glucose absorption.

McNaughton et al., 2011

The Role of Carbohydrates in Diabetes

Role of Carbohydrates in Diabetes

- Glucose
 - Optimal fuel
 - Monosaccharide derived from dietary carbohydrates
 - Excess stored as glycogen in the liver
 - Glucose in the blood triggers insulin release

Role of Carbohydrates in Diabetes

- Carbohydrates raise blood glucose levels.
 - All carbohydrates are equal in equal amounts
 - When "carb counting" 15 grams = 1 choice.
 - Patients often dose their insulin based on units of insulin per choice of 15 grams of carbohydrate.
- Examples of 15 gram choices.

<ul style="list-style-type: none"> Slice of regular bread 1/2 Cup cooked oatmeal 1/3 Cup cooked pasta/rice 1 apple or 15 grapes 1 Tablespoon of sugar or honey 10 French fries 1/2 Cup ice cream 1/2 Cup corn, peas, beans 	<ul style="list-style-type: none"> "Free" foods (No carbs) Cheese Cottage cheese Proteins (one serving) Lettuce Diet soda Most condiments Eggs Salt
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Augustine, 2012

Blood Glucose Monitoring

- ALL patients with diabetes should monitor their blood glucose.
- Patients on insulin must monitor their glucose more closely in order to adjust insulin dosing.
- Normal Glucose range
 - 70 - 130 mg/dL Preprandial (before meals)
 - < 180 mg/dL Postprandial (1 hour after meal)
- Post and Preprandial values are used to adjust treatment.
- To check blood glucose:
 - Patient needs to wash hands
 - Use clean lancet to pierce side of fingertip
 - Place drop of blood on monitor test strip
 - Record glucose value

ADA, 2012c

Questions and Discussion

Questions and Discussion

- How many grams of carbohydrate are in one choice?
- Which type of diabetes has a higher genetic component?
- Name the metabolic abnormalities that occur in Type 2.
- What is the normal range for preprandial blood glucose?

Questions and Discussion

- T or F. A proper insulin injection site is in the tricep region.
- What is the onset time for Humalog insulin?
- T or F. Adding sugar to OJ should be done to initially treat hypoglycemia.
- T or F. A person with type 1 diabetes can survive without insulin.

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Appendix B

Pre-class Survey

Select a response based on the degree in which you agree or disagree with the following statements.

Choose 1 for strongly disagree, 2 for disagree, 3 for agree, or 4 for strongly agree.

1. I feel confident treating a patient who is experiencing a hypoglycemic episode.

1 2 3 4

2. I am able to explain how different foods can affect blood glucose in a person with diabetes.

1 2 3 4

3. I understand the mechanism of action of oral medications used to treat diabetes.

1 2 3 4

4. I am comfortable in explaining the pathophysiology of Type 1 and Type 2 diabetes to patients.

1 2 3 4

5. I know and understand how to interpret blood glucose and A1c values.

1 2 3 4

6. I feel confident in my ability to explain all of the recommended insulin injection sites to my patients.

1 2 3 4

7. I understand the duration and mechanism of action of various types of insulin and could explain this to my patients.

1 2 3 4

8. I feel that the amount of knowledge I have related to diabetes management is enough to enable me to teach most patients with diabetes on how to self-manage.

1 2 3 4

9. I can recognize the symptoms of hypoglycemia and explain them to the family members of a patient with diabetes.

1 2 3 4

10. I feel like nurses receive enough diabetes education through their formal education and through continuing education opportunities.

1 2 3 4

Appendix C

Post-class Survey

Select a response based on the degree in which you agree or disagree with the following statements.

Choose 1 for strongly disagree, 2 for disagree, 3 for agree, or 4 for strongly agree.

1. I feel confident treating a patient who is experiencing a hypoglycemic episode.
1 2 3 4
2. I am able to explain how different foods can affect blood glucose in a person with diabetes.
1 2 3 4
3. I understand the mechanism of action of oral medications used to treat diabetes.
1 2 3 4
4. I am comfortable in explaining the pathophysiology of Type 1 and Type 2 diabetes to patients.
1 2 3 4
5. I know and understand how to interpret blood glucose and A1c values.
1 2 3 4
6. I feel confident explaining the recommended insulin injection sites to my patients.
1 2 3 4
7. I understand the duration and mechanism of action of various types of insulin and could explain this to my patients.
1 2 3 4
8. I feel that the amount of knowledge I have related to diabetes management is enough to enable me to teach most patients with diabetes on how to self-manage.
1 2 3 4
9. I can recognize the symptoms of hypoglycemia and explain them to the family members of a patient with diabetes.
1 2 3 4
10. I feel that the information I received during the diabetes education session has improved my practice in providing direct care for patients with diabetes.
1 2 3 4
11. I feel that the diabetes presentation increased my knowledge and has positively impacted my nursing practice.
1 2 3 4
12. I feel that the diabetes presentation increased my confidence in the ability to help those with diabetes manage their disease.
1 2 3 4