Diabetic Care Protocol: Increasing Diabetic Compliance in the School System

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Table of Contents

Abstract

Addressing insulin-dependent diabetes mellitus (IDDM) among adolescents is a public health concern due to the higher risk for adverse IDDM health outcomes related to increased non-adherence with this age group. An examination of the current literature indicated that school nurse interventions effectively improved IDDM outcomes among adolescents. A nurse care protocol for non-compliant diabetics (NCP-NCD) among non-adherent adolescents diagnosed with IDDM was implemented in a public central Texas school district to improve student adherence to the diabetic plan of care, reduce hypoglycemic medical emergencies, and reduce absenteeism, through standardized holistic nursing care based on current evidence. Donabedian model was utilized to guide quality improvement (QI) project. Convenience sampling was used to recruit eight middle school and high school nurses who were caring for at least one nonadherent diabetic student to participate in the project. There were eleven non-adherent students cared for using the NCP-NCD throughout the timeframe of one month. Results showed an increase in knowledge, skill, and attitudes (KSA) among the project participants. Project results also showed a reduction in student absenteeism; the project objective to decrease hypoglycemic episodes was not met. Additional positive outcomes include increased parent and student engagement and participation in care as well as the desire of the middle and high school nurses to continue the NCP-NCD and expand implementation. A longer timeframe for the project implementation and an increased number of project participants should be considered for the future of the project.

Keywords: insulin-dependent diabetes mellitus, adolescents, non-adherence, school nurse interventions, Nurse Care Protocol for Non-Compliant Diabetics, public-school, Donabedian model, convenience sampling, parent and student engagement, middle school and high school

Diabetic Care Protocol: Increasing Diabetic Compliance in the School System

An average of 1.25 million people in the United States have insulin-dependent diabetes mellitus (IDDM), with 200,000 of these people under the age of 20 (National Diabetes Education Program [NDEP], 2016). Statistics show that by 2050 the number of insulin-dependent diabetics under the age of 20 years old will increase to 600,000 (Juvenile Diabetes Research Foundation International [JDRF], 2018). School-aged diabetic children require scheduled monitoring and treatment throughout the school day (Erie et al., 2018; Sullivan-Bolyai et al., 2014). School nurses have the responsibility of making sure insulin-dependent diabetic students are receiving appropriate therapy, which is a multi-disciplinary diabetic plan of care developed by the school nurse in collaboration with: doctors, parents, principals, and the student's teachers (National Diabetes Education Program [NDEP], 2016). This project will take place at a suburban middle school and high school in Texas. The grade levels are sixth through twelfth-grade students from the ages of eleven to nineteen years old. Adolescents, in general, are in jeopardy to engage in risky behaviors (KidsHealth, n.d.), and for the adolescent diagnosed with IDDM, this may manifest in non-adherence to their diabetic plan of care (Patton et al., 2016). The issue of non-adherence is common among this age group (Borus & Laffel, 2010) so it is imperative that the school nurse follow the diabetic plan of care to prevent hypoglycemic reactions while the adolescent is in the school. The purpose of this project proposal is to develop a nurse protocol to address non-adherent diabetic students based on current best practice standards.

Background

Diabetes is among the most common childhood chronic diseases; it affects approximately 200,000 individuals twenty years of age and under in the United States.

Research conducted by the Search for Diabetes in Youth (SEARCH) showed that 1.93 out of one thousand individuals aged twenty years and under had been diagnosed with IDDM (Alicea-Planas, 2015). This marked an increase of 21% from the year 2001 to 2009. In addition, the increase in the prevalence of this IDDM was reflected in all ethnic groups, besides non-Hispanic whites who were disproportionately affected (England et al. 2014).

In the education setting, the school nurses, as well as educators, are a part of the system of continuous care (Gandhi et al., 2015). Most of the individuals with IDDM spend many hours in school, hence the need for knowledgeable and trained staff who can provide medical care for children with diabetes while in the classroom. However, some of the students that are insulin-dependent may fail to comply to upkeep treatment due to their young age, which may endanger their health while in school. It is the responsibility of the school nurses to ensure that insulin-dependent diabetic students are continually receiving the appropriate therapy which is indicated by the multi-disciplinary diabetic plan of care developed by the school nurse in collaboration with physicians, parents, principals, and the student's teachers (National Diabetes Education Program [NDEP], 2016). The diabetic plan of care should include documentation of the diabetic student's failure to comply with therapy. With all of these considerations, it is therefore important to understand the measures to be taken in caring for non-adherent IDDM in the school system.

During their adolescence, students may rebel against authority as a way of expressing their independence; this is a typical developmental milestone when growing into adulthood (Patton et al., 2016). When adolescents rebel against authority, they can put their well-being at risk. Adolescents diagnosed with IDDM sometimes use their condition as a tool to control situations, which sometime results in a situation where they choose not to comply with their

diabetic plan of care or doctor's orders (NDEP, 2016). This rebellious behavior can put the student diagnosed with IDDM at high risk of having a health crisis while at school.

As a nurse leader, it is essential to provide holistic and therapeutic care to meet individual needs. Holistic nursing treats more than just diabetes by addressing the student's entire wellbeing, which includes physically, mentally, emotionally, spiritually, as well, as how the student relates to their environment (Alicea-Planas, 2015). Providing quality care may be a difficult task when resistance from the student exists. Non-compliant students may project feelings of frustration upon the school nurse (Cornish & Jones, 2014; Newton, 2013). Instead of getting frustrated, a nurse leader should take an enthusiastic approach to providing necessary care (Siminerio et al., 2014). Treating the entire student, not just diabetes, is essential. A holistic approach can help build a relationship of trust between the student and the school nurse (Amutio-Kareaga et al., 2017). A genuine cooperative relationship between the student and school nurse helps facilitate compliance of the student to follow their diabetic plan of care.

According to the American Diabetes Association (2013), diabetes continues to be the most prevalent lifelong illness among children. School nurses encounter students of all ages diagnosed with IDDM within the public-school environment, which demonstrates the need to provide appropriate diabetic care for these students; however, attempting to provide necessary care may become a dangerous power struggle between nurse and student (Peyrot et al., 2006). This may result in a care environment that is no longer therapeutic for the student (Cornish & Jones, 2014).

Students diagnosed with IDDM who choose to be non-adherent can create a breakdown in continuous care where the nurse is unable to follow the plan of care because of the student's lack of compliance (Brundisini et al., 2015). Nurses are obliged to follow protocols in administering the diabetic plan of care but most existing protocols do not include

situations where the student is non-adherent. For the student, they are putting their health at risk by choosing not to comply. The nurse will face the risk of being reprimanded for not following protocols and blame could be placed on the nurse if the student's condition is poorly managed at school (Khan et al., 2012). Unfortunately, due to the non-adherence of the student to the plan of care, the school nurse-student relationship has become opposing versus a cooperative, healthy, relationship.

This atmosphere creates an environment that places the student at risk of a severe hypoglycemic episode, which is a medical emergency (American Diabetes Association, 2013). Incidents of non-adherence of insulin-dependent diabetics to the diabetic plan of care have been increasing at the middle school and high school levels (Foster, Bellando, & Wang, 2016). This situation has made it more difficult for school nurses to provide necessary care for diabetic students and has increased the risk of the student having a hypoglycemic event at school. For this reason, an action plan is needed to promote compliance with the diabetic plan of care.

Significance

To avoid risky situations and reach healthy outcomes, it is necessary to maintain a therapeutic relationship built on honesty and trust between the nurse and student. Development of a nurse protocol that provides care guidelines in handling non-compliant diabetics may offer a guide to help nurture the therapeutic relationship between nurse and student, which may result in increased adherence with the diabetic plan of care. Adherence with the plan of care results in meeting health outcomes of maintaining glucose control in the school system.

Problem Statement

The non-adherence to the diabetic plan of care results in increased hypoglycemic

medical emergencies, increased absenteeism, tenuous nurse-student relationships, and places liability on the school and school nurse. This project will address the problem of non-adherence to the diabetic plan of care by students aged 11 to 19 diagnosed with IDDM in a local suburban middle and high school in Texas. By implementing a nurse care protocol for non-compliant diabetics (NCP-NCD) compared with no existing protocol, the goal is for non-compliant insulin-dependent diabetics to increase adherence of care among students with IDDM, decrease absences, decrease hypoglycemic events in the school setting, and improve the overall health status of students with IDDM within one month of implementation.

Problem Question

Will implementation of an nurse care protocol for non-compliant diabetics (NCP-NCD) within the school system improve adherence of adolescents, reduce medical emergencies because of hypoglycemia, and decrease absenteeism within the timeframe of this Doctor of Nursing practice (DNP) project? The PICOt format was utilized in development of the project question. P is used to describe the problem or population, I is used for the proposed intervention, C is for comparison, O stands for outcomes, and T stands for timeframe (Bemker & Schreiner, 2016).

P= IDDM students in middle and high school

I= Development and Implementation of a NCP-NCD protocol

C= Current practice, no protocol

O= Reduced hypoglycemic medical emergencies and improved attendance

T= within the timeframe of this DNP project

Purpose Statement

The purpose of the project is to develop a NCP-NCD to improve middle school and

high school nurses' knowledge, skill, and attitude (KSA) toward non-adherent IDDM adolescents, improve student adherence to the diabetic plan of care, reduce hypoglycemic medical emergencies, reduce absenteeism, in a public-school environment through standardized holistic nursing care based on current evidence.

Project Objectives

The objectives of this project include:

1. Create a NCP-NCD protocol to utilize in the public-school system environment.
2. Educate the school nurses in the NCP-NCD.
3. Reduce hypoglycemic medical emergencies within the school system within a one-month timeframe.
4. Improve absenteeism of the student diagnosed with IDDM within a one-month timeframe.

Search Terms

A literature search is performed to ensure current, reliable literature is obtained and reviewed for this DNP project. This literature search focused on publications released within the past five years, peer review, English language, and full text. The search of literature was accessible using databases including: National Center for Biotechnology Information (NCBI) database, ProQuest, CINAHL, MEDLINE, SAGE Publications, Directory of Open Access Journals, PubMed, and JAMA Network. The search terms used were "adolescent IDDM", "pre-adolescent IDDM", "non-adherent adolescent IDDM", "non-adherent pre-adolescent IDDM", "caring for adolescent and pre-adolescent insulin dependent diabetics in school", "adolescent and pre-adolescent IDDM statistics in the United States", "IDDM adolescent and pre-adolescent

hypoglycemic medical emergencies in the school system", "nurse and student issues in caring for a non-compliant diabetic", "patient-centered healthcare", "therapeutic care in nursing", and "holistic nursing care". The search terms retrieved more than 200 articles related to the criteria mentioned above. Out of the 200 articles, 28 articles were selected for literature review due to their relation and support of the topic. Peer reviewed full-text research articles were included. Abstracts were reviewed to determine the relevance to the topic. The main inclusion criteria that will be used in the following review includes research studies based on quantitative and qualitative research method with study designs of randomized controlled and non-randomized controlled trials (Beck et al. 2015). Included along with the selected peer reviewed articles, ADA and AADE websites containing adolescent diabetic care guidelines and best practice standards were reviewed. The adolescent population effected by non-adherent insulin-dependent diabetics in the school system would be included. Exclusion criteria will entail studies that lack specific health intervention as well as outputs or outcomes. Non-insulin dependent diabetics were excluded. Articles focused on elementary school aged students were excluded. Moreover, studies older than five years will also be excluded.

Review Synthesis

Impact of the Problem

A study conducted by Swanbrow (2004) showed that both high school and middle school students spend over 30 hours a week in school. A University of Michigan study was completed by economists F. Thomas Juster, Frank Stafford, and sociologist Hiromi Ono at the Institute for Social Research (ISR). The study is a part of a much larger study conducted by the ISR since 1968. The study consisted of 2,907 adolescents 10 years old and older. They were asked to fill out time diaries on two random days. Swanbrow, (2004) study results

indicate that adolescents spend 7.5 hours more at school and academics than they did 20 years ago. The study also suggest that adolescents spend two hours less being physically active, which can contribute to childhood obesity. They also spend less time sleeping instead they are studying or mingling. Since such a significant amount of time is spent at school, it should be treated as a home extension for individuals with insulin-dependent diabetes. Diabetes that requires insulin is common and has a high probability of impacting most schools by disrupting classroom time and attendance (American Association of Diabetic Educators [AADE], 2016).

Diabetes, as well as its complications, contain significant personal, economic and social impact and thus its control minimizes the risk of long-term as well as short-term complications. According to Grabill (2014), more intensive diabetes management via administration of insulin with insulin pumps or injections, frequent monitoring of blood glucose and an individual attention to exercise and diet may result to better control of this disease. The study results suggest parental guidance resulted in improved glycemic control. The longitudinal study measured HbA1c data, family dynamics and adherence data over a two-year period. The Grabill (2014) study consisted of a total of 224 children ages 8-18 years old, 52 of the participants were 16 years old and older that had state-funded insurance. They were selected by a university associated with pediatric diabetic clinic caring for children in a rural community. The school environment being an extension of home and the school nurse incorporating an approach of guidance in caring for a diabetic student will increase compliance and reduce incidences of diabetic emergencies in the school setting (Markowitz et al., 2015). Whereas in the Grabill (2014) study results indicate poor communication and poor problem-solving skills will increase defiance and rejection of the plan-of-care. The nurse being supportive of the student instead of demanding will increase adherence.

There was a concern passed by Canadian Pediatric Society in conjunction with Canadian Pediatric Endocrine Group regarding the manner in which IDDM is managed in schools (Lawrence et al., 2015). There was a position statement released outlining the basic requirements for caring for an insulin dependent diabetic student in the school setting. In the Lawrence et al., (2015) position statement the cause for worry was due to conditions in which blood sugars change unceremoniously hence, the importance of the school nurses and other personnel to be equipped, educated, and available in supporting the diabetic students. The findings suggest that low and high blood sugar effects the student in a negative way in the school setting. Low and high blood sugar causes disruption of instructional time and interferes with cognition. Awah (2014) emphasizes how the importance of involvement of staff delivering a patient-centered approach to healthcare to both the long-term and short-term health of diabetics in Cameroon, especially students diagnosed with IDDM. The results of the literature suggest that issues with IDDM care management in the school system is not only and issue in the United States but also effect other regions of the world.

Adequate commitment of school nurses and other school personnel is likely to assist in optimizing the diabetic students in school performance and daily school activities events sponsored by the school and within the school setting (AADE, 2016). However, non-adherent IDDM individuals exist. The issue of non-adherence for diabetic students should be a cause for worry because it is likely to lead to increased health risks. Non-adherent students fail to attend regular checkups for blood glucose levels as well as other treatment procedures, which may make the school nurses feel weary of pushing the student harder to comply (Sullivan-Bolyai et al. 2014). Many studies have been conducted in the past that revealed the most affected age group likely to be affected by non-adherence situations for insulin-

dependent diabetics was adolescent school aged children (Foster et al., 2016).

Addressing the Problem with Current Evidence

Consequences of non-adherence. A study conducted by Borus & Laffel (2010) showed that, regardless of the presence of effective therapies, adolescents diagnosed with IDDM show poorer adherence to the treatment process when compared to the rest of pediatric age groups. Lack of adherence is highly associated with increased morbidity, suboptimal glycemic control, and premature mortality risks

The researchers Borus & Laffel (2010) state that IDDM, being the second common chronic disease affecting teenagers, requires increased attention. Their research further explained that premature mortality and morbidity related to diabetes is among the main sources of suffering, as well as medical expenditures. The ADA (2016) list medical complications from poorly managed IDDM include vision loss, kidney disease, heart disease, celiac disease, autoimmune disorders, neuropathy, and foot issues due to poor circulation. The complications of diabetes described by the ADA (2016) can start to develop early in an adolescent diabetic life. Although some of the complications may not be present until later on in life. During the time of the research, diabetes had affected an approximation of nine percent of the population of the United States and accounted for 174 billion dollars in annual costs (Borus & Laffel, 2010). Effective therapies include balancing of insulin dosing, exercise, and diet in conjunction with a regular report from the results of blood glucose monitoring.

Therefore, consistent adherence and implementation of such a demanding and complex treatment routine seemed to challenge even some of the highly motivated adolescents (Ersig et al., 2016). In addition, spontaneity and the sense of immortality accompanied by exceptionalism, which are features often seen in teens, is seen as counter to effective management of diabetes

(Siminerio et al., 2014). Increased compliance to the management of diabetes usually affects glycemic control favorably which then results in lower levels of hemoglobin and reduces the complications of diabetes (Gandhi et al., 2015).

Barriers to Adherence

There are many obstacles to adherence that most students in adolescent age group face which may include developmental behaviors, perceived social pressures, and unrest in family dynamics (Markowitz et al., 2015). These obstacles, combined with pubertal physiology, can compound the relative resistance of insulin (Foster et al., 2016). The problems affecting insulin-dependent adolescent students are extended into their schools where they do not feel the need to keep up with treatment. Therefore, it is crucial for them to regulate their blood during the school day.

Besides the complexity of the process of treatment plus the repeated disruptions to the teenagers' lives, there are further complications of adherence, which include disincentives of needle sticks that are painfully needed for monitoring blood glucose (Ersig et al., 2016). Moreover, the teens feel carrying or wearing insulin administration devices to be a nuisance. A study conducted by Kongkwaew et al. (2014) shows regardless of the development of technology that helps in easing the delivery of insulin using pumps and pens, adherence to the regimens of diabetes continue to become a problem for all diabetic students but most specifically adolescents. In the research by Kongkwaew et al. (2014) there was a systemic review and meta-analysis of 19 peer-reviewed observational studies. The studies comprised 2,935 adolescents that met the study criteria. The study results by Kongkwaew et al. (2014) showed that depression effected adherence to treatment in a negative manner and therefore, resulted in poor glycemic regulation. The study results by Kongkwaew et al. (2014), also conclude that concentrating on changing the

adolescent's behavior and social environment improved depressive symptoms and resulted in increased adherence to the diabetic plan of care and resulted in an improvement of glycemic control. This is important to the project in order to develop appropriate interventions in the school setting for IDDM adolescents suffering from depression and the condition interfering with treatment. Adolescence is the age group that most often refuses to comply with the school nurses and the other trained personnel within the institution (Rechenberg et al., 2017).

Similar research conducted by Borus & Laffel, (2010) elaborates that teenagers find it difficult to achieve and maintain target glycemic control due to several factors. Some of these factors include elevated concerns regarding social context and peers, developmental preference towards taking a risk, and the early shift in accountability for management as demanded by parents. In addition, teens may have incomplete knowledge of diabetes treatment regimens and potential health risks, or they may be fatigued from receiving care of such a chronic illness, known as 'diabetes burnout' (LeBow, 2016). At times, physiological changes likely to lead to higher insulin resistance at the stage of puberty may also result in ineffective glycemic control. There is a likelihood of progressive difficulty of adherence with the intensifying of regimens by providers to enhance glycemic control, anticipating better results with the inadvertent outcome of elevating burden while minimizing behaviors of health promotion (Tsiouli et al., 2014).

An American Diabetes Association study (2013) suggested that one of the main barriers to compliance for insulin-dependent diabetics in school is peer influence. The research showed that numerous non-adherent diabetic students believed that friends might bear negative responses towards their condition. However, an empirical study called Diabetes Control and Complications Trial (DCCT) found out that most friends usually encourage the students with diabetes to comply with treatment (Naranjo et al., 2014). Grabill et al. (2014), explain that there

is a correlation between poor adherence and social anxiety in boys rather than girls, which might indicate that boys could be more at risk for treatment non-compliance. In addition, the researchers discovered that teens in school are less adherent as compared to the young ones at home, possibly due to fitting in to social norms. The failure to comply happens regardless of their increased knowledge concerning IDDM when compared to the younger children. Another study conducted by Amutio-Kareaga (2017), employed momentary sampling in evaluating interpersonal relations, mood, and blood glucose in conjunction with baseline metabolic control measures and behaviors of self-care. The data revealed a connection between poor self-care and interpersonal conflict. These studies imply that context is likely to be a barrier for students in the teenage group, while the solutions to overcoming these barriers require personalization. For adolescents that want a sense of privacy, checking the levels of blood glucose in the presence of a school nurse may be quite disturbing and thus triggering non-adherence. Amutio-Kareaga (2017), reveals on the other hand, some teens may be required to check their levels of blood glucose on their own in the school nurse's office but feel isolated and different, which would be rather a disturbing situation leading to worsening of the condition.

O'Hara et al. (2013) reports that teenagers with IDDM encounter rates of depression of around 15%, which is almost double that of teens without the condition. Weissberg-Benchell (2016) showed evidence that an increased risk of depression is a significant observation since research showing that depressed moods can negatively influence metabolic control among adolescents with IDDM. The relationship between the depression symptoms and increased levels of blood glucose is enabled by diminished compliance to monitoring of blood glucose among IDDM teens. Moreover, the O'Hara et al. (2013) study also showed a link between daily

alterations in affect as well as perceived task competence of diabetes, while adults with diabetes seemed to have linkage of strong negative affect and stress with higher levels of blood glucose.

Impact of the School Nurse

Some school nurses are partially viewed by Johnson & Melton (2014) as contributors to non-adherence. These researchers state that, while non-adherent diabetic students may keep up this trend of failing to attend regular checkups, they might be able to improve with follow-ups by responsible school nurses. The school nurse is required to develop an individualized health plan (IHP), which considers special accommodations that students might require in school (Galemore &Sheetz, 2015). The IHP also helps the school nurse to develop a personalized healthcare plan for these students with diabetes, especially those diagnosed with IDDM, in collaboration with the primary care provider and family. In addition, the school nurse is usually the lead member of the team when a diabetic student enters school. The responsibilities of the school nurse are to assess the student's health requirements, perform a nursing assessment/appraisal, and develop a care plan (Galemore &Sheetz, 2015). Moreover, the school nurses are responsible for ensuring that all other relevant personnel are aware of the health needs of the students. The position statement of the National Association of School Nurses [NASN] (2016) describes the nurse's role and responsibilities in caring for students with IDDM, they include implementing individualized Diabetes Medical Management Plan (DMMP); developing both an individualized healthcare plan (IHP) in partnership with the student and student's family and an emergency care plan (ECP); established using the medical orders in the DMMP and the nursing judgement. As stated by the NASN the school nurse is the most qualified school personnel staff in the school to entirely meet the healthcare needs of students. The NASN statement continues in the position that the school nurse should be the lead organizer and care provider for students with diabetes. Also, the NASN

states the school nurse should be skilled case management, collaboration, communication, delivering direct care, training non-medical licensed staff and delegation of direct care to trained staff is required to foster the health, safety, and academic achievement of students who have diabetes within the school setting.

Liese et al. (2012) elaborates that since the nurse is the lead medical personnel at school, they should try to reach out to the non-compliant insulin-dependent students. However, some of the school nurses often give up after making several attempts without considering other methods of intervention to help these students improve their habits (Liese et al., 2012). Some of these situations have resulted in negative cases such as increased health risks for the non-adherent students (Erie et al., 2018). The research of Liese et al. (2012) stressed the importance of the nurse to be informed about the aspects of educational, medical, and social issues concerning students with IDDM. The school nurse should be capable of collecting information from reviews of both educational and medical records. Moreover, they should be able to obtain additional information from the students' home visits or parent interviews, healthcare provider/physician, teaching staff, student interviews, and classroom observations. The school nurse can then assess the data review, which should be conducted in the highest discretion (Cornish & Jones, 2010). It is essential for the school nurse to abide by the policies concerning the release of records, sharing of information, and confidentiality.

Prevention. Some of the positive results focused on emphasizing family members and the importance of nonjudgmental support during the daily tasks of monitoring blood glucose and administration of insulin (Gandhi et al., 2015). In addition, some mediations helped overcome barriers via the use of motivational interviews as well as problem-solving strategies (Brundisini et al., 2015).

The ADA (2018) have current recommendations for caring for adolescents with diabetes. Some of the recommendations include providing age appropriate education to students under the age of 18 on a regular basis as they grow with IDDM (ADA, 2018). The ADA (2018) also recommends school nurses to work closely with the diabetic student's family in order to identify needs of the family, family dynamics, and possible stressors that might inhibit adherence to diabetic treatment. The school nurse is recommended to communicate with the parent and the student to gain a perspective of the student's social well-being, including, relationships with their peers and how well they are adjusting in the school setting in the context of managing diabetes in school (ADA, 2018). In addition, the ADA also recommends students diagnosed with IDDM at age 12 and older should be allowed to spend individual time with the school nurse.

Current management. Section 504 of the 1973 Rehabilitation Act and IDEA expect schools to offer students accommodations if their health status is likely to affect their education. Diabetic students under this act, as well as the American with Disabilities Act, ought to be provided with ample accommodation within the school setting (Schmitt et al., 2014). According to the ADA (2018), the Section 504 was created to meet the needs of the diabetic student. The adaptations must ensure the student's medical needs are cared for, they are connected to the same instruction of teaching as other students, and they are not discriminated against due to their medical condition.

In addition, Section 504 accommodations require a predetermined number of staff members be trained in diabetic care and treatment. All school staff that are in contact with the diabetic student on a regular basis are trained to recognize symptoms on high and low blood sugar and what to do in these situations. Students that are competent to carry their diabetic supplies with them and provide their own diabetic care anywhere when needed should be

allowed. If necessary, the diabetic student will have their treatment supervised in the classroom for medical safety, and to reduce absences from class. The diabetic student should be allowed to participate in sports, field trips, and other school sponsored programs with diabetic care or guidance if needed. Student must be allowed to eat as needed, no matter where they are, and lunch should be given on time with plenty of time to complete the meal. Students diagnosed with IDDM are allotted frequent bathroom breaks, unlimited access to water, and should not be penalized for absences due to doctor appointments or illness. Also, the diabetic student should be allowed to makeup class instruction that is missed due to doctor appointments or being absent due to diabetes. These accommodations will assist in the successful management of their condition (ADA, 2018).

Current recommendations. School nurses are advised to be actively involved in looking for ways of enhancing compliance with diabetic students (Best et al., 2017). Understanding the reason for non-adherence from these students might be a stepping-stone to solving the problem. The school nurses need to use strategies for gaining student's trust so they may be able communicate their reasons for non-adherence. Children, especially adolescents, want to be treated like grown-ups; hence, they may want to be part of the decisions made by their parents and nurses. Failure to include these students in the plan of care may lead them to rebel (Pansier & Schulz, 2015). Therefore, the nurses should interview the diabetic students individually to discern and understand their problems in order to determine if they understand their condition. It is important to let them converse and listen to their concerns and worries if any. In addition, according to Pansier & Schulz, (2015) the school nurses should discuss with the student what perceived obstacles are getting in the way of the diabetic student's adherence to the diabetic plan of care. Pansier

& Schulz, (2015) identifies some level of non-adherence may be caused by anger or depression, and it is crucial that the nurses can identify the cause and make appropriate interventions toward treating the issue.

Benefits of Current Recommendations. The current recommendations are flexible and individualized to each student rather than generalizing issues. Moreover, these recommendations are subject to adjustments (Beck et al., 2015).

Issues still under investigation. The issue of non-adherence of students diagnosed with IDDM continues to be investigated to find out if there is more to the barriers as mentioned above (ADA, 2013). Other issues include:

Addressing non-compliance in diabetic adolescents.

Improving compliance at home through school interventions.

Reducing hypoglycemia at school.

Physical exercise in insulin dependent diabetics.

The school nurse's role in diabetes management.

Diabetes self-management in the school environment.

Insulin pumps vs self-injection vs oral medication management in school-the nurses' role/the student role/national standards-current practice-best evidence.

Issues not yet addressed. Issues such as directly addressing the barriers causing non-adherence have not been addressed adequately. For instance, if specific teens are affected by the social context in school, how the school nurse and management should approach the situation by handling the other students (Amutio-Kareaga et al., 2017).

Conceptual Model

The project will utilize the Donabedian (1988) model (see Appendix A) a systems methodology used for quality improvement (QI) initiatives (Moran, Burson, & Conrad, 2017).

Historical Development

The Donabedian Theory (1988) is a systems methodology conceptual framework that centers on structure, process, and outcome (Moran, et al., 2017). The Donabedian model was developed by Avedis Donabedian (1919-2000); he is noticed for research in the area of quality assessment of public well-being and service (University of Michigan, n.d.). Foreign born in Beirut, Lebanon on January 7, 1919. Avedis Donabedian earned his medical doctorate (MD) then started his career as a physician and educator in Beirut, Lebanon before resettling in the United States in 1953. He continued his education and received a master's degree in public health [M.P.H.] (University of Michigan, n.d.). After graduating with his M.P.H., he began working in his field of expertise, which is research in medical care evaluation (University of Michigan, n.d.).

Avedis Donabedian started the quality improvement movement in health care dating back to 1963. He believed he had a unique point of view on health care delivery and quality of care in the United States (US), being he was foreign-born (Ayanian & Markel, 2016). He was among healthcare leaders included in a newly formed government agency created after Medicare and Medicaid were started in the US in 1965. The leaders discussed social, economic, structure and quality of community health services. Donabedian was given the task to review research on quality assessment in healthcare (Ayanian & Markel, 2016). The results of his review were published in 1966. His contribution to quality assurance in healthcare is still referenced today.

The Donabedian model is a systems quality improvement theoretical framework. The ideals include healthcare care professionals questioning what is occurring in the healthcare delivery system and how can healthcare delivery be improved. The intent of the framework is to assist in the delivery of best-practice and high-quality healthcare to consumers.

In 1988 Donabedian introduced using the Donabedian theory, a three-component model consisting of, structure, process, and outcome, used to appraise the quality of healthcare (Moran, et al., 2017). Ayanian & Markel (2016) described the purpose of the theory was to find a systems approach to implement in order to provide patients with high quality and continuity of care. Donabedian defined "structure" as the environments, competence of providers, and organizational systems within the area where healthcare is delivered; "process" as the elements of healthcare that is delivered; and "outcome" as healing, rehabilitation of health status, and survival (Ayanian & Markel, 2016). The concepts outlined in the Donabedian theory remain to be the foundation of quality appraisal currently.

Donabedian model is important to the nursing profession as a systems methodology for leaders in the healthcare industry to provide high-quality best-practice care. The Donabedian model views the importance of looking at the population that is served and manifest a clear standard of measurement to evaluate if outcomes are met. There is a need for precise dimensions of structure and process in healthcare that correlates with outcomes and reliable measures of quality that can be replicated in practice. The Donabedian model takes a systems approach to evaluate the quality of care. The system is assessed, and suitable implementations are incorporated in order to prevent error, promote rehabilitation, promote coordination and continuity of care, build a relationship between patient and care provider, promote cultural competence, implementation of care that is economically practical and ethical. The current

practice of value-based payments and patient-centered outcomes can be associated with Donabedian's model.

The Major Tenets of the Theory

The Donabedian Theory (1988) focuses on quality improvement in three categories:

Structure. Identifies the healthcare environment the QI initiative will be completed in. It includes the resources available to deliver adequate healthcare services; these resources include buildings, equipment, and trained staff (Sollecito & Johnson, 2011).

Process. Gives details of what QI initiative will be completed and how it will be implemented within the care environment. This is the actions of the practitioners providing care and the patient getting care (Sollecito & Johnson, 2011).

Outcome. Describes what components of the QI initiative that will be measured, examined, and evaluated. Outcomes include improved health of your target population (Moran, et al., 2017). Additional outcomes include patient education and satisfaction with service (Sollecito & Johnson, 2011).

Applicability of Theory to Current Practice

Ayanian & Markel, (2016) asserts the Donabedian model is important to the nursing profession as a systems methodology for leaders in the healthcare industry to provide high-quality best-practice care. The Donabedian theory views the importance of looking at the population that is served and develop a clear standard of measurement to gauge if outcomes are met. There is a need for accurate dimensions of structure and process in healthcare that correlates with outcomes and reliable measures of quality that can be replicated in practice.

In current practice, Donabedian model is still useful in assessing the systems approach in quality of healthcare delivery. Donabedian's model can be applied to any healthcare delivery

system. Study findings conducted by Moore, Lavoie, Bourgeois, & Lapointe, (2015) utilized the Donabedian model in the trauma unit to assess the quality of care and patient outcomes. The study results findings conclude improving the structure of health care delivery systems and improving the process of care improved patient outcomes. Another study conducted by Gardner, Gardner, & O'Connell, (2013) applied Donabedian's model in assessing the quality of healthcare delivery with the utilization of nurse practitioners delivering healthcare as opposed to physicians and if the patient quality of care was affected. Donabedian's model of structure, process and outcome was applied in evaluating nurse practitioner services. The results of the study showed that with appropriate structure and process was necessary for incorporating nurse practitioners within a healthcare environment and also patient quality of care was maintained in the utilization of nurse practitioners within a healthcare delivery system.

Donabedian theory can be applied to healthcare education. Botma & Labuschagne (2017), study used the Donabedian theory to develop a theory-based education program for the future healthcare professional in a health sciences department. The goal of the program was to assure that best-practice standards from the literature were used to develop the healthcare education program. Donabedian's three-step approach to structure, process, and outcome showed to be an effective theory in the development of the healthcare program. Application of the theory was also necessary for assuring the program maintained a quality standard. This evaluation of the program is conducted by looking at the entire system, how it is delivered to the student and if outcomes are met.

Application of Theory to DNP Project

The Donabedian model is a systems methodology that will assist the project lead in the implementation of this project. A description of how the Donabedian model will be utilized in relation to the DNP project is described below.

Structure. The environment, or practice site the QI initiative will take place is a middle school and high school. The available resources include registered nurses, licensed in the state of Texas and obtained the training and experience of working with students with IDDM in the school setting. Nurse resources would also encompass the school nurses' communication and collaboration skills, which are needed to effectively communicate with the student, parents, and other health care professionals. Other resources within the school environment include the nursing clinic, student's diabetic supplies, physician orders, IHP, Section 504 Plan, administrators, teachers, counselors, support staff, and diabetic student's social circle. Resources outside of the school system that influences healthcare delivery includes the student's endocrinologist, other healthcare professionals as needed, and the diabetic student's parents and other family support.

Process. Develop and implement NCP-NCD protocol within four months for non-compliant adolescents diagnosed with IDDM for school nurses to utilize in the junior high and high school sites. This will include providing school nurse staff education on the NDP-NCD protocol and a systematic guide to refer to when the protocol is needed. This project will also employ competencies for the nurses along with monitoring for compliance through chart audits.

Outcome. The items will be measured include school nurse knowledge and skills in diabetic care and implementation of the NCP-NCD, school nurse adherence to the protocol, reducing hypoglycemic episodes, and improving student absenteeism rates within a three-month

timeframe. Appropriate statistical testing will be utilized to provide the scientific underpinning for this project.

Project Design

The DNP project will utilize a quality improvement design. The Donabedian's structure, process, outcome (SPO) model will guide this quality improvement project design. The purpose of the project is to improve student adherence to the diabetic plan of care, reduce hypoglycemic medical emergencies, and reduce absenteeism through strategies and interventions outlined in the NCP-NCD protocol. The mission of the project is to develop an NCP-NCD protocol for implementation into the middle school and high school at the practice site. When an adolescent is non-adherent to their diabetic plan of care, they put themselves at risk of a major health crisis at school. The student is also inhibiting their ability to remain in the classroom safely to effectively receive and participate in learning (Cox & Hunt, 2015).

The population of interest will be discussed; these are the participants who will implement this project. Data will be collected utilizing specific tools created by the project lead to measure if the project has met the objectives. The data collected will be analyzed utilizing appropriate statistical tests. A statistician provided by Touro University Nevada will review this proposal to ensure the statistical testing conducted is appropriate for the measurement of the project outcomes.

Population of Interest

The population of interest includes school nurses who are employed at the middle school and high school caring for non-adherent adolescents with IDDM at the practice site. During the school day, they are responsible for the care of adolescents who are diagnosed with IDDM who are between the ages of 11 to 19 years old and grade levels six through 12. There is a total of 56

school nurses employed at the practice site. The nurse's ages range from 28 years old to 63 years old. All the nurses employed at the practice site are registered nurses (RN) with at minimum an Associate of Applied Science in Nursing (ADN) degree and the highest level of education is a Master of Science in Nursing (MSN) degree. The nurses that will be included in this project are middle school nurses and high school nurses from various campuses at the practice site who are caring for non-adherent diabetic adolescents during the timeframe of the project implementation. The middle school and high school nurses not caring for a non-adherent adolescent with IDDM and the elementary school nurses will be excluded from the project.

Setting

This project will take place at a suburban middle school and high school in Texas. The location of the practice site is in a highly transient community since it is located near the largest Army base in the United States (US). These schools serve a large population of students who are military dependents. Most of the population has some form of military affiliation either past or present. More than 44,000 students receive education through the school district yearly (Killeen Independent School District [KISD], 2018). There is a total of 12 middle school campuses in the district and nine high school campuses in the district (KISD, 2018). The number of high school and middle school students combined are over 20.000. The ethnic backgrounds of the students that attend is diverse and are represented by students from all over the US and the world.

Stakeholders

Permission to implement the NCP-NCD protocol was obtained from the Coordinator of Health Services (Appendix B). Studies show support and collaboration of stakeholders is important in the implementation of the protocol and improve clinical outcomes (Larson et al., 2018). Stakeholders for the project identified by the project leader were selected due to their

interest in the health, safety, and education of adolescent insulin-dependent diabetic in the school setting. The stakeholders identified for this practice change project includes the Coordinator of Health Services, school nurses at the middle schools and high schools at the practice site, campus administrators at each middle school and high school, adolescent IDDM students enrolled in the middle schools and high schools, teachers of the diabetic student on campus, and parents of the adolescent with IDDM. The stakeholders identified will be impacted by the protocol throughout the project period. With the support of the Coordinator of Health Services, the project lead and school nurses at the middle school and high school will be mandated to implement the NCP-NCD protocol when caring for a non-adherent insulin dependent diabetic.

The parents of the student diagnosed with IDDM will also be empowered to address issues in a proactive manner. The school counselor is important if there is a need for referral to services such as mental health or financial assistance. The student's teacher is a major part of the equation since they see the student the most on a daily basis. There will be a need to build a professional relationship and effective line of communication with all stakeholders. This is necessary for the diabetic students to feel safe and comfortable in getting the appropriate care during the school day without feeling different or isolated from their peers.

Recruitment Methods

The Coordinator of Health Services at the practice site has a clear mandate for middle school and high school nurses to utilize the protocol when appropriate. This project is going to impact nursing practice on a systems level within the school district. Therefore, school nurses employed in the middle and high schools who are caring for non-adherent adolescents diagnosed with IDDM are mandated to participate in this project. The nurses will be required to implement the NCP-NCD as part of their job requirement and the use of the protocol will be reflected in

their yearly evaluations of job performance. A nurse staff meeting will be announced through email, messaging middle school and high school nurses regarding the introduction of the project and education in the NCP-NCD protocol. There will be no monetary incentives provided for the participation in the project.

Student charts will be audited for nurse compliance with the protocol as well as adherence to the plan of care. Only the charts of students diagnosed with IDDM and identified as non-adherent will be monitored. All other student charts will be excluded. The diabetic logs will be monitored for specific student information only. The attendance logs will also be retrospectively audited to collect attendance data for the students who are non-adherent to their plan of care.

Tools/Instrumentation

NCP-NCD Protocol

An NCP-NCD will be developed and used as a tool for the middle school and high school nurses to utilize in caring for the non-adherent insulin-dependent adolescents at the practice site (See Appendix C). The NCP-NCD protocol will be introduced to the school nurses at the same school nurse meeting as the educational session and evidence will be presented as to why the NCP-NCD protocol can be an effective tool to utilize. The NCP-NCD protocol will be provided to the nurses as a handout to use as a reference. The tool will be useful in guiding the care for the insulin-dependent diabetic student by helping build the nurse and student healthcare relationship. The NCP-NCD protocol will help the nurse direct the student in taking control of their health needs in a positive manner to improve health outcomes.

Educational Materials

The 12 middle school and high school nurses will be educated on the protocol by the project leader. The education tool will consist of a PowerPoint presentation displaying evidence from the literature, statistics, and evidence obtained from the practice site (Appendix D). The middle school and high school nurses will then educate the identified stakeholders on their individual campuses.

Pre and Post Intervention Test

In order to measure the outcomes of this DNP project, there will be a test developed and included in the project implementation (Appendix E). The test that will be developed will have ten questions to test nursing knowledge and ten questions to test nursing skills. To develop a quality test that promotes learning and meets the objectives of the project a content validity index (CVI) will be used to provide evidence that the contents of the test are valid. The CVI rating table and final calculations will validate the relevance of the test questions (See Appendix E). A CVI of .78 or higher from three or more experts would be considered valid (Polit & Beck, 2006).

Audit Tool

An auditing tool (Appendix F) to track incidences of hypoglycemia, attendance data, and the nurses' compliance with the protocol will be created and given to the nurses during the educational session. The diabetic logs and student incident reports related to hypoglycemic emergencies will be audited to obtain data the month before the implementation of the NCP-NCD protocol and again the month after the implementation of the protocol to assess if there is a reduction of hypoglycemic medical emergencies. This information will be obtained from the medical records on the campuses of the practice site. The attendance data will also be audited a month before the implementation of the NCP-NCD and again the month after protocol

implementation using the same tool by reviewing the practice sites computerized attendance data maintained for the current school year.

Data Collection Procedures

The test will be administered to the school nurses before the educational intervention to obtain a baseline from the nurses to measure the knowledge and skills of the participants caring for a non-adherent IDDM student. The same test will be used and administered two weeks post educational intervention. It is given to obtain subjective data to measure knowledge and skills from the same participants.

Retrospective audit of diabetic glucose logs will be conducted pre and post intervention to collect the results of the students' blood glucose readings, student communication and teaching, parent communication, and any other necessary communication with other stakeholders. This audit will also monitor the nurses for their adherence to the protocol. The attendance log and incident reports will also be retrospectively audited to collect data pre and post implementation.

Privacy and confidentiality will be maintained by excluding personal identifiable information from the data collection process. The project lead will assign numbers randomly to any data collected from the records during the chart audit. The data collected will be stored in a password-protected laptop. Also, the numbers correlating with the participant's name will be stored in a password-protected laptop that only the project lead has access to. The laptop will be stored in a locked home office of the project lead. The nurse participant's pre and post data will be protected by identifiable information being excluded from the testing. The testing results will only be identified by number and any data collected will be destroyed as determined by the school district standards.

The charts of all the non-adherent IDDM students in the middle school and high school who receive care in the clinic will be reviewed by the project lead a month before the implementation of the NCP-NCD protocol. A month after the implementation of the protocol the project lead will review the data of the IDDM students who the NCP-NCD protocol was utilized due to non-adherence. The data that will be collected to determine if outcomes were met include pre and post attendance data, pre and post data on hypoglycemic episodes, and pre and post data on protocol compliance. In addition, the data collected from the pre and post-intervention test will be kept in a locked area where only the project lead will have access.

Intervention/Project Timeline

The time taken to prepare the project proposal will take approximately eight months to prepare all sections of the project proposal. The project proposal will then be submitted for approval. The approval process is completed no later than October 26, 2018. By November 8, 2018, the project will be implemented. Recruitment of participant nurses in the middle school and high school will be contacted by the project lead by email. A description of non-adherent diabetics will be included in the email. The school nurse will be asked if they are currently caring for any non-adherent adolescents with IDDM, a time and date for educational session and introduction to the protocol will be emailed during the same time. Those nurses who are caring for non-adherent adolescent IDDM students on their campus have been mandated to participate in the project.

Week/Date	Activity
Week 1 November 8, 2018	Get the protocol approved by the practice site. Contacting participants via email regarding participation in the project. Inform participants of time and date of educational session. Complete pre-implementation data collection.

Week 2 November 13, 2018	Preparation for education session. Visit the room, check AV equipment to ensure in working order, organize and print approved handouts and presentation. Implement project: complete educational session and give participants a copy of the protocol and presentation for reference.
Week 3 November 20, 2018	School Holiday
Week 4 November 27, 2018	Monitor sites and provide support for the participants. Administer educational post-test through email.
Week 5 December 4, 2018	Monitor sites and provide support for the participants.
Week 6 December 11, 2018	Monitor sites and provide support for the participants.
Week 7 December 18, 2018	Project end: collect post-implementation data of attendance, hypoglycemic episodes, and documentation school nurse documentation.
Week 8 December 25, 2018	School Holiday. Analyze data
Week 9 January 1, 2019	School Holiday. Analyze data
Week 10 January 8, 2019	Analyze data and begin completing the project proposal.
Week 11 January 15, 2019	Continue to work on proposal. Begin preparing for dissemination.
Week 12 January 22, 2019	Continue to work on proposal. Continue preparing for dissemination. Arrange meeting room and equipment for stakeholders meeting.
Week 13 January 29, 2019	Meet with stakeholders to disseminate the project results and discuss plans for sustainability. Prepare for dissemination to course instructors and student colleagues
Week 14 February 5, 2019	Disseminate project results to course instructors and student colleagues
Week 15 & 16 February 12, 2019 & February 19, 2019	Begin planning to disseminate at professional conference.

Ethics and Human Subjects Protection

Ethical considerations include, the project lead completing and passing the Collaborative Institutional Training Initiative (CITI) program. Institutional Review Board (IRB) determination forms will be submitted per TUN policy. It is expected that this project will fall under the category of TUN Quality Improvement, which would not require IRB review. There is no IRB at the project site. All data collected will be absent of personal identifying information. Identifying information from any of the participants in the project will be kept separately from the forms on which they record their responses to the tests. Records will be linked to individuals only through a unique identifier and the information used to link records with identifying information will be kept on a password protected laptop that will be stored in a locked office that is only accessible to the project lead. Overall, potential physical, psychological, and social risks associated with participation in the project are unlikely and of no to low risk.

There may be a perceived risk among school nurses that participation in the project may impact their employment status in a negative way. That perceived risk can be managed and channeled in a positive way through careful attention and training during the implementation phase. The school nurses would be taught to see the benefits of the tool to facilitate best-practice. Utilizing the protocol will reflect in their performance and will promote a positive annual evaluation. The benefits of participation include a guide to safe patient care. There is no monetary compensation for the participants of this project. The incentive is a positive mention that they participated in an evidence-based change in practice.

Plan for Analysis/Evaluation

The data collected will be analyzed using the Statistical Package for the Social Sciences (SPSS) software. The data will be analyzed using the SPSS descriptive statistical analysis to

create frequency and percent tables for both the pre-test and post-test data, pre and post-intervention data for attendance, and pre and post-hypoglycemic episodes. Also, post-intervention of school nurse adherence to the protocol measured through auditing the student's diabetic log for nurse documentation. The statistical test that will be utilized for the pre-test and post-test data will be the paired t-test. The statistical pairing test will be used to analyze the pre and post nursing test participant's responses to compare the same participant before and after. The statistical test that will be used to compare pre and post-implementation data of hypoglycemic episodes and absenteeism is the Wilcoxon test. This test is an appropriate statistical test to ascertain nonrandom correlations between two variables with small sample size and the number of episodes of hypoglycemia and absences can take more than two or three possible values (Weisstein, 2019). The statistical analysis that will be used to measure school nurse adherence to the protocol is the Exact binomial test that will report the percentage of adherence with a 95% confidence interval.

Significance/Implications for Nursing

The NCP-NCD protocol is proposed to address the concerns of safety, attendance, and compliance with the diabetic plan of care among the population of adolescents diagnosed with IDDM in the public-school setting. As the IDDM adolescent age group continue to grow into adulthood, maintaining adherence, and autonomy in diabetic self-care is essential in maintaining health, prevention of diabetic complications, and a long-term reduction in mortality. The NCP-NCD protocol is designed as a tool for school nurses to utilize to promote positive health outcomes of the IDDM adolescent population. The interventions used in the care of a non-adherent IDDM adolescent could leave a lasting impression on the student through adulthood in the management of the life-long condition of IDDM. Building healthy communities is an

important role of the nursing profession and having tools supported by current best-practice evidence is essential in promoting community health.

Evaluation

The data collected were analyzed using the IBM SPSS Statistics 24. The project lead worked with a statistician to analyze the raw data from the project (Appendix G). Full data set using the selected statistical test showing how results were obtained described (Appendix H). The statistician recommended the Wilcoxon test to analyze hypoglycemic episodes and absenteeism test due to the Fisher's exact test not being an appropriate test to interpret the pre and post-data collected due to there were numerously reported values of hypoglycemic episodes, and absenteeism collected. The data were analyzed using the SPSS descriptive statistical analysis to create graphs showing pre and post-implementation data of hypoglycemic episodes and absenteeism. The results of hypoglycemic episodes and absenteeism were reported in separate figures for comparison of pre and post implementation of the protocol. The test scores before and after training were compared using a paired t-test. Nurse adherence to the protocol was reported using the % of adherence with 95% confidence intervals.

Analysis of Results

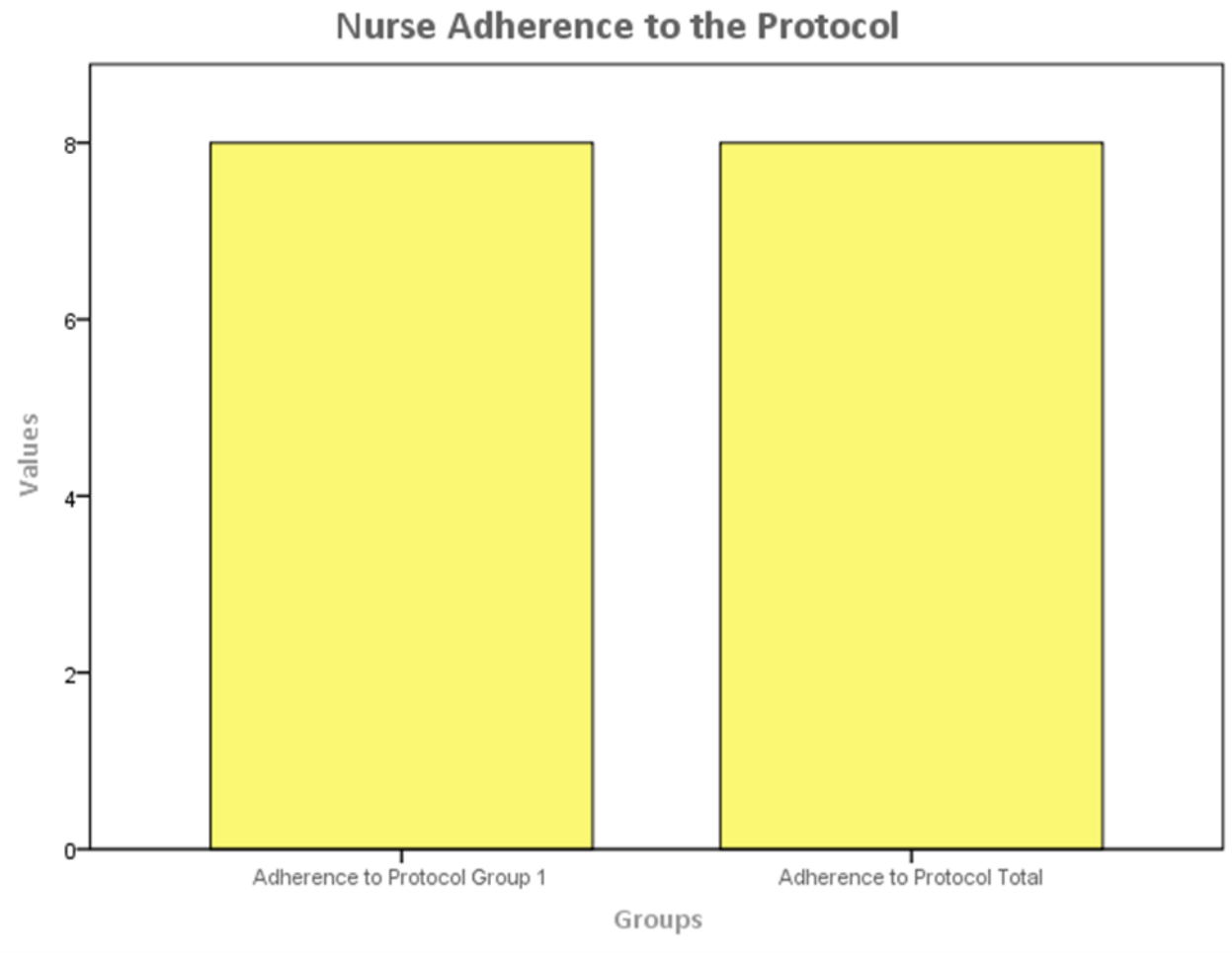
There were eight project participants in total caring for at least one non-adherent diabetic during the school day in the middle school or high school. One of the nurses in the project cared for two non-adherent diabetics, another nurse cared for three non-adherent diabetics, and the remaining six project participants cared for one non-adherent diabetic during the project. There was a total of 11 non-adherent diabetic students receiving care from the project participants. Four nurses scored an 81 on the pre-test and a 100 on the post-test. Two nurses scored a 93 on the pre-test and a 100 on the post-test. One nurse scored a 75 on the pre-test and a 93 on the

post-test. Lastly, there was one nurse that scored an 81 on the pre-test and also an 81 on the post-test. The test scores before and after training were compared (Figure 1);

Figure 1. Exam scores before and after training.

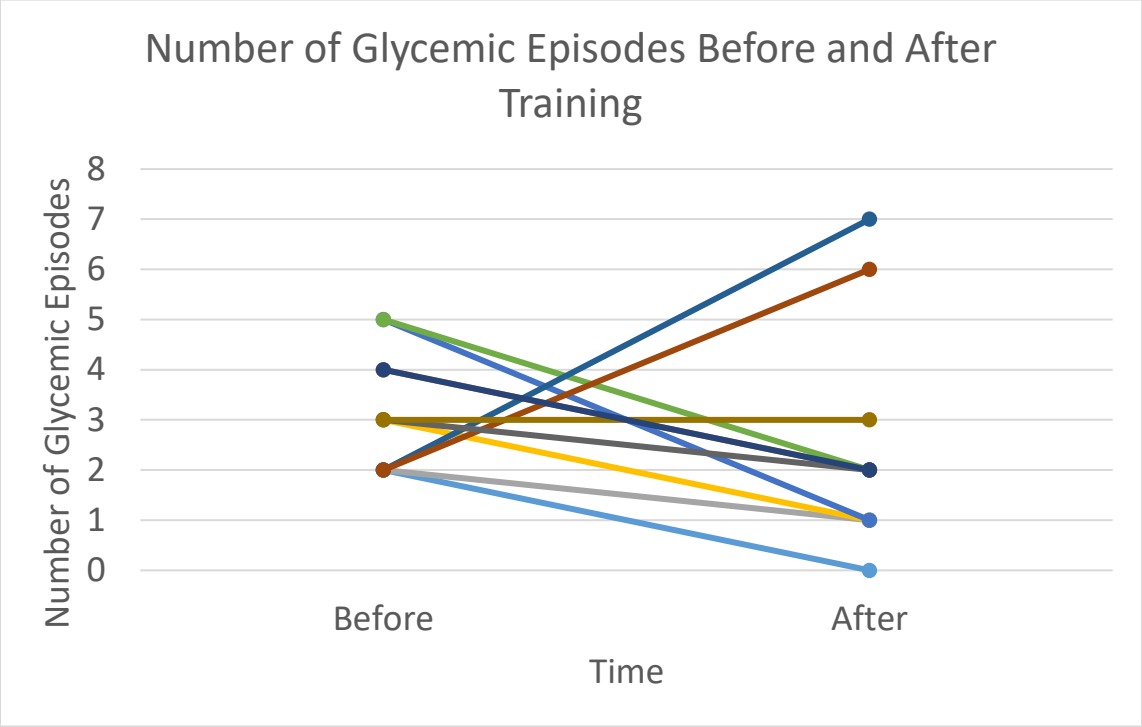
The descriptive analysis for the goal to educate the school nurses in the NCP-NCD indicated project participants improved test scores an average of 13.5% (95% confidence interval: 7.1% to 19.9%) following the training, and this difference was statistically significant (t=5.0, df=7, p=0.0016) as calculated using the paired t-test. The Exact binomial test was used to obtain the result of nurse adherence to the protocol. After training, eight out of eight project participants (100%, 95% confidence interval: 63.1% to 100%) adhered to the protocol.

Figure 2. Nurse Adherence to the Protocol.



The Wilcoxon test was used to analyze hypoglycemic episodes. The descriptive analysis for the goal to reduce hypoglycemic medical emergencies within the school system within a one-month timeframe indicated nine out of 11 students had fewer hypoglycemic episodes after the implementation of the protocol compared to before implementation (Figure 3).

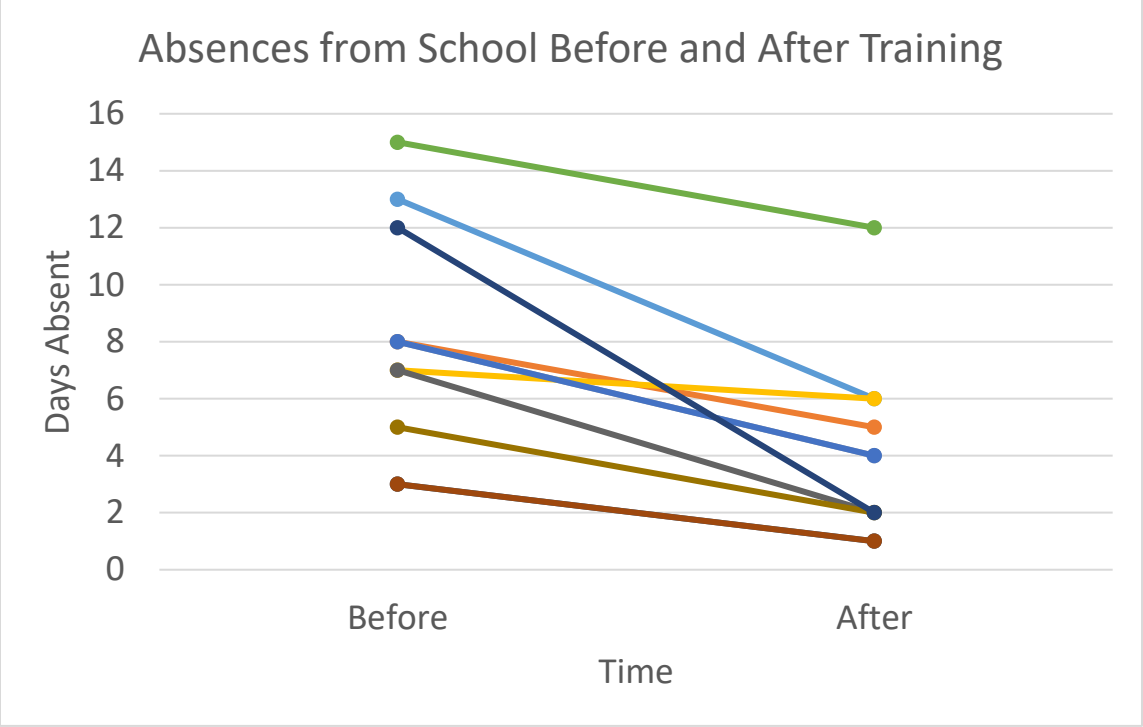
Figure 3. Number of glycemic episodes before and after training. Each line represents one student.



Median (IQR) for before: 3 (2), after: 2 (1.5), the difference was not statistically significant (W=85.5, p=0.098). Although nine out of 11 students had less hypoglycemic episodes after implementation than before implementation of the protocol the reduction in hypoglycemic episodes was statistically improbable that the implementation of the protocol had any effect on reducing the number of hypoglycemic episodes.

Finally, The Wilcoxon test was used to analyze absenteeism. The descriptive analysis for the goal to improve absenteeism of the student diagnosed with IDDM within a one-month timeframe indicated there was a statistically significant (W=100, p=0.010) drop in absenteeism after the implementation of the protocol compared to before protocol implementation (Figure 4);

Figure 4 Number of absences from school before and after training. Each line represents one student.



Median (IQR) for before: 8 (4), after: 4 (3.5). Every student had fewer days absent from school after the protocol implementation.

Discussion

The NCP-NCD protocol is proposed to address the concerns of safety, attendance, and compliance with the diabetic plan of care among the population of adolescents diagnosed with IDDM in the public-school setting. The school nurse must collaborate with the healthcare team including the student and his or her parents to promote health and prevent undesirable IDDM related outcomes. The healthcare team continues to be an essential component of the adolescent's healthy growth and development (Kise, Hopkins, & Burke, 2017). The evaluation of the NCP-NCD protocol was designed to determine the effectiveness of this intervention to improve adolescent IDDM health outcomes by reducing hypoglycemic episodes and decreasing absenteeism from school. The measurement of hypoglycemic episodes, absenteeism, nursing

knowledge, and skills, and nurse adherence to the protocol was imperative as these four components were significant in evaluating the effectiveness of the NCP-NCD protocol. The results of this project showed the NCP-NCD protocol had no improvement in specific areas of concern but did show improvement in other areas of concern.

The results demonstrated that seven of the eight project participants had improved test scores demonstrating improved knowledge, skills and attitudes after implementation of the NCP-NCD protocol. Also, the results showed 100% of project participants adhered to the protocol as designed, which also supported the findings of increased knowledge and skills in the use of the protocol. The results of this project revealed improvement in attendance after the implementation of the protocol, which indicates the protocol was effective. On the contrary, the results indicated the NCP-NCD protocol statistically did not improve hypoglycemic episodes. Although the number of hypoglycemic episodes decreased among all of the 11 students it was not a statistically significant decrease.

As the results of the analysis suggested, the project goal to decrease hypoglycemic episodes was not met, there are several possible reasons. The measurement of hypoglycemic episodes was limited to a month, which is a short timeframe. Post-implementation data may need to be collected for a longer timeframe. Future implementations of the NCP-NCD protocol should observe adolescent student hypoglycemic episodes during the previous three months to allow an extended timeframe to measure outcomes. Also, the majority of the hypoglycemic episodes occurred upon arrival to school, which is an indication that continuous student and parent teaching and support is necessary for effective diabetes care outside of the school environment (American Diabetes Association, 2016).

Significance

The experience of the eight middle school and high school nurses that participated during the implementation of the NCP-NCD protocol was perceived to be positive. During the educational session, nurses were receptive to the information. They were all engaged in the learning activity and asked questions that were answered by the project lead. The recently employed nurses working for the school district voiced the protocol would be useful in guiding them with establishing a therapeutic relationship with the student with IDDM and their parent. The potential impact of the NCP-NCD protocol at the practice site is allowing the nurses to learn the knowledge, skill and attitudes necessary to provide care and address the needs for the non-adherent adolescent diabetic (Leftwich, 2013).

Implications for Nursing

Therapeutic communication between nurse, student, and parent is essential in caring for the adolescent diagnosed with IDDM (Powell, Corathers, Raymond, & Streisand, 2015). Also, building a collaborative relationship that supports self-management and empowerment of the student and parent in maintaining responsibility of appropriate care of the adolescent's diabetic needs (Husted, Weis, Teilmann, & Castensøe-Seidenfaden, 2018). It is vital for the school nurse to build a rapport with the parent and student to assist in assessing the necessities of the family and referring them to the appropriate resources. Identifying the reasons for non-compliance and referring the family to the proper resources is essential in patient-centered holistic care which will increase compliance and it improves patient health outcomes. The project is significant to the nursing profession by providing a protocol to guide the school nurse in implementing safe, effective, and best-practice nursing care (NASN, 2016).

Implementation of the protocol improved outcomes for the non-adherent adolescent with IDDM. The protocol has changed school nursing practice by providing a systematic guide for school nurses to provide care to the non-adherent adolescent with IDDM. This protocol can be implemented in all middle and high school settings; the results are predicted to be positive as well. DNP prepared nurses can take the lead in positively impacting nursing outcomes by using evidence-based best practice to improve outcomes in the adolescent population diagnosed with IDDM.

Limitations

The limitations of the project include a restricted number of participants. There were eight project participants, and they cared for eleven adolescents diagnosed with IDDM. The participant size was limited because it only included school nurses in the middle school and high school who currently care for non-adherent diabetics. In the future to increase the number of participants all middle and high school nurses will be trained and instructed to monitor adolescents with diabetes under their care for compliance. If an issue of compliance does arise, the project participants will be instructed to implement the NCP-NCD. Another limitation to discuss is the project was constrained to one school district. It would be necessary to expand the project to other school districts to evaluate if outcomes are equivalent (Agency for Healthcare Research and Quality [AHRQ], 2015).

The purpose of the project was to increase nurses KSA in the care of the non-adherent diabetic adolescent, reduce hypoglycemic episodes, and improve attendance; there were limitations in the project outcomes. Three of the non-adherent adolescents had an issue with hyperglycemia instead of hypoglycemia. The protocol did not address hyperglycemia because it is not considered an immediate life-threatening emergency at the practice site. Although

hypoglycemia is an immediate emergency in the school setting hyperglycemia can cause immediate symptoms such as decreased concentration, mood lability that would affect behavior and the education experience (Gonder-Frederick et al., 2009). Long periods of hyperglycemia can cause disability and mortality (Baynest, 2015). Diabetic ketoacidosis can develop in less than 24 hours and can cause the student to go into a diabetic coma or cause death (American Diabetes Association, 2015). Hyperglycemia in the school setting is an issue because if the adolescent's blood glucose is poorly managed at home, the school outcomes can be irreversible. Therefore, a limitation of the study design is that it focused only on hypoglycemia and not on hyperglycemia.

This project was implemented during the timeframe of the Touro University DNP program. However, this timeframe was too short to obtain robust data to prove that a protocol for nonadherent adolescents diagnosed with IDDM would be effective. It is necessary to extend implementation to see if outcomes are equivalent or will there be an improvement in hypoglycemic episodes. Outcomes after further implementation of the project will be evaluated in three months before the end of the current school year. The extended timeframe is necessary to evaluate the project outcomes after a more extended period of implementation (Parry et al., 2018).

The limitations as it relates to project design, data recruitment, collection method, and data analysis was the data did not include in qualitative data in its design. In the future of the project, I would like to collect qualitative data to report the nurses, student, and parent feelings and experience in implementation of the protocol. When qualitative methods are used in congruence with quantitative methods, the project lead can interpret and gain a greater awareness

of the multifaceted reality of diabetic care management and the implications of quantitative data (Pearson, Robertson-Malt, & Rittenmeyer, 2011).

Dissemination

The results of this project will be reported to the stakeholders for plans for further dissemination. There are plans to present the project at the Annual School Nurse Conference in the summer of 2020. The project lead will be a podium speaker at the conference. At this conference, the tool will be distributed to other school districts throughout Texas that attend the statewide nurse meeting. Also, the project will be disseminated to the TUN instructors and student colleagues as well as submitted to the DNP project repository. Publication of the project will be considered in the future.

Project Sustainability

It would be necessary for the project lead to collaborate with other nurse leaders throughout Texas school districts who implement the protocol. One nurse leader in every school district would be assigned to implement the protocol and collect pre and post data to submit to the project lead for scientific analysis. It would also be necessary for the same nurse leader in individual school districts to monitor sites for compliance of the protocol.

The results will be presented to individual districts Coordinators of Health Services stakeholders. Frequent communication and updating the stakeholders in the status of the project will help the project's success (Silver et al., 2016). If the protocol improves outcomes after the additional three months of implementation, it is projected that the protocol will be evaluated for adoption into the Nursing Handbook at the practice site. Plans for the approval of the protocol to be utilized permanently within other districts throughout Texas will be discussed after project implementation and evaluation.

Conclusion

In conclusion, this project was designed using current best-practice standards as described in the literature. The project lead analyzed the needs of the project site and deducted evidence from the literature to create an NCP-NCD. A systematic method was used to implement the protocol from a systems approach to create a practice change initiative that would be sustainable and also could be revised over time to meet the need of the target group adequately. Statistical evidence showed the project had many successes and plans are in place for continued success. With the continued support of the stakeholders, the QI initiative has the potential to expand across many school districts in Texas.

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Appendix A: The Donabedian Model

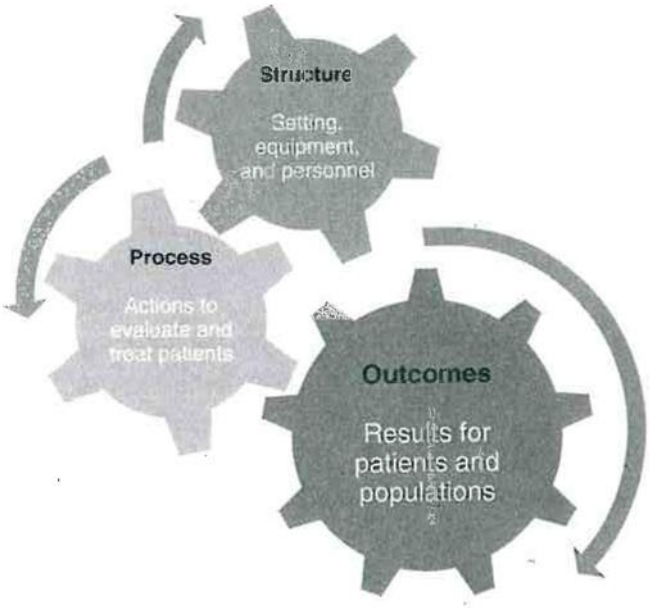

Figure 1. The Donabedian Theory. Reprinted from "*The doctor of nursing practice scholarly project: A framework for success* (2nd ed.)," by K., Moran, R., Burson, & D., Conrad, 2017.

Appendix B: Permission to Implement the NCP-NCD Protocol

Re: Concerning Rachel Smith, RN

Inbox x

Jessica Grimm **<Jessica.Grimm@tun.touro.edu>** Mar 19

to Vhonda, me

Thank you!

Dr. Jessica Grimm DNP, APRN, ACNP-BC, CNE

-------- Original message --------
From: "Gilmore, Vhonda" <Vhonda.Gilmore@killeenisd.org>
Date: 3/19/18 8:35 AM (GMT-07:00)
To: Jessica Grimm <Jessica.Grimm@tun.touro.edu>
Subject: Concerning Rachel Smith, RN

Ms. Grimm,
I am emailing you to make you aware that Rachel Smith, RN has my permission to work on a Quality Improvement Initiative at Killeen ISD.

Thank you,
Vhonda

Vhonda Gilmore, BSN, RN
Coordinator Health Services
Killeen ISD
254-336-1684
254-336-1685 (Fax)

Appendix C: Nurse Care Protocol for Non-Compliant Diabetics (NCP-NCD)

The purpose of this protocol is to increase adolescents with insulin-dependent diabetes mellitus (IDDM) adherence to their diabetic plan of care during the school day. This protocol should be implemented when the IDDM adolescent is showing evidence of non-adherence to their diabetic plan of care. The goal of the NCP-NCD protocol is to promote health, wellness, safety in the school setting and decrease absenteeism of the IDDM so the student can be successful in the classroom and safe at school.

Signs and Symptoms of Non-adherence in the Adolescent Diagnosed with IDDM

a. Avoiding the clinic during scheduled appointment times

b. Arriving in the clinic only when blood glucose (BG) is low but the plan of care dictates the student should come into the clinic more frequently

c. Not maintaining stock of supplies such as: insulin, test strips, glucose monitor, ketone strips, glucagon injections, snacks or fast acting carbohydrates as prescribed by the plan of care

d. Do not report BG results accurately to the school nurse

e. Consumes more or less carbohydrates than what he/she reports to the school nurse

f. BG result of below 70 or above 300 without indications of underlying reasons

Signs and Symptoms of Depression in the Adolescent Diagnosed with IDDM

a. Negative affect: rage, shame, objection, guilt, anxiety, or impatience.

b. Viewing diabetes as a burden

c. Higher levels of family diabetes-specific family conflict

d. Hopelessness

Signs and Symptoms of Diabetes Burnout in the Parent and Adolescent Diagnosed with IDDM

a. Feeling unmotivated in treating diabetes
b. Inconsistency with diet
c. Feeling like caring for diabetes is too much to handle
d. Feeling isolated by IDDM
e. Avoidance of some or all diabetes self-management
f. Feeling overwhelmed in caring for a diabetic child
g. Increase demands in family dynamics

NCP-NCD Protocol

Step 1:
a. If a student diagnosed with IDDM exhibits S/S of non-adherence to the plan of care. a. Document accordingly in the student's diabetic log book b. Proceed to step 2
Step 2:
• Meet with the parent via telephone o Discuss topics below: ▪ Maintaining diabetic supplies • If the parent refuses to supply the clinic with diabetic supplies collaborate with the campus principal for solutions to resolve the issue ▪ Attendance ▪ Behaviors of non-adherence to diabetic plan of care ▪ Try to build a spirit of collaboration and rapport. ▪ Communicate to the parent the nurse is there to help and the parent and student maintains autonomy over diabetic care • Refer the family to a community diabetes program or mental health professional if deemed necessary. • Document telephone consultation in the student's diabetic log book Proceed to step 3
Step 3:

- Meet with the student
    - Discussion topics below:
        - IDDM disease process
        - Knowledge of diabetic plan of care
        - Current feelings on diabetes management at home and at school
        - Develop resolutions together to solve issues inhibiting adherence
- Document communication in the diabetic log book
- Continue to speak to the student quarterly or as needed if there is a change in the students plan-of-care.

If a student exhibits S/S of depression proceed to step 4

Step 4

If a student exhibits S/S of depression

a. If the student is exhibiting signs of depression it is appropriate to continue to provide support
b. Collaborate with the school counselor and contact the parent
c. The school counselor will connect the student and family with appropriate referral services for treatment of depression
d. Document communication in the diabetic log book

If a student or parent exhibits S/S of burnout proceed to step 5

Step 5

If a student or parent exhibits S/S of burnout

e. If the student or parent is experiencing diabetes burnout remain supportive of the student or parent.

f. Utilize motivational interviewing to develop strategies to lessen the feeling of diabetes burnout.

g. Connect the family to community resources for support from other families that may be experiencing the same thing.

    a. Camp Bluebonnet: Children's Diabetes Camp of Central Texas

    b. McLane Children's Hospital - Baylor Scott & White Health

    c. JDRF – Online Diabetes Support Team

    d. American Diabetes Association – Central South Texas

    e. Dell Children's – Specially for Children

h. Refer to family or mental health professional for treatment if deemed necessary

i. Document communication in the diabetic log book

Appendix D: Educational Materials

Educational Tool for Practicum Project.ppt

Appendix E: Pre and Post Intervention Test

Adolescent Student with IDDM Critical Thinking Questions

Test Construction

Purpose

The purpose of this education tool is to improve the school nurses' knowledge and recognition of non-adherence with the plan of care in the adolescents diagnosed with IDDM, and to recognize when implementation of the NCP-NCD protocol is indicated. The curriculum will provide education on the use of the NCP-NCD protocol. It will also cover when to re-evaluate the nurse-student-teacher written contract, either quarterly or as needed if there is a change in the students plan-of-care. This education tool will be utilized to evaluate if the school nurses' knowledge led to changes in practice behaviors (documentation in the student's chart, communication with both student and parent, and nurse protocol compliance after course completion. The concluding information will be measured using a retrospective chart audit.

Learning Objectives

Upon successful completion of this course, you will be able to:

a. Identify behavior of non-adherent adolescents with IDDM
b. Describe psychological changes associated with adolescent students diagnosed with IDDM
c. Recognize assessment findings that may be consistent with non-adherent adolescents
d. Define the NCP-NCD protocol policy and roles and responsibilities related to care of non-adherent adolescents with IDDM

Population

The population of interest are school nurses who work at the middle school and high school.

Length of the Test

The length of the test is 16 questions, 9 questions testing knowledge (K) and 7 questions testing skill (S).

Difficulty and Discrimination Levels of Test Items

Criterion-referenced tests (CRTs) are meant to measure how well a learner has mastered a specific body of knowledge and abilities. Multiple-choice tests CRTs normally are made to decide whether a learner has mastered the material taught in a course (Montepare, 2005). Brame (2018), expresses multiple choice test questions can be formulated to evaluate different levels of learning outcomes, from knowledge, application, analysis, and evaluation. In addition, multiple choice test questions are less susceptive to guessing giving them a higher reliable means of assessment. Furthermore, the objective scoring affiliated with multiple choice test questions clears them from difficulties with scorer variances. The author concludes finally, tests based on multiple-choice questions can typically concentrate on a moderately wide representation of course material, therefore strengthening the validity of the assessment.

Scoring Procedures to be Used

The aim is to use a separate answer sheet that will be utilized to develop a computer-generated detail interpretation record**.**

Item Format

The test will be a selected response multiple choice format

Test Blueprint

Content	Level of Cognitive Skill				
	K		AP		Total
Type 1 diabetes/IDDM	2				2
S/S of hypoglycemia			2		2
S/S of non-adherence	2		1		3
Management of Type 1 diabetes/IDDM in the school setting	4		1		5
S/S of Type I diabetes/IDDM depression	1		1		2
S/S of Type I diabetes/IDDM burnout			2		2
Total	9		7		16

General Directions for the Test and Prepare a Cover Sheet

Select one response from each of the 16 questions concerning care for the IDDM adolescent in the school setting.

Questions

Adolescent Student with IDDM Critical Thinking Questions

1. A student diagnosed with IDDM is refusing to participate in P.E. or extracurricular activities, avoiding to come to the clinic to check blood glucose, not reporting or treating carbohydrate intake, and not taking insulin as prescribed in the student's plan-of-care for the last week and a half. The nurse recognizes this as diabetes burnout. What should be the nurse's next step?
    a. Tell the student to cheer up and they should be excited about joining the football team.
    b. Call the student's parent and discuss behaviors of non-adherence to the diabetic plan-of-care.
    c. Remind the student to bring more glucose test strips to replenish their supplies the next day.

d. Ask the student when their next endocrinology appointment and document the communication in their diabetic log book.

Answer: B *Application/Skills*

Rationale: It's important for a school nurse to recognize signs of diabetes burnout so the nurse can help the student increase adherence. There are signs to look for that indicate diabetes burnout and the diabetic care team should be contacted to provided support the diabetic experiencing burnout (Centers for Disease Control and Prevention [CDC], 2016).

2. You have implemented the NCP-NCD for a 13-year-old male student that you have been caring for the last three months of the school year who exhibited symptoms of diabetes burnout. Things seem to be improving since you have implemented the protocol. When should you speak to the student again concerning the management of their diabetes?

   a. When signs of diabetes burnout start again.

   b. There is no need to speak to the student again on the management of their diabetes.

   c. Quarterly or when there is a change in the student's plan-of-care.

   d. Every week ask the student how they are managing their diabetes at school and at home.

Answer: C *Application* /Skills

Rationale: An adolescent that presents with the above symptoms are exhibiting symptoms of diabetes burnout and should be addressed by the school nurse (Tsai, 2017). The NCP-NCD once implemented it is appropriate to discuss the student's management of their diabetes quarterly and when there is a change in their plan-of-care.

3. You have recognized diabetes burnout in the adolescent with IDDM and have implemented the NCP-NCD protocol as an intervention to increase compliance with the student's diabetic plan of care. You notice after three weeks your efforts of facilitating compliance has not helped the student, but the student is exhibiting worse behavior such as indifference about their health by stating "I don't care if my blood sugar is high. I don't want to take insulin anymore." The school nurse would recognize this behavior as an indication of:
   a. Depression
   b. The student is having a bad day
   c. Normal behavior
   d. The student is being hormonal

   Answer: A *Knowledge*

   Rationale: Persons diagnosed with diabetes are at increased risk of depression. In the United States, people with diabetes are two to three times more prone to depression than people without diabetes (Bădescu et al., 2016). It is important to recognize symptoms of depression to get the student the appropriate referral services for treatment of depression.
4. You have implemented the NCP-NCD, but you recognize that the adolescent student with IDDM is depressed. What would be your next course of action?
   a. Tell the student you hope they feel better tomorrow.
   b. Educate the student on their pre-disposition to depressing and be supportive of the student by informing the student that you will be going with them to the counselor's

office in efforts to collaborate with the counselor for appropriate referral services. Document the teaching and intervention in the student's diabetic log book.

c. Tell the student to go back to class for now and you will call them down later to talk about their depression more when the clinic is less busy.

d. Instruct the student to tell their parents when they get home.

Answer: B *Application/Skills*

Rationale: It is important to provide support to a person experiencing depression and immediate referral for treatment of depression is critical in recovering from depressive episodes (National Institute of Mental Health [NIMH], n.d.). The nurse documenting teaching and communication in the diabetic log book indicates school nurse compliance to the protocol.

5. Which of the following scenarios is indicative of compliance to the diabetic plan-of-care?

a. Student refuses being escorted to the clinic by a staff member for a hypoglycemic episode after the adolescent participated in a strenuous activity.

b. Being escorted to the clinic by a staff member for a hypoglycemic episode after the adolescent has participated in a strenuous activity.

c. Student does not have snacks with them or in the clinic to eat before a strenuous activity.

d. Being escorted to the clinic by a student for a hypoglycemic episode after the adolescent has participated in a strenuous activity.

Answer: B *Knowledge*

Rationale: An adult should always escort a student to the clinic if they are exhibiting signs of hypoglycemia. Never ask another student to escort a diabetic student to the clinic if the student is showing signs of hypoglycemia (Nevada Diabetes Association, n.d.).

6. You are providing teaching on disease process to a non-adherent adolescent with IDDM and they voice they are too young to worry about the effects of poorly managed diabetes. The nurse includes in her teaching the importance of managing IDDM at an early age because long-term diabetes complications are the leading cause of:

   a. Blindness, ESRD, and non-traumatic limb amputation

   b. Hearing loss, obesity, and mortality

   c. Hair loss, hearing loss, and dementia

   d. Short-term memory loss, brittle bones, and tooth decay

   Answer: A *Knowledge*

   Rationale: Diabetic retinopathy, cataracts, and glaucoma can each end in vision loss. High blood sugar levels can impair the kidneys long before a child has symptoms. Kidney impairment can cause chronic kidney disease, which can end in kidney failure. Diabetes destroys blood vessels and nerves, especially in the feet, and can start serious, difficult-to-treat infections. Amputation is sometimes required to prevent the spread of infection (Centers for Disease Control and Prevention [CDC], 2016). Discussing IDDM disease process in a component of the NCP-NCD.

7. You are discussing the disease process of IDDM with a non-adherent adolescent diabetic. Which response is an indication that the diabetic student is knowledgeable of the disease process?
    a. An autoimmune process where the beta cells are destroyed; therefore, they cannot make insulin. Although alpha and delta cells remain intact.
    b. The pancreas is not producing enough insulin to keep the blood glucose at normal level.
    c. Slowed metabolism and being affected by abnormally low production of the thyroid gland hormone.
    d. Increased metabolism and over production of the thyroid gland hormone.

    Answer: A *Knowledge*

    Rationale: Type 1 diabetes (T1D) is an autoimmune disease in which a person's pancreas stops producing insulin, a hormone that controls blood-sugar levels. T1D develops when the body's immune system mistakenly attacks the cells in the pancreas that produce insulin, called beta cells. Research is underway to find out what triggers T1D to develop and how to stop it. Evidence shows there are multiple risk-factors in developing T1D (Juvenile Diabetes Research Foundation [JDRF], 2017).
8. The school nurse implemented the NCP-NCD 3 weeks ago and the student has turned in a new plan-of-care due to his hemoglobin A1c being above normal range after seeing the doctor for a follow-up appointment. According to the NCP-NCD what should the nurse do next?

a. Wait 9 more weeks then have a discussion with the student on the diabetic plan-of-care.
b. Have a discussion with the student on new diabetic plan-of-care
c. Monitor the student's ketones more closely.
d. Provide teaching to the parent on diet compliance.

Answer: B *Application/Skills*

Rationale: The A1c test assesses the average amount of glucose in the blood over the past two to three months by measuring the percentage of glycated hemoglobin (American Association for Clinical Chemistry [AACC], 2018). The diabetic protocol indicates that a discussion with the adolescent should take place quarterly and when a new diabetic plan-of-care is in place.

9. You have a student with IDDM that usually carries his snacks to eat throughout the day and keeps emergency snacks in the clinic per his diabetic plan-of-care. He has presented to the clinic with a blood glucose less than 70 mg/dl 4 days in a row and is running low on his emergency snacks in the clinic. What should be nurses next course of action?
   a. Provide snacks that you bought until the student brings his own snacks.
   b. Ask the student to remind his parents to give him more snacks to carry on his person.
   c. Wait until the emergency snacks run out and then call the parent to discuss maintaining diabetic supplies.
   d. Call the parent and have a discussion on maintaining diabetic supplies for the student according to the plan-of-care. The nurse should also advocate to the parents a need for follow-up with the student endocrinologist.

Answer: D *Application/Skills*

Rationale: Hypoglycemia occurs when the level of glucose in your blood drops below normal. For many people with diabetes, that means a level of 70 milligrams per deciliter (mg/dL) or less. An individual's numbers might be different, so being familiar with the doctor's plan-of-care care is important to find out what level is too low for the patient (The National Institute of Diabetes and Digestive and Kidney Diseases [NIDDK], 2016). The NCP-NCD protocol guidelines list calling the parent to have a phone meeting on maintaining diabetic supplies and the parent and student should maintain autonomy over diabetic care.

10. You have implemented the NCP-NCD for a non-adherent student for 3 months and arranged a meeting to discuss current management of diabetes at school and at home. The student voices he has been checking his blood glucose before meals, before bed, overnight, before/after physical activity, when feeling ill, when he is doing something out of the ordinary. The nurse recognizes this action by the student as compliance in what?
    a. Checking blood glucose
    b. Checking for Signs of severe hypoglycemia
    c. Action to take before taking Metformin
    d. Checking insulin to carb ratio

Answer: A *Knowledge*

Rationale: The patient's doctor may recommend blood sugar testing four to 10 times a day for adolescents diagnosed with T1D. When and how often to test the blood sugar

depends on the plan-of-care (Mayo Clinic, 2018). Checking quarterly compliance with the diabetic plan of care is a part of the continuous evaluation with compliance according to the NCP-NCD.

11. A student diagnosed with IDDM asks why she must monitor her blood glucose so often at school. The nurses best reply would be?

    a. It will not be necessary, if you eat right

    b. Ensure that your blood glucose levels stay normal

    c. That's what the plan-of-care says

    d. It gives us the feedback we need to keep your blood glucose in target range

    Answer: D *Knowledge*

    Rationale: Monitoring alone does not change the blood glucose level, but the only way to know if you are keeping your blood glucose levels in the target range is to monitor your blood glucose. While it is important to eat a healthy diet; diet alone may not be enough. Monitoring your blood glucose will give you the feedback you need. Regular monitoring of glucose is recommended for all children and adolescents diagnosed with T1D during the school day (American Association of Diabetes Educators, 2016). Providing appropriate teaching during the meeting with the student is part of the NCP-NCD.

12. The school nurse should document that the student is knowledgeable in the process of checking his/her blood glucose if he or she recognizes these times to monitor blood glucose more frequently?

    a. You are more active or exercising

    b. You are sick

    c. Your routine changes

d. All the above

Answer: D *Knowledge*

Rationale: There are times to monitor the blood glucose more frequently which are when the diabetic is exerting more energy during exercise or activity, when they are sick, and during routine changes to be sure your blood sugar levels are on target. Follow the doctor's testing instructions during this time. Maintain testing more frequently until normal blood sugar range has been maintained for at least 1 week. Preferentially continue testing until the doctor advises that more frequent testing is no longer needed. (American Academy of Family Physicians, 2018). Documenting the communication between the student and school nurse is a part of appropriately applying the protocol.

13. As a school nurse, you are teaching a parent and student who has been unable to control his/her blood sugar after implementing the NCP-NCD. The education should include:

a. It would be helpful to discuss the problem with your medical provider

b. Monitor your blood sugar at different times of the day such as before and after meals, bedtime, middle of the night, and whenever feeling low

c. Keep a logbook of your blood sugar test results, food, activity/exercise and medication doses

d. All the above

Answer: D *Application/Skills*

Rationale: When your blood sugar is not properly controlled, it is beneficial to monitor blood sugar more often during the day including overnight. Additionally, keep a logbook

of blood sugar results, exercise/activity, the carbohydrate content of the meal, and the insulin dose. Review the log book with the doctor to resolve the problem to why there is difficulty in controlling blood sugar (Dealing with Diabetes, 2013).

14. You try to refer a family to a community diabetes education program during a phone meeting with a parent and the parent replies, “diabetic education is the same everywhere. I took a class a few years ago. I don't need it again.” The nurses best educated response should be?

    a. You’re right but it may have been some information you forgot the last time you took the class.

    b. Diabetes education programs have different philosophies and approaches. Also, there may be new medicines and new technologies. Attending education classes is an excellent way to stay up-to-date on new developments.

    c. You should go anyway it will show your child you care about him.

    d. That may be true, but you and the child are having a hard time managing his diabetes. What do you plan to do to fix this?

    Answer: B *Knowledge*

    Rationale: With appropriate education, support, and care, diabetes can be managed and reduce the incidences of complications. Managing diabetes is a team effort that involves health care providers, diabetes self-management education, family and friends, and community support (Centers for Disease Control and Prevention [CDC], n.d.).

15. A parent has not been maintaining the amount of diabetic supplies for their IDDM adolescent in the clinic even though the school nurse has communicated this several

times. The nurse asks the parent therapeutically why, the parent responds "taking care of my other children, my family, my job, and my child with diabetes is overwhelming." The nurse would recognize this response as a sign of:

a. Caregiver burnout

b. Depression

c. Apathy

d. Nothing to be concerned about

Answer: A *Knowledge*

Rationale: Caregiver burnout is defined as physical, emotional, and mental exhaustion that can go along with caring for someone with significant health needs. It is important for the caregiver to take time to care for themselves and seek support from friends that may be going through similar issues of caring for a diabetic child or talk to someone who may not be as familiar with what the parent is going through (Heyman, 2016).

16. You notice an adolescent with IDDM adhering to their plan-of-care as outlined in their medical orders. What should you do?

a. Do nothing

b. Don't make the child's diabetes the focus of conversation but praise them for their efforts in taking care of themselves to increase autonomy.

c. Give the student a prize

d. Tell the student you are going to call their parents to let them know

Answer: B *Application/Skills*

Rationale: Adolescent diabetics want to be treated like everyone else. The school nurse showing interest in the holistic well-being of the adolescent and not focus only on their diabetes is important to the psychological well-being of the adolescent, providing some outside of diabetes, and taking their diabetes is important to the healthy development and promotes self-care (Peters, Nawijn, & Van Kesteren, 2014).

Content Validity Index Table

Item	Expert 1CI	Expert 2 AM	Expert 3 PM	Mean	I-CVI
1	4	4	4	4.00	1
2	4	4	4	4.00	1
3	4	2	3	3.00	0.67
4	4	2	4	3.33	0.67
5	4	4	3	3.67	1
6	4	4	4	4.00	1
7	4	4	3	3.67	1
8	4	4	4	4.00	1
9	4	2	4	3.33	0.67
10	4	4	4	4.00	1
11	3	4	3	3.33	1
12	4	4	4	4.00	1
13	3	2	4	3.00	0.67
14	4	2	4	3.33	0.67
15	4	4	3	3.67	1
16	4	2	4	3.33	0.67

S-CVI/AVE	0.875
total agreement	10
S-CVI/UA	0.625

The content validity index is calculated using the following formula:

CVR = [(E-(N/2)) / (N/2)] with E representing the number of judges who rated the item as Moderately Relevant or Highly Relevant and N being the total number of judges.

The mean total of all of the means was 3.60 indicating that all of the questions were moderately/highly relevant.

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Appendix F: Audit Tool

NCP-NCD Audit Tool

Student Random Number Identifier: _____

This tool will be used to audit charts pre and post implementation of the protocol. Date of nurse encounter with the diabetic student who presented with hypoglycemia will be documented pre and post implementation. If student absent the date of absence will be documented under student absent pre and post implementation. Date will be noted under school nurse documenting teaching and communication with parent indicate the diabetic protocol was utilized post implementation.

Assessment Date/Evaluation Date Student Code	Pre-Implementation hypoglycemic episodes	Post Implementation hypoglycemic episodes	Pre-Implementation Attendance	Post-Implementation Attendance	Post-implementation School nurse adherence measured through nurse documentation in student's diabetic log

Appendix G: Raw Data from the Project

Test scores before and after training: Paired t-test, report test scores with 95% confidence intervals

Nurse 222 Pre-test: 93 Post-test: 100

Nurse 358 Pre-test: 81 Post-test: 100

Nurse 25 Pre-test: 81 Post-test: 100

Nurse 298 Pre-test: 81 Post-test: 100

Nurse 68 Pre-test: 93 Post-test: 100

Nurse 191 Pre-test: 81 Post-test: 100

Nurse 15 Pre-test: 81 Post-test: 81

Nurse 396 Pre-test: 75 Post-test: 93

Nurse adherence to the protocol data collected from nurse documentation in the diabetic health log: All 8 nurses adhered to the protocol: Exact binomial test, report the % of adherence with 95% confidence intervals

Hypoglycemic episodes pre and post implementation of the protocol: Wilcoxon test

Student 12359 Pre: 2 Post: 0

Student 2715 Pre: 4 Post: 2

Student 12614 Pre: 2 Post: 1

Student 730 Pre: 3 Post: 1

Student 1154 Pre: 5 Post: 1

Student 1003 Pre: 5 Post: 2

Student 3705 Pre: 2 Post: 7

Student 11456 Pre: 2 Post: 6

Student 9593 Pre: 3 Post: 2

Student 3454 Pre: 3 Post: 3

Student 4109 Pre: 4 Post: 2

Absenteeism data collected pre and post implementation of the protocol: Wilcoxon test

Student 12359 Pre: 13 Post: 6

Student 2715 Pre: 8 Post: 5

Student 12614 Pre: 8 Post: 4

Student 730 Pre: 7 Post: 6

Student 1154 Pre: 8 Post: 4

Student 1003 Pre: 15 Post: 12

Student 3705 Pre: 3 Post: 1

Student 11456 Pre: 3 Post: 1

Student 9593 Pre: 7 Post: 2

Student 3454 Pre: 5 Post: 2

Student 4109 Pre: 12 Post: 2

Appendix H: Full Data Set

R code and output:

```
> pre.post.test<-t.test(pre,post,paired=TRUE)
> pre.post.test


        Paired t-test
data:  post and pre
t = 5.0015, df = 7, p-value = 0.001563
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
  7.117391 19.882609
sample estimates:
mean of the differences
                  13.5


#adherence to protocol
8/8 = 100%,
> binom.test(8,8)
        Exact binomial test
data:  8 and 8
number of successes = 8, number of trials = 8
95 percent confidence interval:
 0.6305834 1.0000000
sample estimates:
probability of success
                     1


#hypoglycemic episodes
```

```
> wilcox.test(adherence.pre,adherence.post)
        Wilcoxon rank sum test with continuity correction
data:  adherence.pre and adherence.post
W = 85.5, p-value = 0.09767

#descriptive statistics for hypoglycemic episodes
summary(adherence.pre)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  2.000   2.000   3.000   3.182   4.000   5.000
(IQR=2)
 summary(adherence.post)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  0.000   1.000   2.000   2.455   2.500   7.000
(IQR=1.5)
#Graph to show individual changes

#Absenteeism
> wilcox.test(absentee.pre,absentee.post)

        Wilcoxon rank sum test with continuity correction
data:  absentee.pre and absentee.post
W = 100, p-value = 0.01012

> summary(absentee.pre)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  3.000   6.000   8.000   8.091  10.000  15.000
(IQR=4)
> summary(absentee.post)
```

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
1.000	2.000	4.000	4.091	5.500	12.000

(IQR=3.5)