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School Nurse Influence on Adolescent Type 1 Diabetic Control

Sara E. Dahling
Bethel University

SCHOOL NURSE INFLUENCE ON ADOLESCENT TYPE 1 DIABETIC CONTROL

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SARA E. DAHLING, RN

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Sara E. Dahling

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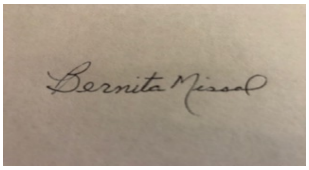
Approvals:

Project Advisor Bernita Missal

Project Advisor Signature: 

Dean/Chief Nursing Administrator Diane Dahl

Dean/Chief Nursing Administrator Signature: Diane Dahl

Director of Nurse Educator Program: Jone Tiffany

Director of Nurse Educator Program Signature: 

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Abstract

Title: School Nurse Influence on Adolescent Type 1 Diabetic Control

Background: Diabetes care is complex and requires consistent management of multiple factors (such as insulin, blood sugar and carbohydrate counting). Type one diabetes is a common chronic condition among children and adolescents (NASN, 2017). School-aged children typically show poorer metabolic control, indicating a need for helping students to manage their diabetic needs. Children spend the bulk of their day in the school setting and therefore supporting students with diabetes care during the school day is important.

Purpose: The purpose of this systematic review is to identify strategies within the care coordination role of the Licensed School Nurse that can be implemented by the school nurse, during the school day, to improve diabetic self-care among children and adolescents. Functions of the school nurse's care coordination role include collaborative communication, school support through case management and chronic disease management, and the school nurse's direct care and supervision.

Theoretical Framework: Pender's Health Promotion Model (Petiprin, 2016) was used as a framework for interventions that the school nurse can use to support diabetic care management in the school setting. Pender's Health Promotion Model provided information about important

factors that can affect an adolescent's diabetes self-management, such as their social support, willingness and functional and cognitive abilities.

Methods: A literature search was conducted to gather evidence about the effects of diabetes care management interventions in the school setting and that could be applied in the school setting. Twenty-one articles related to the management of diabetic care were reviewed. Research studies used in this review provided findings on the effects of nursing interventions that are (or could be) provided to diabetic students during the school day.

Results: Interventions that were or can be provided by the school nurse showed improvements that included: improved adherence to self-care, improved A1c, more frequent blood sugar monitoring and insulin administration, improved life satisfaction, better school attendance and a higher grade point average.

Conclusion: The school nurse's care coordination interventions can improve diabetic outcomes for adolescents with type 1 diabetes. However, there is a need for more randomized control trials specifically testing the effect of specific school nurse interventions on diabetic outcomes.

Recommendations: The findings can be used to support the care coordination role of the school nurse in direct care and supervision, creating a supportive school environment and collaborative communication.

Chapter One

Introduction

School nurses are vital to student health, safety and readiness to learn because they provide care to students with complex health issues and help students achieve their learning goals (NASN, 2016). School nurses provide health services that are not only important for academic success but are also important for students' success in managing their own chronic conditions, such as diabetes. The school nurses' care management, which includes case management, chronic disease management, collaborative communication, direct care, education, interdisciplinary teams and motivation interviewing/counseling for children with chronic health conditions, improves students' knowledge to better manage their illnesses (NASN, 2016).

Diabetes is one of the most common chronic conditions among children and requires continual and consistent care management of multiple factors (Tolbert, 2009). The role of educator, counselor and collaborator are among important roles for school nurses who provide care to school-age children with diabetes. It is vital that school nurses teach diabetic students how to manage their chronic health condition and how to perform self-care. A diabetic students' daily schedule includes recess, Physical Education, field trips, etc. which can complicate blood glucose management. Children are also growing during each academic year which requires frequent changes to their individualized care management plans (Schwartz et.al 2010). A

multitude of factors contribute to adolescents' lack of adherence to self-care such as: lack of motivation, issues with self-esteem, problems with time management, feeling different from peers, time pressures (Snyder, 2015). The school nurse is the most knowledgeable person in the school setting to provide, assist with and educate others regarding complex diabetes care.

Statement of Purpose

Diabetes is a common chronic disease in children and teens, with teens having one of the highest rates of nonadherence to self-management and the highest mean HgA1c's (HgA1c being the average blood glucose level over the past three months) (Ye et al., 2017). According to Izquierdo et al. (2009), "Diabetes is the most common chronic illness in childhood, affecting one in every four hundred school children" (p. 374). The Centers for Disease Control and Prevention (2017) estimate that "132,000 children and adolescents younger than age 18 years (0.18% of the total U.S. population younger than age 18 years)" have diagnosed diabetes (p. 3). How can the school nurse help this group of children and adolescents living with diabetes? Individuals with diabetes need to learn how to manage their chronic condition and diabetic cares. Where can we teach adolescents these cares? Much of adolescents' time during the day is spent at school - approximately seven hours per day for nine months of the year (Izquierdo et al., 2009). Can the school nurse have an impact on improving glycemic control of adolescents with diabetes? How can the school nurse help adolescent diabetics manage their diabetic cares and improve their glycemic control? Do diabetic students who receive nursing care management in the school setting have better outcomes as measured by improved attendance, improved blood sugar, improved A1c scores or improved academic performance?

Appropriate Evidence

According to the American Association of Diabetes Educators (2016) "Diabetes management in children and adolescents requires multiple daily management tasks" (p. 2). The role of the Licensed School Nurse includes the following aspects of care coordination: case management, disease management, collaborative communication, education, motivational counseling, delegation, empowerment and care planning (NASN, 2015). General diabetes management requires an individualized approach and education to promote self-management which begins at diagnosis (Selekman, 2013). Adolescents with diabetes may exhibit maladaptive coping styles, which contributes to greater diabetes distress and deterioration in self-management and glycemic control. (Iturralde et al., 2016). Not all schools have a school nurse available to help diabetic students throughout the school day and provide assistance with diabetes management. Only 35.3% of schools in the United States employ full-time school nurses (Willgerodt et al., 2018). Improved diabetes management can enhance the health and well-being of children with diabetes (Engelke et al., 2011). An obstacle to effective management of diabetes in the school setting is poor or limited knowledge of diabetes; the absence of a school nurse on site daily and a lack of diabetes management policies (Pansier & Schulz, 2015).

Significance to Nursing

Licensed school nurses use evidence-based practice to provide care coordination and advocate for student-centered care, all which promote student health and academic success (Willgerodt et al., 2018). Therefore, school nurses have the power to impact and improve diabetic cares by providing diabetes care management during the school day and promoting self-care. School nurses are effective in using case management to enhance the health and well-being of children with diabetes (Guttu, et al., 2004). As part of care management, nurses are able to provide education and counseling, in addition to providing medical needs to students with

diabetes. Part of the care management is also education to school staff to adequately train staff to be prepared and respond to diabetic needs in order to ensure student safety (Schwartz et al., 2010). The issue of diabetes management in the school setting is important to the profession of school nursing because school nurses can provide interventions that may improve diabetic students' self-care behaviors, life satisfaction, A1c levels, school attendance and academic performance.

Conceptual model/theoretical framework

Pender's Health Promotion Model (HPM) provides an appropriate framework for assisting adolescent diabetics with diabetes management (McEwen & Wills, 2014). The major concepts of this theory include individual characteristics and experiences (the student's age, family, beliefs), behavior-specific cognitions and affect (recognizing benefits of self-care, barriers or their feelings about their own abilities to self-care) and behavioral outcomes (student's commitment and accessibility to self-care). The major concepts of this theory demonstrate what biological, psychological and social factors affect adolescent's participation in their diabetic care to promote their own health (Pender et al., 2011). The school setting is the appropriate place to promote diabetic student health because it is where adolescents spend a great deal of time. The goal is to empower and enable the diabetic student to care for themselves by educating and promoting personal development (McEwen & Wills, 2014).

The theory's concept of individual characteristics and experiences means that a person's biological, psychological and sociocultural factors influence their self-care (Petiprin, 2016). It is important for the school nurse to appreciate that the student's person or personal history has an effect on their self-care abilities, including their gender, race, age, and genetics. Age plays an important role in self-care because the ability to perform self-management is strongly connected

to the child's developmental and chronological age (De Cassia Sparapini, et al., 2017). In application of the HPM, it is important for the school nurse to assess the student's ability to perform tasks such as testing blood sugar, counting carbohydrates, calculating insulin doses and administering insulin (which are important skills in self-care) in addition to assessing the student's ability to identify when a task is needed and the purpose of performing the skill (Coffen & Dahlquist, 2009). The developmental stage not only plays a role in the student's ability to understand the need for diabetic management but also affects their desire to take control of their needs. According to Jackson and O'Neill (2016) "Self-management capability is variable and dependent on the individual student's physical ability, motor skills, maturity, knowledge, and willingness to do so," (p. 203). The school nurse needs to also assess the student's willingness to learn and take control of their cares. Teaching the adolescent about diabetic cares should involve discussion, review, support and an explanation of cause and effect.

Another concept of the HPM is the behavior-specific cognitions and affect. This concept assists in identifying the student's own ability to recognize the benefit of the diabetic tasks, the barriers they feel or sense, and/or their own ideas about their abilities in performing diabetic care (McEwen & Wills, 2014). Students may improve their performance of self-care if they feel capable and in control. This may be accomplished by focusing education on helping the student to understand why the cares are essential. The school nurse can also help create and establish routines so that the diabetic cares become second nature and not a disruption to their school day. The student who feels healthy and has positive outcomes or feelings about their self-care is more likely to continue to participate in self-care (Petiprin, 2016). However, if the student feels poorly or has negative symptoms, there is a reduced chance for participation (Lannon, 1997). The

school nurse should assist the diabetic student with health-promoting behaviors such as blood sugar monitoring, carbohydrate counting/meal planning, and insulin dosing.

Behavioral outcomes are another important concept of the HPM. This can be seen in the diabetic adolescent student's commitment to the diabetic management plan. Students need to have an active role in their treatment and management of symptoms. If the student is committed to following the diabetic medical management plan, he or she can obtain better diabetic control and health. Applying this concept, the nurse should involve the student in creating the diabetic medical management plan so that the student feels involved in identifying needs and is more likely to implement the plan (Petiprin, 2016). Many factors compete with the student's ability to adhere to the plan such as school responsibilities, which include academic tests or missing important class content, access to the diabetic supplies, and a space to test.

Diabetic self-care by adolescents can also be affected by interpersonal influences, according to the HPM (Petiprin, 2016). The student's parental support, encouragement or acceptance from friends, participation in diabetic support groups, positive role models, and the experience they had while initially learning about diabetes can all affect how well the student will adhere to their diabetic management plan. Adolescent diabetic students need support and supervision, especially when newly diagnosed (Jackson & O'Neill, 2016). Students with strong social support and parental involvement may do better with diabetic self-management. Applying this concept, the school nurse should assess if the diabetic student has parental support or how well the parents understand the diabetic needs and provide support through education. The school nurse may also encourage the diabetic student to share the diagnosis with friends since they can be helpful in supporting the student's care plan.

Summary

In conclusion, care of diabetic students is complex and the role of the school nurse is laden with multiple responsibilities. The review of the existing literature regarding improving diabetic care among adolescents may help to determine what interventions the school nurse can apply in the school setting to be most effective in promoting self-cares and diabetes/glycemic control. If specific interventions can be identified as effective in promoting independence in diabetes management, the school nurse can use their valuable time to add these vital interventions to the diabetic care plan.

Chapter Two

Introduction

There is an abundance of primary and secondary source documents on diabetes such as diabetes care, diabetes prevention, and diabetes education. The search for information regarding the question in this research review focuses on how cares provided by the school nurse improve adolescent diabetic student self-care behaviors, life satisfaction, A1c levels, school attendance and academic performance. Primary source documents, written by researchers who conducted studies, are used in this review with research articles including primary and secondary source data (Garrard, 2017). Keywords that are related to the subject manner and help to describe the research topic were used in data collection from a variety of databases.

Description of the Search Strategies

To gather evidence on diabetes care in the school setting and its effects on diabetes management, a systematic review of the literature according to Garrard (2017) was conducted using the databases CINAHL (nursing and allied health journals) and PubMed (database on life sciences and biomedical topics). A research librarian was consulted and assisted with search strategies. Key words used in the search were “Diabetes in the school setting, “Adolescent

diabetes education," and "Diabetes AND school AND nurse." There were limited randomized control trials related to school nursing, so the search expanded to "Diabetes and Adolescents" or "Diabetes care management." The ancestry approach, looking for citations from relevant studies to find more research data, was also used to find research on diabetes care in the school setting (Polit & Beck, 2018). The goal was to find articles that provided research on the effects of nursing interventions that are (or could be) provided to diabetic students during the school day.

Criteria for Inclusion and Exclusion of Research Studies

The profession of nursing was the primary focus of the research. The goal was to specifically identify school nursing interventions that benefit diabetic student outcomes. However, there was a limited number of randomized control trials related to school nursing, so the search was widened to include randomized control trials related to "adolescents with diabetes" in general. This allowed more studies to be revealed. The search was limited to "adolescents" to exclude other age ranges from the search. Studies related to diabetes care for adolescents can be used to inform the school nurse's practice. Expanding the search criteria from only school nursing, or the school setting to generalized diabetes and adolescents, expanded the search beyond the school setting and the nursing profession. This allowed research articles and randomized control trials that support nursing interventions to be included in the search. These types of interventions can be used in the school setting and implemented by the school nurse to help improve diabetes care. Initially no range of years was applied in the search, which yielded articles that were outdated with some data that is now obsolete. The articles used in this systematic review ranged from 2004-2017.

Summary of Studies:

Of the twenty-one research articles identified, eight were level I randomized control trials, six studies were level II quasi-experimental studies and seven studies were level III descriptive studies. The studies ranged from good to low quality according to the Johns Hopkins Evidence Level and Quality Guide (Dang & Dearholt, 2018). Twenty studies analyzed quantitative data while one study reviewed qualitative data. The qualitative study evaluated online posts from diabetic teenagers about peer pressure, stigma and stress related to Type 1 diabetes. Independent variables in the studies include the following categories: nurse supervision, education or care reminders school support, case management by school nurses, school nurse intervention, video conference with nurse, student and diabetes team, teleconference, text-message check-ins, school nurse presence, education/counseling by the school nurse, and frequent check-ins with education. Dependent variables in the studies include A1C, blood glucose monitoring, insulin administration, life satisfaction/quality of life, parent satisfaction, self-efficacy, academic outcomes, school personnel understanding and perception, and students' access to care. Tools for measurement include questionnaires, parent surveys, student surveys, interviews, self-efficacy tools, care-provider survey, academic grades, academic standardized test scores, academic attendance, nursing goals met and school nurse visit logs.

Criteria for Evaluation of Research Studies

The Johns Hopkins Evidence Level and Quality Guide was used to evaluate and rate the research articles. The research design determines the level of evidence; the quality is determined by a critical appraisal of the methods used in the study and the strength of the evidence is determined through consideration of the combination of the level and quality of evidence (Dang & Dearholt, 2018). The Johns Hopkins Evidence Level and Quality Guide is a useful tool for determining the quality of the evidence in an article (Dang & Dearholt, 2018). The rating scale

was used to organize and differentiate evidence that has a variety of strengths and qualities (Dang & Dearholt, 2018). The research articles were each appraised to determine their study design (experimental, quasi-experimental, non-experimental, qualitative or mixed method) along with the study quality (evaluation of the study methods and procedures) (Dang & Dearholt, 2018). It was also important to assess each article's applicability, or how the parts of the study (subjects, interventions and outcome measures) matched with the research question. In this review, the articles used are applicable to diabetes interventions that improve diabetes outcomes or self-management in adolescents that can be used during the school day. The methods used in the research articles were also evaluated for validity and reliability to help determine quality. The strength of the evidence from the articles used in this research was determined after careful analysis of the level and quality (Dang & Dearholt, 2018).

Summary

In conclusion, search strategies and methods were vital to condense the large amount of available information regarding diabetes care in adolescents. The inclusion and exclusion criteria helped narrow the information that was gathered to what is most appropriate for helping adolescents with diabetes care and management during the school day. There are many options for how to search in the many available databases of health research information. The criteria for evaluating research studies helps to ensure that the research data being utilized is accurate and reliable.

Chapter 3 Literature Review and Analysis

Introduction:

This systematic review of the literature is a synthesis of research articles to accumulate knowledge about how school nurses can improve diabetic outcomes and diabetic self-care for adolescents (Garrard, 2017). Each article used in this review has been evaluated for its purpose and the quality of its scientific methods. The findings were summarized and then used to draw conclusions to guide school nurse practice. The evidence found suggests that supporting diabetes care within the school setting can improve diabetes management. The research studies provide evidence that diabetic students' A1c levels improve, blood glucose monitoring increases, insulin dosing and adjustments increase, and self-care behaviors and life satisfaction improve with interventions that can be applied by the school nurse. The evidence presented supports interventions that help diabetic students succeed and the practice question that students who receive nursing care management by school nurses can have improved diabetic outcomes.

Synthesis of Major Findings:

Twenty-one articles related to diabetes care and improving outcomes in adolescents with type 1 diabetes were reviewed. The synthesis of the findings support that the school nurse's role can have a direct impact on diabetic outcomes for adolescents. According to NASN's Framework for 21st Century School Nursing Practice, one of the responsibilities of the Licensed School Nurse (LSN) is care coordination (NASN, 2015). Care coordination includes case management (activities intended to improve student care), chronic disease management (treatment plans to help students manage their diabetes), direct care, motivational counseling, education, and collaborative communication (NASN, 2016). The studies in this review support the role of the LSN in diabetes care coordination within the school setting. The synthesis of the major findings is broken down into three subcategories of the care coordination role in: direct care, school support and collaboration.

Direct Care/Supervision

According to the NASN's Framework for 21st Century School Nursing Practice (NASN, 2015), direct care is a role of the licensed school nurse within care coordination. In a randomized control trial by Nguyen et al. (2008), 36 adolescents were randomized into a control group or intervention group. The intervention group had insulin injections and blood glucose monitoring conducted daily at lunch by a school nurse. After three months, the control group's A1c remained the same (9-13.7 at initial visit and 9.3-14 after three months) and the A1c in the intervention group decreased (8.5-14 at the initial visit and 7.4-11 after three months). This study showed that supervision of blood glucose monitoring an insulin injection in the school setting improves A1c (Nguyen et al., 2008). Direct care for diabetic students should include

nursing supervision activities such as frequent check-ins, cues, and monitoring diabetic tasks and needs.

To determine the effect of school-based intervention on diabetes management at home and school, twenty seven students were enrolled into a study to test if visits by a pediatric nurse practitioner monthly throughout the school year would improve self-management (Faro et al., 2005). The visits did improve blood glucose monitoring (from 31% to 46.2%), insulin administration (from 10.3% to 23.1%), and insulin adjustment (from 6.9% to 23.1%) as measured by parent survey, the self-efficacy for diabetes tool and a diabetes care provider survey (Faro et al., 2005). When diabetic students had a pediatric nurse practitioner supervise blood glucose levels and insulin administration with students, this frequent contact increased blood glucose monitoring, insulin adjustments, and administration at school (Faro, 2005). School nurses provide frequent contact, monitoring, supervision and examination of blood glucose levels and insulin administration with students to support increased blood glucose monitoring and insulin administration.

In the Yi Han et al. (2015) study, 30 preadolescent students with type 1 diabetes were randomly assigned to determine the effect of text messaging between regular clinic appointments in order to engage them in their personal awareness of symptoms and knowledge of diabetes management. The results of the study indicated trends toward improvements in life satisfaction (improved 7.79%) and metabolic control (HbA2c decreased .21 and .37) as well as decreased worries related to their diabetes (improved 1.4%). A measure used in the study was the HbA1c and Quality of Life questionnaire. This study indicates that there is value in frequent check-ins to continue to improve symptoms awareness and overall diabetes management, which can be done by the school nurse's direct care.

In the Schiaffini et al. (2016) study, 29 adolescents were enrolled into either the control group or the intervention group to receive monthly teleassistance and tele-interaction over five years. In this study, monthly teleassistance improved treatment compliance and compliance in self-management of their diabetes, as evidenced by decreased A1c (telemedicine group 7.5 compared to the control group 7.8). The number of blood glucose tests also improved (5.5 compared to 3.8 in the control group) and insulin boluses increased (4.2 compared to 3.3 in the control group). As shown by this study, the school nurses can provide helpful frequent feedback within the school setting to support diabetes management.

The Markowitz et al. (2014) study measured a text messaging intervention for teens and young adults with diabetes. Ninety participants were assigned either a control group or intervention group. The intervention group received text messaging with daily motivation, goals and check-ins while the control group received traditional educational information in pamphlet form. Participants in the intervention group experienced a small improvement in A1c (decreased by 0.2) and reported that the messages helped them follow their goals. The Physical Activity and Health Food Efficacy Scale for Children showed the participants felt motivated about their healthier habits. The study's findings show that the school nurse's application of motivational, daily education to youth with diabetes in the school setting can improve diabetes management and lifestyle.

A randomized control trial by Samimi et al. (2017) provided an intervention of telephone follow-up by a nurse to determine if it strengthened knowledge, helped to promote continuous care, improved adherence to self-care and improved well-being of diabetic patients. In this study, telephone calls were made two times/week for one month then one time/week for the second and third months. Telephone conversation topics included follow-up on diabetes

training, problem solving, and answering questions. The results of the telephone intervention was measured by the A1c score and a researcher-made self-care questionnaire. The participants' A1c scores were reduced by 14% in the experimental group while the control group's A1c reduced by only 0.48%. The participants' self-care scores improved by 17.06% in the experimental group and by 2.9% in the control group. The study showed that follow-up from a school nurse can strengthen healthy behaviors and create more consistency in diabetes treatment or management for patients.

School Support

School support includes providing staff awareness and training, ascertaining that proper supplies are available along with the proper environment for diabetic care and integrating diabetic care into the school routine. This is vital for diabetic care compliance in adolescents. Care coordination by the Licensed School Nurse can address issues related to providing school support. Research findings indicate that school support, which can be provided through the school nurse's case management and chronic disease management, can improve self-care behaviors and patient/student life satisfaction (Tang et al., 2013). In a descriptive study by Tang et al. (2013), 139 adolescents with type one diabetes were given questionnaires to assess their perceptions of school support, self-care behaviors, and life satisfaction. In this study, school support positively and directly affected self-care behaviors (.25) and life satisfaction (.33); self-care behaviors directly affected life satisfaction (.33) and school support indirectly affected life satisfaction through mediation of self-care behaviors (.41). This study showed that school nurses' support will have a positive effect on self-care behaviors and improve overall life satisfaction.

In a study by Maranda et al. (2015), correlating diabetic care with another structured task provided cues to perform diabetes self-management in adolescents. In this study, twenty-eight adolescents with A1c greater than 8.5% were recruited to test if a behavioral intervention of the structured care of a pet would improve diabetic adolescents' glycemic control. The intervention group associated daily and weekly fish cares with diabetes self-management tasks (i.e. blood glucose monitoring). The results were measured by the A1c, which was recorded at baseline and again at three months. The intervention group's A1c decreased by 0.5% compared to the control group that increased their A1c by 0.8%. School nurses can use this information to correlate diabetic cares with another school day task to foster independence and promote training in self-care (Maranda, et al., 2015).

In order to evaluate the experience of children and adolescents with type 1 diabetes in school, the Schwartz et al. (2010) study surveyed patients, parents and school personnel involved in their care. In this study, eighty children and their parents were surveyed, along with twenty-eight school personnel (which the study indicates were primarily school nurses). The questionnaire was designed by researchers. The findings were that seventy percent of children and adolescents felt that they were treated differently in school because of their diabetes, fifty-three percent (more than half) reported being prevented from self-management of their diabetes and only forty percent of parents felt that school personnel were adequately trained to respond to diabetic needs . This study indicates the need for a school environment that promotes diabetic care by providing appropriate time and space for diabetic care and educating/training staff.

A descriptive study by Wagner, et al. (2006), examined diabetic student and parents' perception of the school experience and its effect on A1c. The Diabetes Quality of Life for Youth Scale and a parent survey was used to measure student and parent perception of the school

experience. The study included fifty-eight participants. Children who were given more flexibility to decide where to perform self-care, demonstrated better glycemic control. Children whose parents reported school staff were trained, showed better diabetes control (A1c 7.7) than those who reported untrained school staff (A1c 8.4). School nurses can promote school support by educating school staff and providing flexibility and locations for performing self-care in order to help improve diabetic student's glycemic control.

Collaboration

Collaborative communication is another important component of the care coordinator role of the Licensed School Nurse. In the Izquierdo et al. (2009) randomized control trial, the intervention of telemedicine (monthly video conference between the school, nurse, child and diabetes team) was tested for its effectiveness at improving the care of children with type 1 diabetes. The study measured the effectiveness of telemedicine by the A1c values and the Pediatric Quality of Life Scale. The A1c in the control group increased from baseline to six months (8.5-9.5) and the A1c decreased in the intervention group (8.5-8.4). Improvements were also seen in the Pediatric Quality of Life Scale - in dimensions of complying with the care plan, and diabetic tasks and with emotional functioning. The results of this study indicate that communication among the school nurse, child and diabetes medical team provides a collaborative, team approach and improves diabetes management.

Parent and peer relationships influence health behaviors in youth with and without type 1 diabetes. Helgeson et al. (2014) examined aspects of parent and peer relationships on health behaviors, psychological well-being, self-care and glycemic control through questionnaires, a depression scale, perceived stress scales, an eating disorder inventory and a self-care inventory. Parent support was found to be related to better self-care behavior and friend conflict was

associated with higher A1c. Supportive relationships with parents predicted better diabetes self-care as measured by a self-care inventory. The evidence from this study shows that school nurses should collaborate with parents and encourage parental support and involvement.

The Schiaffini et al. (2016) study also supports the role of collaborative communication. In this study, the telemedicine group included the medical team, the patient and their families. The study found that when adolescents received frequent feedback from the medical multidisciplinary team, they were more compliant in self-management of their diabetes. School nurses should be a part of this multidisciplinary team in order to support diabetes self-management.

Critique of Strengths and Weakness of Studies Reviewed

The twenty-one studies reviewed included eight random controlled trials, six quasi experimental design studies, and seven descriptive studies. The studies reviewed were primarily quantitative research. One article was qualitative, in order to determine outcomes that matter to teens with type 1 diabetes. The strength of the studies varied with most being of good quality when using the Johns Hopkins Evidence Appraisal Tool (Polit & Beck, 2018). Research was conducted in the United States, Taiwan, Iran, the United Kingdom and Italy. The research participants included parents of diabetic children and school-aged children in the school setting, at diabetic camps, and from diabetes care clinics. The results from the randomized control trials provide strength to the research due to the randomization which limits possible sources of extraneous variables, or variables that may affect the results unintentionally, and can influence the results (Polit & Beck, 2018). Many studies were small and were not focused on specific school nurse interventions. However, the research data can be useful when findings are applied to school nurse interventions.

The Nguyen et al. (2008) article provided significant support for nursing supervision. This study showed that daytime supervision by the school nurse improved students' A1c by decreasing the A1c from 8.5-14.0 at the initial visit and from 7.4-11 after three months. This is valuable data to support direct care by school nurses. The school nurses' direct care should include supervision activities such as monitoring blood glucose and insulin injections. The Nguyen et al. (2008) study used random assignment to the control and intervention groups in order to limit bias. In addition, the results were consistent, and inclusion and exclusion criteria helped keep homogeneity within the sample group. However, the article did not discuss the specific exclusion criteria, and the sample size was small; these factors make it difficult to generalize the findings to larger populations. Other variables (extraneous variables) could have influenced the dependent variable (improved A1c), which limits the study's generalizability. Examples of extraneous variables in this study include insulin dose adjustments, the use of the logbooks in the experimental group, and insulin regimen changes (Nguyen, 2008). This research study was a Johns Hopkins Evidence Appraisal, level one because it is a random control study and is considered of good quality .

The Samimi et al. (2017) study researched the impact of telephone follow-up calls by nurses. Although the research was not specific to the functions or role of the school nurse, the research data can be carried over into the school setting. This study found that frequent communication from the nurse promoted continuous care and improved adherence to self-care, as evidenced by student questionnaires and improved A1c levels. The communication from a nurse included follow up on training, problem-solving, and answering questions via phone conversations. The school nurse can communicate with students to help address important diabetic care questions and needs. The study's strengths included random assignment and

inclusion and exclusion criteria. It is also a strength of this study that the measurement tool (the questionnaire) was analyzed for content validity and a test-retest method was used to help determine validity and reliability of the measurement tools. However, it is difficult to rule out all extraneous variables such as education the participants may have received from other sources, individual interest, or other factors that may affect their response. Generalizability is also limited by the small sample size of seventy children. This study was a Johns Hopkins Evidence Appraisal level one of good quality.

Tang et al. (2013) conducted a descriptive, non-experimental study that assessed the effects of school support and self-care behaviors on life satisfaction in 139 adolescents from Taiwan. This cross-sectional study used a questionnaire that was examined by experts for content validity. The reliability of the questionnaire was assessed by measuring the internal consistency and test-retest reliability of each scale. The study proposed creating a supportive school environment as an important factor in aiding in diabetes management which is an important function of the care coordination role for the school nurse through case management and chronic disease management. The Tang et al. (2013) study showed that school support positively influences self-care behaviors and life satisfaction. School nurses create this type of school environment by training staff and teachers, providing space for diabetic care and integrating diabetic care into the school routine. The study limitation was that the self-care behavior scale was found to have low reliability and participants were recruited using a convenience sampling which limits the generalizability of the results. This descriptive study was level three with good quality, using the Johns Hopkins Evidence Appraisal Tool.

The Helgeson et al. (2014) study found that parent and peer relationships impact health behaviors in youth with type 1 diabetes. This study used questionnaires, a depression scale, a

perceived stress scale, an eating disorder inventory and a self-care inventory to assess aspects of parent and peer relationships, self-care behaviors and glycemic control. The study's strength was that the scales used were established and reported of good reliability and validity. Limitations of this study include low generalizability because the sample was primarily middle class and Caucasian; other variables, besides parent support and peer relationships, can affect health behaviors and wellbeing. However, the study did find that parent relationships have an important influence on health behaviors and on the well-being of youth. The study reported that supportive relationships with parents predict better diabetes self-care (.22 $p<.001$). The study results indicate that it would be beneficial for school nurses to collaborate with parents when working with diabetic students and encourage parent involvement in student care management. This quasi-experimental study was level two and of good quality, using the Johns Hopkins Evidence Appraisal Tool.

It was difficult to identify research articles related solely to school nurse interventions that improve diabetic outcomes in adolescents. So, the research was expanded to include articles that provided evidence on the effect of nursing interventions that could be implemented at school. This provided information about how the school nurse can improve care coordination for the diabetic adolescent and includes direct care such as requiring frequent check-ins, providing cues, supervising, monitoring diabetic tasks and providing feedback and follow-up on education. Care coordination also includes creating a supportive environment which includes: integrating diabetic tasks into the school day, training teachers and staff, providing the appropriate space, providing time in the school day and creating flexibility for diabetic students. Collaborative communication as a function of the care coordination role of the LSN can be improved by communicating with parents and supporting parental involvement with the diabetic management

team. It is still important to note that because of the limitations of certain studies (sample size, validity and reliability of the scales, and possible sampling bias), there should be some caution in generalizing the findings to all populations.

Conclusion

School nurses can provide diabetes care coordination during the school day that can improve diabetic outcomes. This is evident by the improved A1c level in students who received school nurse supervision, the increased blood glucose monitoring, improved insulin administration and adjustments, and the positive correlation between school support and self-care behaviors and life satisfaction (Nguyen et al., 2008, Faro et al., 2005; Tang et al., 2013). Improved self-care behaviors are necessary to improve life satisfaction in adolescents (Tang et al., 2013). The studies support a recommendation that school nursing services that offer diabetes guidance and assistance with diabetes management can improve diabetes outcomes (improved A1c, improved life satisfaction, improved blood glucose monitoring, insulin administration and adjustment). This research also validates that school support plays a vital role in self-care and adolescents' overall life satisfaction (Tang et al., 2013).

Chapter 4 Discussion, Implications and Conclusions

Introduction

An examination of the literature was conducted in order to answer whether school nurses can improve outcomes for diabetic students. The literature confirms the supposition that school nurse's care coordination, which includes direct care, creating a supportive school environment, and collaborative communication can improve diabetic outcomes. It is also important to note that other factors contributed to self-management adherence in adolescents; for example, parent support and peer relationships.

Synthesis of Literature to Answer Practice Question

The synthesis of findings from the literature showed that increased support from the school nurse can improve overall outcomes for diabetic adolescents. This is evident from quality of life questionnaires, A1c scores, academic measures (test scores and/or grades) and improved self-care behaviors. The school nurse's care coordination includes direct care, creating a supportive environment, and collaboration with parents and the diabetes management team.

Supervision/Direct Care

In the school setting, direct supervision and monitoring of blood glucose and insulin injections improved A1c scores in children and adolescents with Type 1 diabetes (Nguyen et al., 2008). Frequent check-ins via text message improved life satisfaction and decreased worry related to diabetes among adolescents (Yi Han et al., 2015). School nurses can use this information and perform frequent check-ins with diabetic students and provide information about symptom awareness. Daily check ins, again by text message, improved A1c measurements (Markowitz et al., 2014). Frequent feedback via telemonitoring resulted in more compliant self-management and lowered the A1c in adolescents with Type 1 diabetes (Schiaffini et al. 2016).

Telephone follow-up from a nurse regarding diabetic education, problem solving and answering questions can create more consistency in diabetes management for patients (Samimi et al., 2017). The school nurse can provide these daily check-ins, frequent feedback, and follow-up with motivational, positive, and educational interventions to youth with diabetes to improve diabetic goals. Improving students' diabetes management helps students to succeed in school. Facilitating good diabetes management in the school setting not only affects the student's health and safety but can also impact academic success as evident by increased grade point averages being limited by higher levels of HbA1c (Winnick et al., 2017). End of grade/standardized test scores improved when students with chronic health conditions (such as diabetes) receive case management from school nurses at school (Keehner et al., 2008).

School Support

School support includes educating and training school staff to respond to diabetes emergencies. It also includes education to peers/classmates with general information about diabetes and hypoglycemia. When education and training was provided to school staff and student's peers, diabetic students had improved quality of life scores from questionnaires and HbA1c improvement (Wagner et al., 2006). The school support function of the school nurse care coordination role also includes creating an environment to promote self-care, such as providing appropriate space, allowing time in the day, identifying cues or reminders for care needs, minimizing interruptions to the student's normal school day, and adequately training staff to respond to needs.

Collaboration

Care coordination also includes collaborating with other health professionals and members of the care team, such as parents. Collaboration with prescribing providers increases

insulin adjustments (Faro et al., 2005). When the school nurse collaborates with the student and the diabetes management team, diabetic management is improved, evident by decreased A1c and improved quality of life questionnaire scores (Izquierdo et al., 2009). Parental involvement is influential in diabetes management in adolescents. The school nurse role with collaboration should include the parents as their support has an influential role on health behaviors and psychological well-being in adolescence (Helgeson et al., 2014). Supportive relationships with parents predicted better diabetes self-care as measured by a self-care inventory (Helgeson et al., 2014).

There was little research literature that was specific to school nursing interventions to improve diabetes outcomes. There is a need for more research to support the important role of school nurses. When the school nurse is present to assist in student health care needs, fewer less students are sent home ill, case management improves standardized test scores, nursing care goals are met, and quality of life measures improve (Keehner et al., 2008; Pennington & Delaney, 2008). Evidence shows that children in schools with only part-time nursing services have less encounters with the nurse for health education, asthma visits, mental health counseling and care (Telljohann et al., 2004).

The research studies that were reviewed do not account for all the factors that may contribute to self-care adherence and diabetic control. Socioeconomic factors can influence adherence to diabetic self-care. Technology such as continuous glucose monitors and insulin pumps can also influence self-care adherence. Pump therapy alone has direct benefits in quality of life and patient satisfaction as a practical treatment for insulin therapy that fits well into daily activities (Schiaffini et al., 2016). Research should also assess the timing of interventions.

There may be more improvement in diabetic outcomes when specific nursing interventions are applied closer to diagnosis.

Implications for Nursing Practice

The implications for nursing practice include applying the findings and utilizing the functions of the school nurse's care coordination role. School nurses' care coordination should include creating school support through an environment that promotes self-care. This can be done by integrating diabetic care into the school day, allowing enough time for diabetic care, minimizing interruptions to the student's normal school day, providing adequate space and providing adequate training to staff to respond to diabetic needs. These interventions help to create an environment which promotes self-care by providing comfort and ease. The school nurse's application of the research should also include frequent check-ins and supervision of blood glucose monitoring and insulin administration. This should include follow up on diabetic education and providing motivational, positive, and educational feedback to improve diabetes goals in order to strengthen self-care behaviors and A1c levels in adolescents. As part of the school nurse's care coordination, he/she should also collaborate with other health care professionals and function as a member of the multidisciplinary team with health care providers and parents. School nurses can promote collaborative communication by working with parents and encouraging parental support and involvement.

Diabetes management in the school setting is an important role of school nursing because evidence shows that nursing interventions, which can be provided during the school day by the school nurse, can improve diabetic students' self-care behaviors, life satisfaction, A1c levels, school attendance, and academic performance (Nguyen et al., 2008; Tang et al., 2013; Winnick et al., 2017). The Winnick et al. study (2017) supports the claim that maintaining good

metabolic control promotes positive school performance in adolescents. School nurses should use data such as this to support their practice and their role.

Recommendations for Nursing Research

Research supports a recommendation that school districts have a school nurse to empower students to develop healthy behaviors that promote health and wellness (National Association of School Nurses [NASN], 2016). School nurses can provide diabetic students with appropriate assistance in developing healthy self-care behaviors through care coordination services. The recommendation is to disseminate the findings and share the results with team members of school nurse organizations such as the School Nurse Organization of Minnesota, or the National Association of School Nurses in order to use the evidence to support their role and practice of diabetic care in the school setting. However, more research would be needed in order to develop or recommend specific practice changes. There is a need for more research studies that specifically study school nurse interventions - such as school nurse supervision, school nurse education, school nurse support. Future research could include applying specific nursing interventions within the school setting and observing the response of students in their self-care abilities, adherence to their care plan and, the effects the interventions have on the student's A1c. School nurses can also assist in promoting what they do each day if there was a better way to document and observe the effects of their interventions. This research supports the value in direct care given by the nurse and the nurse's role in promoting self-care behaviors which improves life satisfaction in diabetic students. Findings also suggest that direct care, school support and involvement in diabetes management by a nurse at school are effective strategies for improving diabetes management in children and adolescents with poorly controlled diabetes. The recommendation for further nursing research is to perform studies of specific school nurse

interventions such as direct supervision, collaboration, and school support, or apply an intervention in the school setting and monitor for change in diabetic outcomes.

Integration of Theoretical Framework

Pender's Health Promotion Model (Petiprin, 2016) provided a framework for interventions that the school nurse can use to support diabetic care management in the school setting. The nurse's care coordination and interventions should utilize major concepts of Pender's Health Promotion Model to improve the health of diabetic adolescents. Pender's major concepts include individual characteristics and experiences, behavior-specific cognition and affect and behavioral outcomes.

Individual Characteristics and Experiences

Nursing care coordination and school nurse interventions need to address the individual characteristics (the ability to complete tasks and understand cause and effect). The school nurse's education should align with the student's ability to understand and perform the diabetes task. Educational interventions should include counseling and symptom awareness. Student education regarding diabetes and diabetes care should also be reinforced frequently in order to improve life satisfaction and decrease worry related to diabetes (Yi Han et al., 2015).

Behavior Specific Cognitions and Affects

Behavior specific cognitions and affects (the ability to recognize health benefits, their feelings about their care and create a routine) can be incorporated into the education and interventions provided in the school nurse's care coordination. Adolescents' desire for independence and their interest in privacy can be accommodated by school nurse interventions to foster independence and create cues (within their normal routine) to perform diabetes self-care (Maranda et al., 2015). Avoidance coping contributes to greater diabetes distress and can be

minimized by reducing discomforts associated with performing day-to-day diabetes tasks (Iturralde et al., 2016). School nurses can help to minimize discomforts by establishing routines, grouping cares, and by providing a private and safe environment for diabetes care.

Behavioral Outcomes

Behavioral outcomes (the student's commitment to the plan and accessibility to needs) are an important component of the health promotion theory and also for success in self-care. School nurses should strive to create an environment that promotes self-care. Questionnaires by parents and diabetic adolescents indicated that they felt they were treated differently and prevented from self-management which meant their school environment did not promote self-care (Schwartz et al.,2010). The school nurse can promote self-care by providing a safe space and integrating time in the school day for diabetic cares. Support from school staff such as teachers is also important in improving self-care behaviors (Tang et al., 2013). The theory supports that creating a welcoming environment, with positive interactions, establishing routines and providing accessibility will support self-care success.

Interpersonal Influences/Relationships

Pender's Health Promotion Model also indicates that interpersonal influences from families/parents, peer and healthcare providers can change how students engage in their health promotion or self-care (Petiprin, 2016). The Ye et al. study (2017) showed that many outcomes matter to diabetic teens, including their blood glucose control, but that many still fail to maintain blood glucose control. Peer pressure, stigma and stress in teenage life is also a concern for teens with type 1 diabetes. Teens shared that they want to be normal and free from distress of social stigma associated with their diabetes treatment needs (Ye et al., 2017). School nurses should consider what is important to diabetic teens when working with them to motivate them to

improve their blood glucose control. The school nurse's role includes collaboration. To promote success in diabetes management for adolescents, this collaboration should be with parents to encourage the parents support and involvement. The Helgeson et al. study (2014) found that parent support was related to better self-care behavior and that when parent support was low, friend conflict was associated with higher HbA1c. This research also supports school nurse functions in assisting with peer support such as sharing and/or including their friends in the management plan or providing information for peer support groups or online groups.

Conclusion

Pender's Health Promotion Model provided important factors that can affect an adolescent's willingness and functional and cognitive abilities to come to light. Utilizing the knowledge that their biological, psychological, and social factors affect their participation in their own diabetic cares helped identify how to tailor the interventions to best support their needs in order to improve their diabetic outcomes. Interventions by the school nurse should match the cognitive capabilities of the student, the care coordination should include providing a safe and comfortable environment to perform self-care routines and the collaboration should include the adolescent, his/her family, and peers to facilitate support.

Diabetes care requires the management of multiple tasks including blood glucose monitoring, insulin administration and carbohydrate counting/meal planning. Improving diabetes self-care among adolescents with type 1 diabetes prevents the onset of diseases associated with elevated A1c (Tolbert, 2009). Students with higher levels of A1c have limited increases in their Grade Point Average (GPA) and are at risk for learning problems and poor academic performance (Winnick et al., 2017). This review of twenty-one articles related to the management of diabetic care and the outcomes can be used to support the care coordination role

of the school nurse in direct care and supervision, creating a supportive school environment and collaborative communication with parents and the diabetes care management team.

References

American Association of Diabetes Educators. (2016). Management of children with diabetes in the school setting (Position Statement). *The Diabetes Educator, 34*(3), 439-443. Retrieved from: https://www.diabeteseducator.org/docs/default-source/practice/practice-resources/position-statements/diabetes-in-the-school-setting-position-statement_final.pdf

Centers for Disease Control (2017). National Diabetes Statistics Report, 2017. Retrieved from: https://www.cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf

Coffen, R. & Dahlquist, L. (2009) Magnitude of Type 1 Diabetes Self-management in youth. *The Diabetic Educator,* vol. 35 (2), p302-308. Retrieved from: https://doi-org.ezproxy.bethel.edu/10.1177/0145721708327534

Dang, D. & Dearholt, S. (2018). *Johns Hopkins nursing evidence-based practice: Model and guidelines* (3rd ed.). Indianapolis, IN: Sigma Theta Tau International.

De Cassia Sparapini V., Liberatore, R., Damiao E., Dantas, I., Camargo, R., & Nascimento, L. (2017). Children with Type 1 Diabetes Mellitus: Self-management experiences in school. *Journal of School Health*, 87(8), 623-629. Retrieved from: http://dx.doi.org.ezproxy.bethel.edu/10.1111/josh.12529

Engelke, K., Swanson, M., Guttu, M., Warren, M. & Lovern, S. (2011). School nurses and children with diabetes: A descriptive study. *NC Medical Journal*, 72(5) 351-358. Retrieved from: https://doi.org/10.1177/1942602X12468418

Faro, B., Ingersoll, G., Fiore, H. & Ippolito, K. (2005). Improving students' diabetes management through school-based diabetes care. *Journal of Pediatric Health*, 19(5), 301-308. doi: 10.1016/j.pedhc.2005.03.004

Garrard, J. (2017). *Health sciences literature review made easy, the matrix method* (5th ed.). Burlingto, MA: Jones & Bartlett Learning.

Guttu, M., Keehner Engelke, M. & Swanson, M. (2004). Does the school nurse-to-student ratio make a difference? *Journal of School Health*, 74(1) 6-9. Retrieved from: https://doi-org.ezproxy.bethel.edu/10.1111/j.1746-1561.2004.tb06593.x

Helgeson, V., Palladino, D., Becker, D., Escobar, O., Reynolds, K. & Siminerio, L. (2014). Relationships and health among emerging adults with and without type 1 diabetes. *Health Psychology,* 33(10), 1125-1133.

Iturralde, E., Weissberg-Benchell, J. & Hood, K. (2016). Avoidant coping and diabetes-related distress: Pathways to adolescents' type 1 diabetes outcomes. *American Psychological Association*, 36(3) 236-244. Retrieved from: https://doi.org/10.1037/hea0000445

Izquierdo, R., Morin, P., Bratt, K., Moreau, Z., Meyer, S., Ploutz-Snyder, R., Wade, M. & Weinstock, R. (2009). School-centered telemedicine for children with type 1 diabetes mellitus. *Journal of Pediatrics*, 155 (3) 374-379. Retrieved from: https://doi.org/10.1016/j.jpeds.2009.03.014

Jackson, C. & O'Neill, A. (2016). Supporting the student's graduated independence in diabetes care. *NASN School Nurse*, Vol. 31 (4), p202-204. Retrieved from http://dx.doi.org.ezproxy.bethel.edu/10.1177/1942602X16651749

Keehner Engelke, M., Guttu, M., Warren, M., & Swanson, M. (2008). School nurse case management for children with chronic illness: Health, academic and quality of life outcomes. *National Association of School Nurses*, 24(4) 205-214. doi: https://doi.org/10.1177/1059840508319929

Lannon, S. (1997). Using a health promotion model to enhance medication compliance. *Journal of Neuroscience Nursing*, Vol. 29 (3), p170-179. Retrieved from: https://ovidsp-dc2-ovid-com.ezproxy.bethel.edu/sp-4.04.0a/ovidweb.cgi?&S=JBAHFPBPIOEBKIEMJPBKEHBFDLIBAA00&Complete+Reference=S.sh.22%7c1%7c1&Counter5=SS_complete%7c01376517-199706000-00004%7covft%7covftdb%7covftc

Maranda, L., Lau, M., Stweart, S. & Gupta, O. (2015). A novel behavioral intervention in adolescents with Type 1 Diabetes Mellitus improves glycemic control. *The Diabetes Educator*, 41(2) 224-230.

Markowitz, J., Cousineau, T., Franko, D., Schultz, A., Trant, M., Rodgers, R. & Laffel, L. (2014). Text messaging intervention for teens and young adults with diabetes. *Journal of Diabetes Science and Technology*, 8(5) 1029-1034.

McEwen, M., and Wills, E. (2014) *Theoretical basis for nursing* (4th ed.). Philadelphia, PA: Lippincott Williams and Wilkins.

National Association of School Nurses. (2015). Framework for the 21st century school nursing practice. Retrieved from: https://www.nasn.org/nasn/nasn-resources/professional-topics/framework

National Association of School Nurses (2016). Better health. Better learning. E-tool kit. Retrieved from: https://www.nasn.org/nasn/nasn-resources/models-samples/bhbl

National Association of School Nurses. (2017). Diabetes management in the school setting. Position Statement. Retrieved from: https://www.nasn.org/nasn/advocacy/professional-practice-documents/position-statements/ps-diabetes

Nguyen, T., Mason, K., Sanders, C., Yazdani, P. & Heptulla, R. (2008). Targeting blood glucose management in school improves glycemic control in children with poorly controlled type 1 diabetes mellitus. *Journal of Pediatrics*, 575-578. doi: https://doi.org/10.1016/j.jpeds.2008.04.066

Pansier, B & Schulz, P. (2015). School-based diabetes interventions and their outcomes: A systematic literature review. *Journal of Public Health Research*, 4(1). doi: https://doi.org/10.4081/jphr.2015.467

Peery, A., Keehner Engelke, M. & Swanson, M. (2012). Parent and teacher perceptions of the impact of school nurse interventions on children's self-management of diabetes. *The Journal of School Nursing*, 28(4) 268-271. doi: https://doi.org/10.1177/1059840511433860

Pender, N.J., Murdaugh, C.L., & Parson, M.A. (2011). *Health promotion in nursing practice* (6th ed.). Upper Saddle River, NJ: Pearson.

Pennington, N. & Delaney, E. (2008). The number of students sent home by school nurses compared to unlicensed personnel. *Journal of School Nursing*, 24(5) 290-297. doi: https://doi.org/10.1177/1059840508322382

Petiprin, A. (2016). Health Promotion Model. Retrieved from http://www.nursing-theory.org/theories-and-models/pender-health-promotion-model.php

Polit, D & Tatano Beck, C. (2018). *Essentials of nursing research: Appraising evidence for nursing practice* (9th ed.). Philadelphia, PA: Lippincott Williams & Wilkins.

Samimi, Z., Talakoub, S. & Ghazavi, Z. (2017). Effect of telephone follow-up nurses on self-care in children with diabetes. *Iranian Journal of Nursing and Midwifery Research*, 23(1) 26-30. doi: 10.4103/1735-9066.220950

Schiaffini, R., Tagliente, I., Carducci, C., Ullmann, N., Ciampalini. P., Lorubbio, A. & Cappa, M. (2016). Impact of long-term use of eHealth systems in adolescents with type 1 diabetes treated with sensor-augmented pump therapy. *Journal of Telemedicine and Telecare,* 22(5), 277-281. doi: http://dx.doi.org.ezproxy.bethel.edu/10.1177/1357633X15598425

Schwartz, F., Denham, S., Heh, V., Wapner, A. and Shubrook, J. (2010). Experiences of children and adolescents with type 1 diabetes in school: Survey of children, parents, and schools. *Diabetes Spectrum*, 23(1) 47-55. Retrieved from: http://spectrum.diabetesjournals.org/content/23/1/47.full

Snyder, C. (2015). Strategies to improve insulin adherence in adolescents with type 1 diabetes. *Pediatric Endocrinology Nursing Society*, 30(1): 278-280. doi: http://dx.doi.org.ezproxy.bethel.edu/10.1016/j.pedn.2014.10.017

Sparapini, V., Liberatore, R., Damiao, E., Dantas, I., Camargo, R., Nascimento, L. (2017). Children with type 1 diabetes mellitus: Self-management experiences in school. *Journal of School Health,* Vol. 87, (8), p623-629. Doi: https://doi-org.ezproxy.bethel.edu/10.1111/josh.12529

Tang, S., Chen, S. & Wang, R. (2013). Establishing a model to assess the effects of school support and self-care behaviors on life satisfaction in adolescents with type 1 diabetes in Taiwan. *Journal of Nursing Research*, 21(4) 244-251. Retrieved from: https://insights.ovid.com/article/00134372-201312000-00004

Telljohann, S., Price, J., Dake, J. & Durgin, J. (2004). Access to school health services: Differences between full-time and part-time school nurses. *The Journal of School Nursing*, 20(3) 176-181. doi: https://doi.org/10.1177/10598405040200030801

Tolbert, R. (2009). Managing type 1 diabetes at school: An integrative review. *Journal of School Nursing,* 25(1), 55-61. DOI: https://doi.org/10.1177/1059840508329295

Wagner, J., Heapy, A., James, A. & Abbott, G. (2006). Brief report: Glycemic control, quality of life and school experiences among students with diabetes. *Journal of Pediatric Psychology,* 31(8), 764-769. doi: https://doi.org/10.1093/jpepsy/jsj082

Willgerodt, M.A., Brock, D. M., & Maughan, E.M. (2018). Public School Nursing Practice in the United States. *Journal of School Nursing*, 34(3), 232-244. Retrieved from: https://higherlogicdownload.s3.amazonaws.com/NASN/3870c72d-fff9-4ed7-833f-215de278d256/UploadedImages/PDFs/Advocacy/2017_Workforce_Study_Infographic_School_Nurses_in_the_Nation.pdf

Winnick, J., Berg, C., Wiebe, D., Schaefer, B. & Pui-Wa, L. (2017). Metabolic control and academic achievement over time among adolescents with Type 1 diabetes. *American Psychological Association,* 32(1), 105-117. doi: https://doi.org/10.1037/spq0000190

Ye, C., Jeppson, T., Kleinmaus, E., Kliems, H., Schopp, J. & Cox, E. (2017). Outcomes that matter to teens with type 1 diabetes. *The Diabetes Educator,* 43(3) 251-259. doi: https://doi.org/10.1177/0145721717699891

Yi Han, M., Spezia Faulkner, M., Fritz, H., Fadoju, D., Muir, A., Abowd, G., Head, L. & Arriaga, R. (2015). A pilot randomized trial of text-messaging for symptom awareness and diabetes knowledge in adolescents with type 1 diabetes. *Journal of Pediatric*

Nursing, 30, 850-861. doi:

http://dx.doi.org.ezproxy.bethel.edu/10.1016/j.pedn.2015.02.002

Literature Matrix

Article Matrix #1

Source: Nguyen, T., Mason, K., Sanders, C., Yazdani, P. & Heptulla, R. (2008). Targeting blood glucose management in school improves glycemic control in children with poorly controlled type 1 diabetes mellitus. *Journal of Pediatrics*, 575-578.

Johns Hopkins Evidence Appraisal

Level of Evidence: 1

Quality: B. good quality

Purpose	Sample	Measurement	Results	Strengths/Limitations	Conclusion/Recommendation
Determine if school nurse supervision of diabetic cares will improve glycemic control in children and adolescents with poorly controlled type 1 diabetes. This was measured by their A1c levels.	36 subjects from the US (mean age 14, 7 males, 9 females in control group and 10 males, 8 females in the intervention group, 2 participants in the control group dropped out) with high hemoglobin A1c were recruited for the study. (The article does not give a value for "high")	Method: A parallel study, single-blinded randomized control trial. Pretest-posttest data was collected at initial screening visit and again after three months. Instrument: Hemoglobin A1c Levels	After 3 months, the control group's A1c remained the same (9-13.7 at the initial visit and 9.3 to 14.0 after 3 months). The A1c decreased in the intervention group (8.5-14.0 at initial visit and 7.4-11.0 after 3 months).	Strengths: The random assignment to control or intervention group helps to limit bias. Results were consistent. The inclusion and exclusion criteria helped keep homogeneity within the sample group. (However, the article does not discuss what the exclusion criteria were) Limitations**:** The sample size is small, hard to generalize findings to a larger population. Other variables (extraneous) may have influenced dependent variable (improved A1c). For example: insulin dose adjustments with the use of the log books in the experimental group and insulin regimen changes	Conclusion: The outcome was that the control group's A1c remained unchanged and the intervention group's A1c decreased. The supervision of blood glucose monitoring and insulin injections in the school setting improved HBA1c in children and adolescents with poorly controlled type 1 diabetes. Recommendation: to continue more clinical trials to determine which intervention is the most beneficial and long-term sustainability.

Article Matrix #2

Source: Faro, B., Ingersoll, G., Fiore, H. & Ippolito, K. (2005). Improving students' diabetes management through school-based diabetes care. *Journal of Pediatric Health*, 19(5), 301-308.

Johns Hopkins Evidence Appraisal

Level of Evidence: 2 - quasi-experimental

Quality: C/Low.

Purpose	Sample	Measurement	Results	Strengths/Limitations	Conclusion/ Recommendation
To determine the effect of the school-based intervention (nurse visit at school) on diabetes management at home and school (parent satisfaction, self-efficacy and A1c).	A convenience sample of 27 students from the US -15 male and 12 female(students who were receiving care at a diabetes center and enrolled in a large urban school district. 6-HS students, 4-MS students, 17 ES students	Method: School visits by a Pediatric Nurse Practitioner monthly for 20-30 minutes throughout the school year. Instrument: parent survey, the self-efficacy for diabetes tool and a diabetes care-provider survey - at enrollment and at the end of the study.	No statistically significant differences were seen between pre-intervention and post intervention mean scores on the SED tool, parent satisfaction or HBA1c. (statistics were not provided for these). Frequency of BG monitoring increased pre 31% to post 46.2%, insulin administration increased 10.3% to 23.1% and insulin adjustment increased 6.9% to 23.1%	Strength: Insulin administration at school was seen to increase as blood glucose monitoring increased and insulin adjustments (in response to the documented need) increased. Many parents in the post survey expressed appreciation for the regular visits, knowledge and confidence they believed their child had gained. Limitations: the sample was small and self-selected/those who responded to invitation. The evaluation lacked valid and reliable instruments to measure the impact. Results were not clearly reported and recommendations were unclear other than it was seen as positive.	Conclusion: The article notes that the surveys done by the parents and care providers indicate that blood glucose monitoring at home and school increased and insulin administration practices and insulin adjustments improved. School nurses also increased their level of expertise in diabetes management through the visits with the PNP. Recommendation: school nurse should monitor blood glucose and insulin administration and collaborate with diabetes management team

Article Matrix #3

Source: Tang, S., Chen, S. & Wang, R. (2013). Establishing a model to assess the effects of school support and self-care behaviors on life satisfaction in adolescents with type 1 diabetes in Taiwan. *Journal of Nursing Research*, 21(4) 244-251.

Johns Hopkins Evidence Appraisal

Level of Evidence: Level 3, non-experimental

Quality: B-Good.

Purpose	Sample	Measurement	Results	Strengths/Limitations	Conclusion/ Recommendation
To assess the effects of school support and self-care behaviors on life satisfaction in adolescents with Type 1 Diabetes	A convenience sample of 139 adolescents from Taiwan (aged 10-18 years old) with type 1 diabetes completed questionnaires. Of 139 participants, 43%/63 were female, 54%/76 were male, ages ranged from 10-18 years, mean age 14.5.	Descriptive study. Method: Cross-sectional survey/questionnaire used to measure the effect of school support for diabetes car Instrument: Questionnaires to assess four sections: demographic characteristics (age, gender, family type, socioeconomic status), perception of school support, self-care behaviors and life satisfaction.	School support positively influenced self care behavior (.25) and life satisfaction (.33). Self care behaviors positively influenced life satisfaction. (.33). School support significantly and indirectly affected life satisfaction.(.41)	Strength: Experts examined the content validity of scales used in the study. Reliability was assessed by measuring internal consistency of the scales and test-retest reliability of each scale. A literature review discussed the prevalence of T1DM in children and the importance of life-satisfaction on well-being, positive adolescent development and the importance of self-care behaviors for glycemic control which affects life satisfaction. The article supports the school environment as an important factor in aiding in diabetes management. Results were presented in narrative and with tables. Limitation: The self-care behavior scale was found to have low reliability. Participants were recruited using a convenience sampling which limits the generalizability of the results.	Conclusion: School support positively and directly affected self-care behaviors and life satisfaction, self-care behaviors directly affected life satisfaction and school support indirectly affected life satisfaction through mediation of self-care behaviors. Recommendations: Improved school support and self-care behaviors are necessary to improve life satisfaction in adolescents.

Article Matrix #4

Source: Keehner Engelke, M., Guttu, M., Warren, M., & Swanson, M. (2008). School nurse case management for children with chronic illness: Health, academic and quality of life outcomes. *National Association of School Nurses*, 24(4) 205-214.

Johns Hopkins Evidence Appraisal

Level of Evidence: Level II quasi-experimental

Quality: B-good

Purpose	Sample	Measurement	Results	Strengths/Limitations	Conclusion/ Recomendation
To examine health and academic outcomes for children with chronic illness who receive case manage-ment from school nurses	Purposive sampling (nurses enrolled children that were struggling academically or had difficulty managing their illness at school). 114 children age range 5-19 in the US with asthma, diabetes, severe allergies, seizures or sickle-cell anemia in 5 school districts who were provided case management by school nurses	Method: Nurses collected data electronically and created goals and interventions for the students. Pre and post test data was collected on the interventions of school nurse case management. Instrument: Data gathered: demographic information, grades, standardized test scores, attendance, a baseline quality of life assessment and achievement of goals. Measure for same variables were obtained at the end of the school year and compared: previous and current year	For children with diabetes, there was significant improvement in the treatment barrier subscale of the quality of life scale (18.3% change)-meaning students felt less barriers to treatment (p=.01). 60% of students with the poorest grades improved. End of grade/standardized test scores improved(65% of students improved in math, 67% of students improved in reading). Goals that align with nursing care were more successfully met (staff training 100% met, Decreased hypoglycemia episodes 65% met, A1c <7, 27% met	Strength: Nurses were trained in case management and procedures for the study. Additional sessions were held in the school year to monitor progress and answer questions, the project nurse, technical support visited school districts several times and were avail by phone and email daily. The authors discuss reliability for scales used in the quality of life instrument/scales. Limitation: author notes findings should be interpreted with caution; it is not clear amount of improvement in grades is due to case management or remedial education. There is no random assignment or control group.	Conclusion: Improvement in academic measures was found primarily among children who were not doing well in school. Children who received case management reported improved quality of life. Recommendation: Outcome data helps to demonstrate the contributions of school nurses and gives visibility to the role and importance of school nurses in schools

Article Matrix #5

Source: Samimi, Z., Talakoub, S. & Ghazavi, Z. (2017). Effect of telephone follow-up nurses on self-care in children with diabetes. *Iranian Journal of Nursing and Midwifery Research*, 23(1) 26-30.

Johns Hopkins Evidence Appraisal

Level of Evidence: Level I

Quality: B-good

Purpose	Sample	Measurement	Results	Strengths/Limitations	Conclusion/ Recommendation
Identify if follow-up by a nurse strengthens knowledge, helps to promote continuous care, improves adherence to self-care and improves well-being of diabetic patients.	70 children age 10-18 years old with type 1 diabetes (35 in control group and 35 in experimental group). Participants were randomly selected from a treatment center in Iran and assigned randomly to either the control (no follow-up care) or experimental group (received 12 weeks of telephone follow-up training/care)	Method: Data was gathered at the time of enrollment and 12 weeks after the intervention. Follow up phone calls were made 2x/week for 1 month and then 1x/week for 2nd and 3rd month. Average 20 minute conversations include f/u on training, problem solving and answering questions. The control group only received training from the center. Instrument: A researcher-made questionnaire on self-care and HbA1c measurement. Questionnaire included demographics, questions about the disease, and 43 questions related to self-care.	HbA1c reduced by 14% in the experimental group ($p<.001$). HbA1c reduced by only .48% in control group ($p=.100$). Self-care scores increased by 17.06% in the experimental group ($p<.001$) and by 2.9% in the control group ($p=.160$)	Strength: random assignment, inclusion and exclusion criteria for participants, and content validity and test-retest methods were used to help determine validity and reliability of the measurement tools Limitations: participants may have received education from other sources in addition to the education program/follow up phone calls. Individual interest or psychological state may affect participant's responses.	Conclusion: The study shows the effectiveness of follow-up on strengthening self-care is demonstrated by improved self-care questionnaire scores and HbA1c. The study shows that follow-up from a nurse has the ability to strengthen behaviors and create more consistency in diabetes treatment or management for patients. Recommendation: school nurses can provide continued follow-up about diabetes education to support diabetes self-management

Article Matrix #6

Source: Engelke, K., Swanson, M., Guttu, M., Warren, M. & Lovern, S. (2011). School nurses and children with diabetes: a descriptive study. *NC Medical Journal*, 72(5) 351-358.

Johns Hopkins Evidence Appraisal

Level of Evidence: Level III (descriptive study)

Quality rating: good quality

Purpose	Sample	Measurement	Results	Strengths/Limitations	Conclusion/ Recommendation
Analyze data and describe care provided to children with diabetes by school nurses using care management, identify differences in care on the basis of nurse workloads and the age of the child, explore the role of the nurse in responding to emergencies in the school and describe the relationship between case management and quality of life.	86 children from the US. The mean length of time a child received case management was 7.1 months, median duration was 6.8 months. 63 nurses, 25% assigned 1 school, 43% with 2 schools, 32% assigned 3 schools and 7% with 4 schools.	Method: School nurses completed an expanded health assessment. Instrument: Student goals established by the school nurse were examined by the authors. Nurses logged interventions and entered visits as ID/intervention day. (some intervention days had as many as 4-5 encounters), the relationship between case management and quality of life was measured by comparing baseline and final scores on the PedsQL 3.0 type 1 diabetes module quality of life scale	Safety goals were the priority and most highly met. The average number of intervention days (IDs) was greater for nurses assigned to 1-2 schools (40.3) than for nurses assigned to 3-4 schools(24.4) ($p<=.05$) Nurses assigned 1-2 schools had 25.3 days of direct care and those assigned 3-4 schools had 11.7 days. Nurses assigned 1-2 schools had 14.2 days of student education/counseling nurses with 3-4 schools had 11.6 days. Improvement in quality of life was seen in adolescents (beginning 64.97, end 70.57 change 5.60 $p=.05$)	Strengths: Review of the relevance of diabetes in children and the need for care during the school day. Tables accompanied narrative content and were consistent and helpful. Results were clear. T-tests were used to compare mean IDs between nurses assigned 1-2 schools and nurses assigned 3-4 schools and also used to compare QOL scores (between baseline and end of case management) Limitation: The sample was small and there was no comparison group. There was no measure of diabetes control (or HbA1c).	Conclusion: School nurses are effective in using case management to enhance the health and well-being of children with diabetes. When nurses are assigned fewer schools, they are able to provide more direct care and more education/counseling. Nurses working with students has a positive impact on their quality of life. Recommendation: to improve the well-being and meet the needs of diabetic students, nurses should be present during the school day

Article Matrix #7

Source: Schwartz, F., Denham, S., Heh,V., Wapner, A. & Shubrook, J. (2010). Experiences of children and adolescents with type 1 diabetes in school: Survey of children, parents and schools. *Diabetes Spectrum,* 23(1).

Johns Hopkins Evidence Appraisal

Level of Evidence: Level III

Quality rating: C

Purpose	Sample	Measurement	Results	Strengths/ Limitations	Conclusion/ Recommendation
To evaluate the experience of children and adolescents with Type 1 Diabetes in school by surveying patients, parents and school personnel involved in their care.	Convenience sample of 80 children and their parents and 28 school personnel surveys from 20 schools in the US. Age range K-12th grade with type 1 diabetes. School personnel were primarily school nurses (85%) or others directly responsible for care	Method: Questionnaires, designed by researchers, to identify the diabetes-related experiences of children, their parent, and school personnel. Instrument: Tables and frequency charts of responses by children, parents and school personnel were produced using SPSS software, cross tabulation was used to compare responses among children, parents and school personnel	70% of children and adolescents felt that they are treated differently in school because of diabetes, 53.2% (more than half) of the children and adolescents reported being prevented from self-management of their diabetes. Parents reported that schools do not always allow for adequate time for self-care. Only 40% of parents felt that school personnel were adequately trained to respond to needs. Only 27.6% of children and adolescents felt that school personnel were adequately knowledgeable to care for their diabetes. 38% of school personnel were very concerned about their preparedness to assist a child, only 20% of school personnel felt there were adequate nurses available for children with diabetes in their school.	Strengths: tables that accompanied the narrative in the article helped clarify the findings. Software was used to help tabulate responses Limitations: study size is small and self-selection by patients/parents if want to respond to a questionnaire. There is also no discussion regarding the reliability or validity of the questionnaire	Conclusion: The questionnaire helped to identify that ability to perform routine diabetes self-management was a concern, there was inadequacy of diabetes training to teachers/staff, the absence or lack of standardization of care plans and inadequate numbers of school nurses or other trained personnel to ensure safety. Recommendation: this study provides information for areas to focus on improvements for diabetic student's school environment from the perspective of the students, parents and school staff

Article Matrix #8

Source: Izquierdo, R., Morin, P., Bratt, K., Moreau, Z., Meyer, S., Ploutz-Snyder, R., Wade, M. & Weinstock, R. (2009). School-centered telemedicine for children with type 1 diabetes mellitus. *Journal of Pediatrics*, 155 (3) 374-379

Johns Hopkins Evidence Appraisal

Level of Evidence: Level 1

Quality rating: B Good

Purpose	Sample	Measurement	Results	Strengths/ Limitations	Conclusion/ Recommendation
To test the feasibility and effectiveness of telemedicine (video conference between school nurse, child, and diabetes team done monthly) to improve the care of children with Type 1 diabetes in schools	Children age 5-14 years old from the US randomized to usual care (18 students in 13 schools) or intervention (23 students in 12 schools).	Method: Usual care was medical visits every 3 months and communication between school nurse and diabetes team as needed by phone. Intervention group received those cares plus a telemedicine unit in school nurse office Instrument: HgA1c and pediatric quality of life were measured every 3 months for 1 year	A1c values increased from baseline to 6 months in the usual care group (8.5 to 9.5) and decreased in the telemedicine/intervention group (8.5 to 8.4) ($p<.02$). Improvements were also seen in several subscales of the pediatric diabetes quality of life questionnaire for the intervention group (the study reports "significant improvements" in dimensions that assess difficulty complying with care plan, difficulty with tasks, and emotional functioning). Urgent diabetes related calls initiated by the school nurse were significantly reduced (10 in intervention group and 35 in control/usual care group) and there were fewer hospitalizations and ER visits.	Strength: Randomized control trial - students were randomized to intervention or control group Limitation: number of schools and children enrolled was small. The study also reports 'technical difficulties' in the first three months of intervention.	Conclusion: A telemedicine program can improve diabetes care in grades K-8 - telemedicine being a link for communication between the school nurse, child and diabetes team at scheduled intervals/monthly Recommendation: the care of children with diabetes is complex and involves many caregivers. The school nurse is an important caregiver and supervises the care of these children during the school day, this team approach may be of even greater benefit by increasing access to care

Article Matrix #9

Source: Pennington, N. & Delaney, E. (2008). The number of students sent home by school nurses compared to unlicensed personnel. *Journal of School Nursing*, 24(5) 290-297.

Johns Hopkins Evidence Appraisal

Level of Evidence: Level III

Quality: B-good

Purpose	Sample	Measurement	Results	Strengths/ Limitations	Conclusion/ Recommendation
To determine if there is a difference in the number of students sent home when ill or injured based on who assessed the student in the school health office- a school nurse or an unlicensed school employee	Four schools in the US with students ranging from K-12 and student population of 2,100. The nurse to student ratio was 1:1,050. The number of students seen for illnesses or injuries were tracked for 5 months. A total of 3,132 reports were submitted.	Method: A Descriptive study. Illness/injury reports were submitted over a 5-month period. The reports were analyzed. The number that returned to class and number sent home were calculated for each group- either seen by school nurse or by unlicensed school employee Instrument: An Illness/injuries report form was created by health coordinators to record the number of illness/injuries seen in the school health office. All personnel were trained in the use of the form.	5% of students seen by the school nurse were sent home. 18% of students seen by an unlicensed school employee were sent home. 64% of students were assessed by a school nurse and 36% were seen by an unlicensed school employee. 95% of the students seen by the school nurse for illness or injury were able to return to the classroom and continue the academic day	Strengths: the illness/injury form was reviewed by school nurses for content and validity Limitations: threat to internal validity-the form needed to be completely and accurately filled out. The sample was small. No interrater reliability was established for those completing the form	Conclusion: More students could be kept in school when the school nurse provided assessment and interventions aimed at helping students, this improves school attendance which promotes academic success. Recommendation: the study demonstrates that full-time nurses reduce the number of students who leave school during the day because of illness or injury. The study can be used to advocate for increasing school nurse presence and supports there being a full-time nurse schools.

Article Matrix #10

Source: Peery, A., Keehner Engelke, M. & Swanson, M. (2012). Parent and teacher perceptions of the impact of school nurse interventions on children's self-management of diabetes. *The Journal of School Nursing*, 28(4) 268-271.

Johns Hopkins Evidence Appraisal

Level of Evidence: III

Quality rating: B good

Purpose	Sample	Measurement	Results	Strengths/ Limitation	Conclusion/ Recommendation
To examine the relationship between school nurse interventions and the parents and teachers perception of how well students can self-manage their diabetes.	Nurses enrolled students who were having difficulty managing their illness or difficulty in school. 69 children in the US with both parent and teacher assessment at baseline and the end of case management. 28 female and 41 male (ES-10, MS-38 and HS-21 students)	Method: Data was analyzed to evaluate the relationship of improvement in self-management with occurrence of nurse interventions. Instrument: A parent and teacher assessment tool/questionnaire was used. Diabetes related goals were developed in 6 areas (safety, symptom management, self-care, academic success, relationships and health care coordination. Interventions were grouped in 5 categories, (direct care, education/counseling, family education, teacher/staff education and coordination of care). Data from teacher and parent assessments, goals and interventions was analyzed	Assessment scores: The parent (baseline M=6.3, SD=2.3) and teacher (baseline M=6.4, SD= 2.6) assessment scores increased at the end of case management, parent (M=7.5, SD=2.3) teacher (M=7.7, SD=2.0). Students identified by their parents as improving in self-management were 5x more likely to have had counseling/education interventions (OR=4.9, 95% CI p=.02). Students identified by their teachers as showing improvement in self-management had more classroom visits by the nurse (M-14.8 intervention days) compared to students with no improvement (M=11.7) and more education sessions by the nurse with their teachers (M=16.7 intervention days) compared to students with no improvement (M=12.1).	Strength: the assessment tool was reviewed by three school nurses for face validity Limitations: small sample size and it focuses on parent and teacher perception of the child's self-management rather than the objective measure of self-management	Conclusion: Findings suggest that the roles of educator, counselor, and collaborator are important for school nurses who provide care to school-age children with diabetes. Recommendation: for the school nurse to address the skills and attitudes related to living with diabetes and not just helping with the tasks of diabetes care and include teachers, PE and guidance counselors in diabetes education.

Article Matrix #11

Source: Telljohann, S., Price, J., Dake, J. & Durgin, J. (2004). Access to school health services: Differences between full-time and part-time school nurses. *The Journal of School Nursing*, 20(3) 176-181.

Johns Hopkins Evidence Appraisal

Level of Evidence: II

Quality rating: B good

Purpose	Sample	Measurement	Results	Strengths/ Limitations	Conclusion/ Recommendation
To examine the difference in student access to health services between schools with nurses 2 days/week compared to schools with nurses 5 day/week.	Stratified random sample of elementary schools in the US were randomly assigned to either 5day/week nurse group (n=7) or 2day/week nurse group (n=7). (total 14 schools)	Method: To record the number and types of student visits Instrument: A form, created by the director of health services for the school system, was used to record the number and types of student visits Number of visits to the school nurse per 100 students per year for health service activities was tracked.	Of the 30 conditions or health office activities identified, 28 were seen by the school nurse significantly more often with full-time school nurses as compared to part-time school nurses. 21 of the 30 health service activities in schools with 5 day/wk nurses were accessed by students more often the expected 2.5 times that of the school with nurses 2 days/week. 5-day week school nurses were 6-12 times more likely as 2-day nurses to be involved in health education, asthma visits, critical/trauma incidents, substance abuse visits, mental health counseling, and menstrual/gynecological issues.	Strengths: the "form' was reviewed by 48 school nurses for content validity and review over a 2-yr period prior to data collection Limitations: nurses found completion of the form burdensome which may threaten internal validity, form didn't account for time spent with students, the sample was small, which limits generalizability. There was no interrater reliability established.	Conclusion: the study suggests a significant unmet need for access to health care services in schools with part-time nurses. The study found that children in schools with part-time nurses may not receive adequate access to school-based health care as compared to children in school with full-time nurses. Children's health problems in schools with part time school nurses either are not being addressed or may be handled by non-medical personnel such as secretaries Recommendation: school nurses should use this data to advocate for increasing the number of school nurses in their school district.

Article Matrix #12

Source: Yi Han, M., Spezia Faulkner, M., Fritz, H., Fadoju, D., Muir, A., Abowd, G., Head, L. & Arriaga, R. (2015). A pilot randomized trial of text-messaging for symptom awareness and diabetes knowledge in adolescents with type 1 diabetes. *Journal of Pediatric Nursing,* 30, 850-861.

Johns Hopkins Evidence Appraisal

Level of Evidence: 1

Quality rating: Good

Purpose	Sample	Measurement	Results	Strengths/ Limitations	Conclusion/ Recommendation
To examine the effect of text messaging between regular clinic appointments to engage adolescents in their personal awareness of symptoms and knowledge of diabetes management	30 preadolescents or adolescents with Type 1 Diabetes (T1D) were recruited at a diabetes clinic in the US. inclusion criteria included age, diagnosed for over 1 yr, HbA1c 7.5%-11%, have a cell phone and able to read English.	Method: Participants were randomly assigned into one of three groups to receive text messages: 1. Control group: received no text messages, 2.Symptoms awareness group (S) received only symptoms questions every other day. 3.Symptoms awareness and knowledge group (SK) received both symptom and knowledge questions every day Instrument: HbA1c was measured before and after. Quality of life was measured by the Problem Areas in Diabetes questionnaire and the Diabetes Quality of Life for Youth questionnaire	Of the 30 adolescents enrolled, 27 completed the study. No significant difference in HbA1c between 3 groups, C: decreased 0.21 S: decreased 0.37, SK: decreased 0.03. However, over time, all 3 groups had mean reductions in HbA1c. Improvements on QOL: The SK group reduced their worries (7.79 % improved)$p<.05$ and perceived impact of diabetes on their lives (10.42% improved)$p<.001$. The S group also improved on worries about diabetes (improved 1.4%)p=240	Strengths: face validity and content validity for appropriateness of questions used as they were designed with input from physicians and nurse practitioner. Limitations: small sample and short duration/3-4 months	Conclusion: daily text messages lessened some negative impacts of having diabetes for participants. The response rate was around 80% for both symptom and knowledge questions indicating adolescents were receptive. The results indicate trends toward improvement in life satisfaction, metabolic control and decrease in diabetic related worries when receiving text messages on symptom awareness every other day. Recommendation: supports value in frequent check-ins to improve symptom awareness and overall diabetes management. School nurses can provide education on symptom awareness and diabetes management.

Article Matrix #13

Source: Iturralde, E., Weissberg-Benchell, J. & Hood, K. (2016). Avoidant coping and diabetes-related distress: Pathways to adolescents' type 1 diabetes outcomes. *American Psychological Association*, 36(3) 236-244.

Johns Hopkins Evidence Appraisal Level of Evidence: I

Quality: Good

Purpose	Sample	Measurement	Results	Strengths/Limitation	Conclusion/ Recommendation
Examine the association between avoidant coping style in adolescents and diabetes related distress and diabetes outcomes.	264 Adolescents with Type 1 Diabetes. Youth were recruited in the US. Inclusion criteria age 14-18, minimum 1 year diabetes, insulin dependent and spoke English fluently.	Method: Participants were randomized into 2 interventions: Group 1-a resilience skills program (Type 1 Diabetes (T1D) education with cognitive-behavioral concepts.) Group 2-a dose-matched advanced diabetes education class. (Lessons on Diabetes Instrument: Adolescents were examined 4 times over 1 year to measure avoidant coping style, diabetes-related distress, adherence (glucometer data and self report) and glycemic control (A1c). Questionnaires were completed on avoidant coping style and diabetes-related distress. Adherence was measured by blood glucose monitoring frequency and A1c by blood draw during assessment visits	Neither intervention group saw changes in avoidant coping style over time F=.70 P=.55. Higher levels of avoidant coping were associated with greater diabetes-related distress (rs=.33-.38 ps<.001), which was related in turn to fewer blood glucose checks, less frequent self care behaviors, and poorer glycemic control(rs=-.31 to -.20, ps<.01). Avoidant coping style was consistently associated with reduced self-care behaviors (rs=-.31to -.20 ps<.01)	Strengths: use of repeated measurement of psychological and diabetes health processes at 4 assessment points with a large sample. Limitations: the interventions provided (T1D education and cognitive-behavioral concepts) may have influenced the outcome - the groups may have lessened in avoidant coping due to the education (skill building and improved diabetes knowledge) which has an effect on the findings. Also selection bias - those with depression were excluded	Conclusion: an avoidant coping style contributes to greater diabetes specific distress followed by deterioration in self-management and glycemic control. Recommendation: the maladaptive coping style is modifiable and offers an entry point to intervene to help. When avoidant coping skills are identified-the school nurse can assess and intervene during diabetes care visits. School nurses can also aim to reduce the discomfort associated with facing day-to-day diabetes tasks to help limit avoidance

Article Matrix #14

Source: Maranda, L., Lau, M., Stweart, S. & Gupta, O. (2015). A novel behavioral intervention in adolescents with Type 1 Diabetes Mellitus improves glycemic control. *The Diabetes Educator*, 41(2) 224-230.

Johns Hopkins Evidence Appraisal
Level of Evidence: I
Quality: good B

Purpose	Sample	Measurement	Results	Strengths/ Limitations	Conclusion/ Recommendation
To develop and test a behavioral intervention (the structured care of a pet) that would improve diabetic adolescent glycemic control	28 adolescents with A1C>8.5% were recruited from a diabetes clinic in the US. The study reports no significant differences between intervention and control groups for age, gender, race/ethnicity, diabetes duration, A1C at enrollment. 36% were male and mean age was 14.2.	Method: Participants were randomly assigned to either the intervention group (care of a pet fish) or control group (usual care)Intervention group were given instructions to associate daily and weekly fish care duties with diabetes self-management tasks (blood glucose testing and parent-child communication) Instrument: Primary outcome measure was A1C, measured at baseline and after 3 months. Secondary outcomes included QOL (PedsQoL Generic Core and Diabetes Module) at baseline and 3 months and the Self-Management of Type 1 Diabetes for Adolescents questionnaire	Intervention group decreased A1C by .5% compared to the control group that increased their A1C by .8% (p=.04). Ages 10-13 had a greater improvement of -1.5% (p=.04). No significant effects were observed for the PedsQoL modules or the subscales on the SMOD-A questionnaire.	Strengths: inclusion and exclusion criteria so the two groups were relatively similar which limits confounding variables. The randomization and control group are also strengths. Limitation: small sample size, the clinician was not blinded which could have affected the glycemic outcomes	Conclusion: The structured care of the pet provides cues to perform diabetes self-management behaviors and therefore improves glycemic control. Recommendation: the article notes the improvement in the younger adolescents can be related to their characterization of a desire for independence, rule following and greater interest in privacy. The school nurse could use this information to correlate diabetic care with another task during the school day to foster independence and promote training in self-care

Article Matrix #15

Source: Whittemore, R., Liberti, L., Sangchoon, J., Chao, A., Minges, K., Murphy, K. & Grey, M. (2016). Efficacy and implementation of an internet psychoeducational program for teens with Type 1 Diabetes. *Pediatric Diabetes*, 17(8) 567-575

Johns Hopkins Evidence Appraisal

Level of Evidence: Level II Quasi-experimental

Quality rating: C low

Purpose	Sample	Measurement	Results	Strengths/ Limitation	Conclusion/ Recommendation
To evaluate if the participation in an internet psychoeducational program (aimed to increase self-efficacy by retraining behavior to more positive patterns and diabetes education) improves patients A1C and Quality of Life (QOL) as compared to an open-access diabetes website (with diabetes education and discussion boards)	124 teens in the US with Type 1 diabetes (age 11-14 years and 63% female) consented to a 'web-based information prescription' but were randomized into one of the 2 intervention groups blindly.	Method: Teens were to logon to the websites at least 2x/weekly over 4 wks and participate on discussion boards. Data included the number of logins, posts to discussion board and lessons completed. Instrument: Participation was assessed via IT programming from each intervention website. A1c was obtained via a chart review at baseline, 3 months and 6 months. QOL was measured by the Diabetes-specific Pediatric Quality of Life Inventory. Self-care was assessed with the Self-Care Inventory to assess adherence to diabetes self-care behaviors teen or parens view	Number of logins was similar between groups (14/teen). Posts to the discussion board were higher in the open-access diabetes website (28 vs. 19). When participation was monitored and reminders were individualized to the teen, there was high participation in lessons. Participation in completing lessons was low (69% completed any lessons). There was no change to mean A1C and no significant difference in QOL between groups	Strengths: randomization to groups. Limitations: small sample size, recruited from a diabetes center and subjects had "relatively good metabolic control" (Whittemore et al) Results cannot be generalized to all teens. The effect of psychoeducational programs may have been more visible if the study had a true control or a non-experimental group.	Conclusion: psychoeducational programs are helpful to teach adolescents with Type 1 DM how to cope and manage their diabetes, family-based intervention and programs help with problem-solving (Whittemore et al). However, teens did not actively participate in the psychoeducational program if they did not have frequent reminders. Recommendation: Because teens have competing demands, strategic implementation of targeted reminders and support by the school nurse during the day may help improve outcomes

Article Matrix #16

Source: Markowitz, J., Cousineau, T., Franko, D., Schultz, A., Trant, M., Rodgers, R. & Laffel, L. (2014). Text messaging intervention for teens and young adults with diabetes. *Journal of Diabetes Science and Technology*, 8(5) 1029-1034.

Johns Hopkins Evidence Appraisal Level of Evidence: Level 1

Quality rating: c-low

Purpose	Sample	Measurement	Results	Strengths/ Limitations	Conclusion/ Recommendation
To examine if a text message program targeting self-efficacy and goal setting among diabetics will improve diabetes outcomes. Both groups set goals for nutrition and physical activity.	90 recruited participants in the US with mean age 18.7 with diabetes for 10 years (+/- 4.6 years) and A1c of 8.7 (+/- 1.7). 47% male and 91% with Type 1 diabetes.	Method: Experimental group received text messaging intervention. (texts: daily motivation, goal check-ins, and logistical check-ins/identify any texting difficulties) Control group received traditional information provided in pamphlet format. Instrument: A1c, Physical Activity and Health Food Efficacy Scale for Children (PAHFE-C) at baseline and 1 month, and at the end of 1 month a satisfaction survey,	Small improvement in A1c Participants were positive about the intervention. 93% of participants reported working toward their health goal during the study and 71% reported it helped them follow their health goals. 67% of adolescents stated the text message helped them feel motivated about having healthier habits. Both groups showed a small non-significant improvement in A1C (-.6 in the control group and -.2 in the intervention group) (P=.5). There was no difference in change score from baseline to follow-up between the 2 groups self-efficacy (P>.21).	Strength: participants were randomized into control or experimental groups. Limitations: Participants were recruited, the sample size was small, the study duration was short, the sample was primarily white college students so not representative of youth in general.	Conclusion: Results are not significant. However, positive, daily, motivational text messages may increase motivation for changes in areas of nutrition and physical activity. Recommendation: Apply the intervention of motivational, positive, daily educational intervention to youth with diabetes in the school setting to improve diabetes goals.

Article Matrix #17

Source: Ye, C., Jeppson, T., Kleinmaus, E., Kliems, H., Schopp, J. & Cox, E. (2017). Outcomes that matter to teens with type 1 diabetes. *The Diabetes Educator,* 43(3) 251-259.

Johns Hopkins Evidence Appraisal

Level of Evidence: III

Quality: B good

Purpose	Sample	Measurement	Results	Strengths/Limitations	Conclusion/Recommendation
To describe outcomes that matter to teens with type 1 diabetes (T1D) which could support successful interventions to improve diabetes self-management	50 publicly available published posts from "teen" diabetes online forums, one in the US and one in the UK. Posts were evaluated between year 2011-2013. (average age 15.7yrs) average time since diagnosis was 6.3yrs. 36 subjects:11 female, 5 male and 20 unknown	Method: Qualitative research method to analyze posts made by teens. Content and descriptive data was collected Instrument: 2 researchers and 3 trained coders used coding techniques to analyze the content of the posts and identify outcome themes. They identified outcomes as "impacts or consequences of T1D).	Most commonly mentioned outcomes were interactions with peers 72%, emotional well-being 56%, and blood glucose management 40% Other outcomes included physical well-being 20%, education and motivation of others 14%, family interactions 10%, academic achievement 10% and interactions with important others such as teachers 8%	Strength:were that there were multiple researchers and coders to code the information had similar findings, excerpts/example posts were provided in tables, multiple researchers were used which supports investigator triangulation and promotes reliability of their findings Limitations were that posts were open to the public so teens may have been hesitant to share openly, teens who chose to post might not represent all teens with T1D and some posts did not include age, so they may not be teens even though it was a 'teen' forum.	Conclusion: many outcomes matter to diabetic teens; their blood glucose control is one of them, but many fail to maintain blood glucose control. Peer pressure, stigma and stress in teenage life is also a concern for teens with T1D. Teens shared that they want to be normal and free from distress of social stigma associated with their diabetes treatment needs (Ye et al 2017). Recommendations: nurses should consider what is important to diabetic teens when working with them to motivate them to improve their blood glucose control. School nurses can strive to create an environment that promotes self-care by minimizing interruptions to the students' normal school day, support peer interactions, emotional well-being and educate staff.

Article Matrix #18

Source: Helgeson, V., Palladino, D., Becker, D., Escobar, O., Reynolds, K. & Siminerio, L. (2014). Relationships and health among emerging adults with and without type 1 diabetes. *Health Psychology,* 33(10), 1125-1133.

Johns Hopkins Evidence Appraisal

Level of Evidence: II Quasi-experimental

Quality: Good

Purpose	Sample	Measurement	Results	Strengths/ Limitations	Conclusion/ Recommendation
To examine the impact of parent and peer relationships on health behaviors and psychological well-being of youth with and without type 1 diabetes	117 seniors in high school and one year later in the US with diabetes and 122 without diabetes were recruited from a previous study	Method: youth with and without diabetes completed questionnaires Instrument: Questionnaires, depression scale, perceived stress scale, eating disorder inventory and self-care inventory to address supportive and problematic aspects of parent and peer relationships, health behaviors, psychological well-being and for diabetics: also self-care behaviors and glycemic control.	Friend conflict was a more potent predictor than friend support of changes in health behaviors. Peer relationships influence health behaviors and psychological well-being. Parent support was related to better self-care behavior. When parent support was low, friend conflict was associated with higher HbA1c.	Strengths: the scales were established and reported good reliability and validity Limitations: the respondents were primarily middle class and Caucasian which limits generalizability and that other variables can affect health behaviors and well-being other than parent support and peer relationships	Conclusion: Parent relationships remain an important influence on health behaviors and psychological well-being of young adults Supportive relationships with parents predicted better diabetes self-care as measured by a self-care inventory. Parent and peer relationships influence health behaviors and psychological well-being of young adults with Type 1 diabetes Recommendations: School nurses should collaborate with parents and encourage parental support and involvement

Matrix #19

Source: Schiaffini, R., Tagliente, I., Carducci, C., Ullmann, N., Ciampalini. P., Lorubbio, A. & Cappa, M. (2016). Impact of long-term use of eHealth systems in adolescents with type 1 diabetes treated with sensor-augmented pump therapy. *Journal of Telemedicine and Telecare,* 22(5), 277-281.

Johns Hopkins Evidence Appraisal

Level of Evidence: I

Quality: Good

Purpose	Sample	Measurement	Results	Strengths/ Limitations	Conclusion/ Recommendation
To compare the long-term effect of eHealth intervention and traditional care on glyco-metabolic control of type 1 diabetes in adolescents with sensor-augmented pump therapy	29 adolescents with type 1 diabetes and sensor-augmented pump (SAP) from Italy were randomly assigned to a telemedicine intervention group or traditional care.	Method: The telemedicine group had monthly teleassistance and tele-interaction between the medical team and patient/families. The study period was five years. Instrument: HbA1c in the year before randomization was evaluated for each group and at 6 month intervals. Number of insulin boluses and blood glucose tests/day was measured and recorded	Mean HbA1c values during the follow-up period were significantly (p=.03) lower in the telemedicine group (7.5) as compared to the control group (7.8). HbA1c decrease in the telemedicine group was associated with better treatment compliance through frequency of sensor use, number of BG tests and number of insulin boluses.	Strength: the recorded outcomes were analyzed using software and both groups were homogeneous for sociodemographic characteristics Limitations: a small sample size which limits generalizability and confounding variables can also contribute to better glycemic control	Conclusion: monthly teleassistance improved treatment compliance. Patients receiving frequent feedback provided by the medical/multidisciplinary team were more compliant in self-management of diabetes Recommendations: The school nurse should be a part of the multidisciplinary team because they can help provide frequent feedback to support diabetes management.

Matrix #20

Source: Winnick, J., Berg, C., Wiebe, D., Schaefer, B. & Pui-Wa, L. (2017). Metabolic control and academic achievement over time among adolescents with Type 1 diabetes. *American Psychological Association,* 32(1), 105-117.

Johns Hopkins Evidence Appraisal

Level of Evidence: II

Quality: good

Purpose	Sample	Measurement	Results	Strengths/Limitations	Conclusion/Recommendation
To examine the relationship between the control of Type 1 Diabetes and academic performance	252 adolescents with Type 1 diabetes were recruited at clinic appointments in the US. Participants were between 10-14 years old and had Type 1 diabetes for one year or more.	Method: measure the relationship between academic achievement/Grade Point Average (GPA) and metabolic control (A1c) every 6 months at clinic appointments Instrument: A1C was used to measure glycemic control and GPA scores were reported by mothers	HbA1c predicted change in GPA: Positive trends in GPA and HbA1c were observed in the sample. A1c was a limiting factor for GPA whereas GPA was not associated with changes in A1c.	Strengths: the study also notes disease duration's effect: those with type 1 diabetes for < or = 1.7 years showed stronger coupling: that the higher GPA was related to slower increase in HbA1c, 2 coupled change equations were examined: poor metabolic control limits GPA and whether GPA limits changes in HbA1c and the study also equated in moderator factors such as age, disease duration, intelligence scores, pump status and sex.. Limitations: recruited sample, that the mothers reported the GPAs and the sample was homogenous which limits generalizability	Conclusion: poor metabolic control limits student academic achievement and the study indicates the importance of maintaining good diabetes management for school success (Winneck et al., 2017). Recommendations: Facilitating good diabetes management at school affects not only the students' health and safety but also academic achievement

Article Matrix #21

Source: Wagner, J., Heapy, A., James, A. & Abbott, G. (2006). Brief report: Glycemic control, quality of life and school experiences among students with diabetes. *Journal of Pediatric Psychology,* 31(8), 764-769.

Johns Hopkins Evidence Appraisal

Level of Evidence: III

Quality: Good

Purpose	Sample	Measurement	Results	Strengths/ Limitations	Conclusion/ Recommendation
To determine if training school staff and friends has an effect on A1c, does the diabetic's and parent's perception of the school experience have an effect on diabetes control?	58 Children in the US with Type 1 diabetes, average age 12 years old, diagnosed with diabetes for 5 years and attended public school, and their parents	Method: Descriptive study. Instrument: a Diabetes Quality of Life for Youth(51 items to assess diabetes satisfaction, impact and worry), a parent survey (designed for this study that included whether personnel at school had received diabetes training), parent report of A1c and student interview to assess experiences at school (including appropriate care in school settings, potential diabetes related problems, supports and whether classmates were trained)	Children whose parents reported school staff were trained showed significantly better diabetes control (HbA1c 7.7) than those who reported untrained school staff HbA1c 8.4).. 58% of parents reported that their child's school personnel had received training in routine diabetes care. Children who had to leave class for diabetes care had higher HbA1c (8.4) than those who indicated they were unrestricted (7.5) Children who reported trained peers had significantly higher QOL (M=82.8) than those with untrained classmates (M=75.2)	Strengths: Interviewers were psychologists that were blind to participants QOL and A1c data and were trained in asking open-ended and non-leading questions Limitation: Cross-sectional, observational design, limited to self-report which affects reliability (how well they understand or children's age for reporting). Generalizability is limited	Conclusion: Flexibility to decide where to perform self-care demonstrated better glycemic control. Training school staff about diabetes cares benefits students quality of life and A1c. Recommendation: School nurses should educate school staff and student peers in order to help improve diabetic student's QOL and A1c.