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The Relationships Among School Nurse to Student Ratios, Self-efficacy for Type 1 Diabetes Management, and Glycemic Control in Adolescents

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THE RELATIONSHIPS AMONG SCHOOL NURSE TO STUDENT RATIOS,
SELF-EFFICACY FOR TYPE 1 DIABETES MANAGEMENT, AND GLYCEMIC
CONTROL IN ADOLESCENTS

BY

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Abstract

Type 1 diabetes mellitus (T1DM) is one of the most common chronic diseases of childhood. Adolescents with T1DM experience decreased treatment adherence, poor glycemic control, and acute complications more frequently than adults. Self-efficacy is the belief that one can carry out specific behaviors in specific situations and is the major determinant of intention, and has been shown to influence diabetes self-management in the adolescent.

School nurses are in a unique position to influence self-efficacy for type 1 diabetes management in adolescents. Although previous research has shown that school nurses positively influence student health outcomes in a variety of ways, there is little empirical evidence regarding the impact of the school nurse on students' perceptions of their self-efficacy, or ability, to manage their diabetes.

The purpose of this descriptive correlational study was to determine if there is a relationship among the school nurse to student ratio, self-efficacy for type 1 diabetes management, and glycemic control in adolescents; age and diabetes duration were also explored. The sample consisted of 89 parent-adolescent dyads. Adolescents aged 10-16 years old with T1DM completed the Self-Efficacy for Diabetes Self-Management (SEDM) scale and a brief questionnaire about diabetes in the school setting. Parents completed a 42-item questionnaire about adolescents' diabetes in general and in the school setting.

A negative correlation ($r = -.244, p = .021$) was noted between school nurse to student ratio and glycemic control, measured by HbA1c levels. No statistically significant relationships were found between self-efficacy for type 1 diabetes management and either school nurse to student ratio or HbA1c levels. The SEDM was associated with age ($r = .224, p = .036$) and showed gender differences; a t-test was significant, $t(87) = -2.00, p = .048$, with females scoring higher. A large correlation between school nurse to student ratio and age was also noted ($r = .539, p < .01$).

Several other findings derived from the questionnaires contribute new knowledge to the paucity of existing literature on school nursing and adolescents with type 1 diabetes, with numerous implications for nursing practice, education, research, and policy.

Chapter I

INTRODUCTION TO THE PROBLEM

Worldwide, estimates of the incidence of type 1 diabetes mellitus (T1DM) in the general population have shown an increase over the past two decades (Dabelea et al., 2007). The prevalence of T1DM in youth less than 20 years old increased by 21.1% from 2001-2009 across both genders, all age groups except birth to 4 years old, and all ethnic subgroups, with the exception of American Indians; the greatest increase in prevalence was noted in adolescents aged 15-19 years old (Dabelea et al., 2014). It is estimated that in the United States (US), individuals with T1DM may number up to 3 million (Chiang, Kirkman, Laffel, & Peters, 2014). Using data from the SEARCH for Diabetes in Youth population based study, researchers estimated that the annual number of newly diagnosed youth less than 20 years of age with T1DM in the US in 2009 was approximately 18,436 (Chiang et al., 2014). Moreover, it is estimated that T1DM and type 2 diabetes mellitus (T2DM) affect 208,000 children and adolescents under 20 years of age (Centers for Disease Control and Prevention [CDC], 2014). When stratified by age, the rates of newly diagnosed cases of T1DM were similar among the < 10 years old group (19.7 cases per 100,000) and the 10-19 years old group (18.6 cases per 100,000) (Dabelea et al., 2007). Prevalence varies by race and ethnicity; Dabelea et al. (2007, 2014) reported that the highest rates of T1DM were observed in nonHispanic White youth.

Adolescence is a pivotal time in a child's life, marked by the transition from childhood to adulthood. This is especially true for a child who has been diagnosed with T1DM. Adherence to the diabetes management plan declines as does glycemic control (Rausch et al., 2012). Self-efficacy is the belief that one can carry out specific behaviors in specific situations and is the major determinant of intention (Bandura, 1997). Self-efficacy has been shown to influence diabetes self-management in the adolescent; therefore, those adolescents with a strong or high level of self-efficacy should be more resilient when faced with barriers to the management of their diabetes (Iannotti et al., 2006).

Student enrollment in pre-kindergarten through twelfth grade in public and private educational institutions was projected to approximate 55 million children in 2013 (U.S. Census Bureau, 2012). Students spend an average of 6.6 hours per day or 1,193 hours per year in school (National Center for Education Statistics, 2011); therefore, the increasing incidence and management of diabetes in youth in the school setting poses a unique challenge to school nurses. As the leader in the school health community, school nurses provide health care to students using clinical knowledge and judgment, providing expertise and oversight for the provision of health care services (National Association of School Nurses [NASN], 2011a). In order to ensure student safety, NASN recommends minimum school nurse to student ratios depending on the needs of the population: 1:750 for the general population, 1:225 in the population requiring daily professional school nursing services or interventions,

1:125 in student populations with complex health care needs, and 1:1 for individual students with highly complex and continuous needs (NASN, 2010).

Unfortunately, there is a great deal of variability throughout the US in the nurse to student ratios proposed by NASN. Vermont ranks first (best) with a 1:396 ratio, while Michigan ranks last (worst) with a 1:4,411 ratio. Indiana, representing the median state, ranks 26th with a 1:960 ratio (NASN, 2011b). Only 45% of public schools have a full time school nurse presence on site, and many school nurses provide health services to multiple schools (NASN, 2010). There are complex reasons for inadequate numbers of school nurses in some states. Insufficient funding for school nurse positions, rather than a shortage of school nurses, contributes to the variable models of school health delivery systems and school nurse caseloads (NASN, 2010). Key health policymakers typically are unfamiliar with school based health. As a result, the health care community and by extension, the community at large, lack an understanding and appreciation for the school nurse's role in providing school based health services (Lear, 2007). In addition to organizational factors, there are barriers to obtaining substitute nurses, such as a limited supply of nurses in the workforce and a pay rate that is not commensurate with advanced education and experience (Vollinger, Bergren, & Belmonte-Mann, 2011).

There are far reaching effects on student health outcomes when a school nurse presence on site is lacking. Oftentimes, the health office is either unstaffed entirely or staffed by personnel without medical or nursing knowledge (Vollinger et al., 2011). Empirical studies have shown that the lack of a school nurse presence impacts

negatively on medication administration (Canham et al. 2007; Ficca & Welk, 2006; Kelly, McCarthy, & Mordhorst, 2003; McCarthy, Kelly, & Reed, 2000; Price, Dake, Murnan, & Telljohann, 2003), student attendance (Telljohann, Dake, & Price, 2004), early release or dismissal from school (Allen, 2003; Pennington & Delaney, 2008; Wyman, 2005), vaccination rates (Salmon et al., 2004), access to school based health care (Telljohann, Price, Dake, & Durgin, 2004), and management of chronic illness (Guttu, Engelke, & Swanson, 2004; Nabors, Troillet, Nash, & Masiulis, 2005). Indeed, in their landmark publication, *The Future of Nursing*, the Institute of Medicine (2011, p. 435) recommends a certified school nurse to student ratio of 1:750 in every state and in all schools.

T1DM is one of the most common chronic diseases of childhood (Kelo, Martikainen, & Eriksson, 2011) and much of the empirical literature in school nursing focuses on diabetes management from the perspectives of the school nurse (Darby, 2006; Fisher, 2006; Nabors et al. 2005), the child or adolescent (Hayes-Bohn, Neumark-Sztainer, Mellin, & Patterson, 2004; Nabors, Lehmkuhl, Christos, & Andreone, 2003), the parent (Hayes-Bohn et al., 2004; Peery, Engelke, & Swanson, 2012), and the teacher (Peery et al., 2012). In an integrative review of 22 studies conducted by Kelo et al. (2011), data were obtained primarily from the perspectives of the child and/or the parent. In a randomized intervention study, Nguyen, Mason, Sanders, Yadzani, and Heptulla (2008) found that school nurse supervision of blood glucose monitoring, insulin injection, and insulin dose adjustment in the school setting significantly reduced HbA1c levels in students with poorly controlled T1DM.

Self-efficacy beliefs are based on individuals' *perceptions* of their ability to execute specific tasks or behaviors rather than their ability to actually do so.

Perceived self-efficacy is the major determinant of human behavior, as people's level of motivation, affective states, and actions are based primarily on what they believe to be true rather than what is actually true. Self-efficacy beliefs influence the course of action people choose to pursue, how much effort they expend, how long they persevere in the face of obstacles and failure, their resilience to adversity, whether their thought patterns are hindering or helpful, how much stress they experience in coping with challenging environmental demands, and the level of accomplishment they attain. For example, individuals with a higher perceived self-efficacy are more likely to be persistent in behaviors with thought patterns that lead to success than those with lower levels of perceived self-efficacy, who anticipate failure and have negative thought processes (Bandura, 1997).

Positive health practices are formed during childhood and adolescence. Although familial practices are largely influential in the development of health promoting behaviors, the school setting is also important in the reinforcement of such behaviors, as students spend a great portion of their time in school (Bandura, 1997).

The school nurse is in a unique position to influence self-efficacy for type 1 diabetes management in adolescents. Higher levels of self-efficacy are associated with increased treatment adherence and therefore increased glycemic control (Iannotti et al., 2006), which greatly reduces complications and morbidities often associated with diabetes (CDC, 2011).

Problem Statement

Although previous research has shown that school nurses positively influence student health outcomes in a variety of ways, there is little empirical evidence regarding the impact of the school nurse on students' perceptions of their self-efficacy, or ability, to manage their diabetes.

Purpose of the Study

The purpose of this study was to determine if there is a relationship among the school nurse to student ratio, self-efficacy for type 1 diabetes management, and glycemic control in adolescents.

Definitions

School nurse to student ratio was conceptually defined in this study as the number of full-time equivalent (FTE) school nurses (E. Maughan, personal communication, February 21, 2014) available for the total number of students (NASN, 2010). The number of FTE school nurses was operationally defined by the responses given by school personnel to the researcher's telephone inquiry. The total student enrollment was operationally defined as follows: New Jersey public and charter school total enrollment as reported by the New Jersey Department of Education ([NJDOE], 2014) for the school year 2013-2014; New Jersey nonpublic school total enrollment as reported by the NJDOE Office of Nonpublic School Services (G. Kocher, personal communication, October 2, 2014) for the school year 2013-2014.

Self-efficacy for type 1 diabetes management in adolescents was conceptually defined as “beliefs in one’s capabilities to organize and execute the courses of action required to produce given attainments” (Bandura, 1997, p. 3), and operationally defined by the mean score of 10 items recorded on the Self-Efficacy for Diabetes Self-Management (SEDM) scale (Iannotti et al., 2006).

Adolescents were conceptually defined as “young people between the ages of 10 and 19” (World Health Organization, 2013), and operationally defined by the age recorded on the demographic questionnaire. Adolescents between the ages of 10 and 16 years old were included in this study, as this was the age range used for norming of the SEDM (Iannotti et al., 2006).

Glycemic control was conceptually defined as an individual’s average blood glucose level over the previous two to three months, obtained by measuring the percentage of glucose that adheres to the red blood cell, which is proportional to the amount of glucose in the blood (American Diabetes Association [ADA], 2013a). Glycemic control was operationally defined by the most recent HbA1c level recorded by the parent on the demographic questionnaire.

Inclusion and Exclusion Criteria

The population of study was adolescents with T1DM. Inclusion criteria for the study were the following: English speaking; aged 10-16 years old; attendance at a public or private school; diagnosed with T1DM, unspecified onset and duration; insulin administration via injection or continuous subcutaneous insulin infusion (CSII); and able to read and understand grade level material. Exclusion criteria

included: nonEnglish speaking; aged less than 10 and greater than 16 years old; home schooled; T2DM; cognitively impaired; and any comorbid disease processes that lead to an increase in interaction with the school nurse. It is probable that increased interaction with the school nurse may lead to the skewing of results.

Theoretical Framework

Theoretical underpinnings for this study originated from Albert Bandura's self-efficacy theory, derived from social cognitive theory. Social cognitive theory posits that, within the nature of human agency, people can exercise influence over what they do. They contribute to, but are not the sole determinants of what happens to them. Agency refers to acts done with intentionality, whether the consequences are beneficial, detrimental, or unintended. Personal efficacy beliefs comprise the key component of human agency, which operates in a triadic reciprocal causation structure, consisting of bidirectional relationships between behavior, personal factors, and the external environment (Bandura, 1997).

Perceived self-efficacy refers to beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments. Self-efficacy is not an omnibus measure of global efficacy, but rather, is domain specific, differing in level, strength, and generality. The four sources of self-efficacy are enactive mastery experiences, vicarious experiences, verbal persuasion, and physiological and affective states. Enactive mastery experiences serve as indicators of capability. Vicarious experiences modify efficacy beliefs through comparison with the attainment of others. Verbal persuasion serves as a social influence that an individual possesses

certain capabilities. Physiological and affective states serve as a basis from which individuals partially judge their capability, strength, and vulnerability (Bandura, 1997).

The researcher posited that reciprocal interactions of the student and the school nurse have a direct effect on self-efficacy for type 1 diabetes management. The school nurse and the student interact in each of Bandura's (1997) four sources of efficacy information. Through verbal persuasion and encouragement, the student acquires skills related to the management of T1DM, which directly influences his or her enactive mastery experience. Using vicarious experience, the school nurse can facilitate meetings or support groups where students newly diagnosed with T1DM can interact with students who have been effective in their own diabetes management. Lastly, the school nurse can positively impact the source of efficacy information of physiologic and affective states through a calm and reassuring approach.

Research Question

Is there a relationship among the school nurse to student ratio, self-efficacy for type 1 diabetes management, and glycemic control in adolescents?

Significance of the Study

Adolescents with T1DM experience decreased treatment adherence (Rausch, et al., 2012), poor glycemic control and acute complications more frequently than adults, largely attributable to their changing physiology and to behavioral and adherence issues (Svoren, Butler, Levine, Anderson, & Laffel, 2003). Diabetes is a highly complex disease that requires intensive management in order to prevent

complications such as heart disease, hypertension, blindness, renal disease, neuropathies, limb amputation, dental disease, and pregnancy complications (CDC, 2011). While the complications of retinopathy, nephropathy, and neuropathy are rarely reported in prepubertal children and children with diabetes duration of fewer than two years, they may appear after the onset of puberty or after 5-10 years of diabetes (Chiang et al., 2014). Hyperglycemia can lead to diabetic ketoacidosis requiring hospitalization (ADA, 2013b). Management of T1DM requires skills such as frequent monitoring of blood glucose, insulin administration, carbohydrate counting, and treatment of hypoglycemia (Svoren et al., 2003).

The consequences of poorly managed T1DM are vast. Significant comorbidities are well defined in the literature (CDC, 2011) and result in great cost, both physically and financially. The risk of stroke is two to four times higher among individuals with diabetes. Adults with diabetes have heart disease mortality rates that are two to four times higher than adults without diabetes. Diabetes is the leading cause of new cases of blindness among adults aged 20-74 years old. In addition, diabetes is the leading cause of renal disease, accounting for 44% of new cases in 2008. The total cost of diagnosed diabetes in the US in 2012 was \$245 billion, of which \$176 billion went to direct medical costs and \$69 billion went to indirect costs resulting from reduced productivity from disability, work loss, and premature mortality (ADA, 2013c). Predicted mean annual medical expenditures associated with diabetes among privately insured youth in the US in 2007 were \$9,333 for T1DM and \$5,683 for T2DM (Shrestha, Zhang, Albright, & Imperatore, 2011). In a similar study

examining costs associated with diabetic ketoacidosis and severe hypoglycemia for privately insured US youth, researchers predicted mean total expenditures of \$14,236 and \$12,850 respectively (Shrestha, Zhang, Barker, & Imperatore, 2010).

Bandura states that perceived self-efficacy is a major determinant of intention; it is concerned not only with the attainment of a particular skillset, but what individuals believe they can do with that skillset under different circumstances (Bandura, 1997). Adolescents with T1DM are an at-risk group for poor glucose control (Svoren et al., 2003), and subsequently, future complications. Through increasing their perceived self-efficacy for type 1 diabetes management, it is hopeful that with tight glucose control, diabetes related complications can be avoided.

The school nurse is in the unique position of being able to interact with adolescent students with diabetes on a regular basis. The frequency of contact varies depending on the school nurse to student ratio and the level of school nurse presence in individual buildings. Nevertheless, school nurses can make an impact on the self-efficacy for type 1 diabetes management of adolescents with T1DM through education, supervision, collaboration, and interaction.

Chapter II

REVIEW OF THE LITERATURE

Introduction

This chapter will provide an overview of diabetes in adolescents, Bandura's self-efficacy theory and self-efficacy in adolescents with diabetes. Empirical research on the role of the school nurse in diabetes management will be presented, as well as the impact of school nursing on student health outcomes.

A literature search was conducted across several broad databases, including Cumulative Index of Nursing and Allied Health (CINAHL), MEDLINE, ProQuest, SAGE Publications, JSTOR, Directory of Open Access Journals, PsycARTICLES, PsycINFO, and ProQuest Dissertation and Theses, using keywords "adolescent", "youth", "child", "diabetes", "self-efficacy", "school nurse", and "self-management", alone or in combination. Primary works in English, located in peer reviewed journals, were accessed for the review. Empirical research included in the literature review was published between 1992 and 2013.

Diabetes in Adolescents

T1DM is one of the most challenging and complex chronic medical illnesses and requires a high level of demanding behaviors throughout a person's life (Guo, Whittemore, & He, 2009). Patterns of behavior that may compromise health often begin in early adolescence and continue into adulthood. Self-efficacy beliefs differ

among young children and adolescents. Young children have inadequate knowledge of their cognitive and behavioral capabilities, and they have difficulty processing multiple sources of efficacy information simultaneously (Bandura, 1997). Their ability to appraise themselves is inconsistent (Parsons & Ruble, 1977), depending on immediate and relevant information (Bandura, 1997). With experience, they begin to understand how increasing efforts can offset the lack of ability. Older children judge their capabilities and limitations more accurately through more extensive use of efficacy information (Bandura, 1997; Parsons & Ruble, 1977). In addition, self-efficacy beliefs become more strongly related to behavior as children grow older, and they become better and more efficient at processing information, largely due to an increase in the development of brain capacity for more complicated processes (Davis-Kean et al., 2008).

There are myriad factors that have the potential to influence the development of self-efficacy for type 1 diabetes management in school-aged children and adolescents, such as self-concept, mastery of diabetes self-management skills, ability to follow the prescribed treatment plan or adherence, and presence of support systems.

Youth perspectives. There has been a fair amount of qualitative research examining the impact of T1DM from the perspectives of adolescents with diabetes. Four qualitative studies were located, three originating in the US (Dickinson & O'Reilly, 2004; Freeborn, Dyches, Roper, & Mandleco, 2013; Roper et al., 2009), and one in Northern Ireland (Chaney et al., 2011).

Recurring concerns from adolescents concerned feeling different or alone (Freeborn et al., 2013; Roper et al., 2009), struggling with the diabetes regimen (Chaney et al., 2011; Dickinson & O'Reilly, 2004), and struggling for independence in self-management (Chaney et al., 2011; Dickinson & O'Reilly, 2004; Roper et al., 2009). Children and adolescents identified knowledge gaps in the areas of recognizing and treating hypoglycemia (Freeborn et al., 2013), carbohydrate counting and the relationship between carbohydrate metabolism and insulin (Chaney et al., 2011), and various other aspects such as technology, physiology of diabetes, effects on the family, and how to handle social situations (Roper et al., 2009).

The existing qualitative literature underscores that those adolescents with diabetes struggle with the complexity of the diabetes treatment regime while seeking to achieve independence from adults. Research on approaches to assist adolescents with T1DM in achieving this balance is needed.

Glycemic control and self-management. Based on international recommendations, the ADA (2014a, p. S15) has adopted the threshold of HbA1c of $\geq 6.5\%$ for the diagnosis of diabetes and recommends a target HbA1c of $< 8\%$ for children aged 6-12 years old and $< 7.5\%$ for adolescents and young adults aged 13-19 years old (p. S51). The International Society for Pediatric and Adolescent Diabetes (ISPAD) recommends a more stringent target HbA1c of $< 7.5\%$ for all ages (ISPAD, 2011, p. 51). Optimizing metabolic control through adherence is essential in the prevention of diabetes related complications (CDC, 2011), as the long term outlook for adolescents with diabetes is directly linked to the level of glycemic control

(Lewis, Powers, Goodenough, & Poth, 2003). Using data from 13,316 youth enrolled in the United States-based T1D Exchange Clinic Network, it was determined that only 32% of youth met age specific targets for both ADA and ISPAD recommendations for HbA1c. Forty-three percent of youth aged 6 to younger than 13 years of age and just 21% of youth aged 13 to younger than 20 years of age met ADA target HbA1c levels (Wood et al., 2013).

Although adherence and self-management are often used interchangeably, the primary distinction is that adherence generally refers to the degree to which an individual follows medical advice, and self-management is a concept that includes activities or tasks that youth and their parents perform to manage the disease, including collaboration between youth, parents, and the healthcare provider. The ultimate goal of self-management for youth is the assumption of full responsibility for diabetes management (Schilling et al., 2009).

HbA1c and blood glucose monitoring. Researchers and healthcare providers frequently use HbA1c levels as a measure of adherence to the diabetes regimen. As the empirical literature often addresses HbA1c levels and blood glucose monitoring (BGM) frequency together, it will be reviewed in this manner. Seven studies were located in the literature, all originating in the US, with the exception of one study which was conducted in Portugal (Serrabulho, Matos & Raposo, 2012). Six studies were quantitative designs (Helgeson, Honcharuk, Becker, Escobar & Siminario, 2011; Hsin, La Greca, Valenzuela, Moine & Delamater, 2010; Johns, Faulkner &

Quinn, 2008; Levine et al., 2001; Serrabulho et al., 2012; Urbach et al., 2005) and one was a qualitative descriptive design (Schilling, Knafl, & Grey, 2006).

Higher HbA1c levels were associated with decreased BGM frequency (Helgeson et al., 2011; Serrabulho et al., 2012), increased age (Levine et al., 2001; Urbach et al., 2005), longer diabetes duration (Levine et al., 2001), higher rates of hospitalization (Levine et al., 2001), and higher frequency of clinic visits (Urbach et al., 2005). Better glycemic control has been associated with increased BGM frequency (Helgeson et al., 2011; Johns et al., 2008; Levine et al., 2001), younger age (Serrabulho et al., 2012; Urbach et al., 2005), and increased adherence (Hsin et al., 2010). One study did not find a significant correlation between BGM frequency and HbA1c (Urbach, et al., 2005). In addition, blood glucose monitoring frequency has been positively correlated with self-efficacy (Helgeson et al., 2011). Qualitative findings suggested that the transition to independent diabetes self-management through the adolescent years was marked by parent-adolescent conflict and the struggle for independence, particularly in the early adolescent years between 11 and 15 (Schilling et al., 2006).

In a study examining the health of adolescents ($N = 91$) aged 11-16 years old in Portugal, Serrabulho et al. (2012) found that higher HbA1c levels were correlated with decreased BGM frequency (r not provided, $p < .05$) and age; younger adolescents (≤ 13 years) had lower HbA1c levels ($t = 3,161$, $p < .01$) than older adolescents (≥ 14 years).

In a US longitudinal study of adolescents aged 11-13 years old, Helgeson et al. (2011) conducted interviews for five consecutive years ($N = 132$) in order to determine if BGM frequency was related to glycemic control, and to examine demographic and psychosocial correlates, including self-efficacy, of BGM. Self-efficacy was measured using the Multidimensional Diabetes Questionnaire (Talbot, Nouwen, Gingras, Gosselin, & Audet, 1997). There were several findings important to the current study. After controlling for age, higher BGM frequency was related to lower HbA1c levels ($B = -.32, p < .001$). Additionally, self-efficacy about testing ($B = .01, p < .001$) and self-efficacy to control blood glucose ($B = .01, p < .05$) were related to increased BGM frequency and did not interact with age. Monitoring frequency was not associated with length of diabetes duration. Although not statistically significant, BGM frequency decreased with older age ($B = -.06, p = .08$).

Hsin and colleagues (2010) examined the role of family involvement in adherence and glycemic control among Hispanic youth in the US aged 10-17 years old ($N = 111$). The Diabetes Self-Management Profile (Harris et al., 2000) was used as a measure of adherence in this study. Among other findings, important to the current study was a correlation between HbA1c levels and adherence ($r = -.42, p < .01$). A hierarchal regression analysis was performed with glycemic control as the outcome measure. The final model was significant, $F(8, 84) = 4.39, p < .001$, total $R^2 = .30$, predicting that youth with better adherence had better glycemic control ($\beta = -.37, p < .01$).

Johns et al. (2008) performed a secondary analysis of data from a larger cross-sectional descriptive study. The researchers studied 108 adolescents aged 13-18 years for the purpose of identifying differences in characteristics between adolescents who experience adverse events related to their diabetes and those who do not experience adverse events related to their diabetes. In this US study, adverse events were defined as either self-reported episodes of hypoglycemia or diabetes related hospitalization. A hypoglycemic event was defined as an event that required the assistance of another person. Data from the sample were divided according to glycemic control (HbA1c < 8% ($n = 42$) versus $\geq 8\%$ ($n = 65$), hypoglycemic reactions in the past year (0 versus ≥ 1), and hospitalizations in the past year (0 versus ≥ 1). The researchers found that adolescents with a HbA1c < 8% ($n = 42$) had a higher frequency of BGM than those in the HbA1c $\geq 8\%$ group ($n = 65$), $t(105) = 3.93$, $p < .01$. In the examination of hypoglycemic reactions, no statistical differences were found between groups regarding HbA1c levels or other variables. In addition, there were no differences between hospitalization frequency groups with respect to HbA1c levels.

Urbach et al. (2005) conducted a study of 155 children and adolescents in the US aged 2-18 years old for the purpose of evaluating glucose control and its predictors. Multivariate linear regression demonstrated that HbA1c levels were associated with age and number of clinic visits in the previous year. Adolescents between 14 and 18 years of age had significantly higher HbA1c levels than children between 2 and 8 years of age ($\beta = .56$, 95% CI [.03, 1.08], $p = .04$). Those who visited the clinic ≥ 5 times in the previous year had higher HbA1c levels than those who

visited 3 to 4 times in the previous year ($\beta = 1.11$, 95% CI [.23, 1.2], $p = .01$). Although not statistically significant, those visiting the clinic ≤ 2 times in the previous year had HbA1c levels that were .46% higher than those who visited the clinic 3 to 4 times in the previous year ($\beta = .46$, 95% CI [-.05, .97], $p = .07$). It was hypothesized by the researchers that the association between the increased frequency of clinic visits (≥ 5) and higher HbA1c levels was related to the practice of following those in poor glycemic control more closely. No association was found between BGM frequency and HbA1c levels.

Levine et al. (2001) examined predictors of glycemic control and the relationship between glycemic control and short term adverse outcomes in 300 US youth between the ages of 7 and 16 years old. The study population was divided into three groups according to baseline HbA1c: $< 8.1\%$, $8.1-9\%$, $> 9\%$. Those in the highest group were significantly older (HbA1c $> 9\%$, $M_{age} = 12.7$ years, $SD = 2.4$ years) than the two lower groups (HbA1c $< 8.1\%$, $M_{age} = 11.5$ years, $SD = 2.4$ years; HbA1c $8.1-9\%$, $M_{age} = 11.5$ years, $SD = 2.5$ years, $p < .001$) and had longer diabetes duration (HbA1c $> 9\%$, $M_{age} = 6.2$ years, $SD = 2.9$ years) than the two lower groups (HbA1c $< 8.1\%$, $M_{age} = 4.5$ years, $SD = 2.9$ years; HbA1c $8.1-9\%$, $M_{age} = 5.0$ years, $SD = 2.8$ years, $p < .001$). Using a multiple regression model, controlling for duration of diabetes, the researchers found that BGM frequency was a significant predictor of HbA1c ($R^2 = .12$, $p < .0001$). In comparing clinic visits over the previous year, there were no significant differences between the frequency (1 to 8 visits per year) of clinic visits and the three HbA1c groups, $\chi^2(14) = 14.5$, $p = .412$. A chi-square test of

independence was performed, and it was determined that the hospitalization rate for those with the poorest glycemic control was significantly higher than the rate in the two lower groups, $\chi^2(2) = 17.4, p = .001$ for the 3-way comparison.

A US qualitative descriptive study conducted by Schilling and colleagues (2006) explored changing patterns of self-management in youth ($N = 22$) aged 8-19 years old with T1DM, examining division of labor, conflict, and transfer of care. Preadolescence, defined in the study as ages 8-11, was characterized by parental control over care, little conflict, and self-management that is parent dominant. Early adolescence (11-15 years) was marked by adolescents assuming increased levels of care, able to treat hypoglycemia, but not hyperglycemia independently. All participants in this age group reported conflict, particularly over food and BGM. Self-management in early adolescence was shared between parent and child, referred to as transitional self-management in this study. Youth in mid-adolescence (15-17 years) became more independent, treating both types of abnormal blood glucose levels independently. Conflict continued over food and BGM in two of five parent-child dyads. Self-management was either adolescent dominant or transitional. Late adolescence (17-19 years) was characterized by independent self-management with parental reminders about diet, BGM, and foot care. Little conflict existed for most and self-management was adolescent dominant. Trustworthiness was established and described by the researchers.

In summary, HbA1c levels are influenced by BGM frequency, age, and diabetes duration. In turn, BGM frequency has been correlated with self-efficacy. For

adolescents with diabetes, the period of transition to self-management is tumultuous, and parental support is important for a successful transition. There is a significant gap in the literature regarding the role of school nurses in helping adolescents with diabetes increase self-efficacy for type 1 diabetes management and successfully transition to independent self-management. There were a variety of quantitative study designs with adequate numbers of participants, including a five year longitudinal design (Helgeson et al., 2011) and a one year prospective design (Levine et al., 2001). Most of the studies had either relatively homogeneous samples (Hsin et al., 2010; Johns et al., 2008; Schilling et al., 2006) or didn't report demographic information such as ethnicity or socioeconomic status (Helgeson et al., 2011; Levine et al., 2001; Serrabulho et al., 2012; Urbach et al., 2005).

Dietary adherence. Dietary adherence is one of the most problematic areas for adolescents (Chisholm et al., 2007; Serrabulho et al., 2012), and is often the source of conflict between youth and parents (Schilling et al., 2006). Four quantitative studies were located in the empirical literature on adolescents with diabetes and dietary adherence (Austin, Senecal, Guay & Nouwen, 2011; Howe, Jawad, Kelly & Lipman, 2008; Lawrence et al., 2008; Parker, Lee & Reiboldt, 2013). All studies originated in the US, with the exception of one from Canada (Austin et al., 2011).

Healthier eating habits were associated with lower age, male gender, and lower HbA1c levels (Parker et al., 2013). Girls were more likely than boys to report unhealthy weight loss practices, such as skipping meals (Howe et al., 2008) or skipping insulin doses (Lawrence et al., 2008). For both genders, skipping meals or

insulin doses was associated with higher HbA1c levels (Howe et al., 2008); however, Lawrence et al. (2008) reported that unhealthy weight loss practices as a whole were associated with poor glycemic control for females, but not for males. Lastly, better dietary self-care was significantly associated with higher levels of self-efficacy and lower HbA1c levels (Austin et al., 2011).

Youth have difficulty meeting dietary guidelines put forth by the ADA. In the US, Parker and colleagues (2013) studied 125 dyads of predominantly Latino youth (82%) with T1DM or T2DM, aged 10-20 years old, and a parent or guardian for the purpose of investigating perceptions of eating habits in youth with diabetes. Instrumentation used in this study included the Youth Eating Patterns (YEP!) Survey, an online food habits survey administered in Melbourne, Australia (Pearson, Ball, & Crawford, 2011); higher scores indicate healthier eating habits. The researchers found that healthier eating habits have been significantly associated with lower age ($r = -.240, p = .008$) and lower HbA1c levels ($r = -.247, p = .007$). In addition, mean scores on the YEP Survey were significantly higher in boys ($M = 40.60, SD = 5.49$) than in girls ($M = 38.16, SD = 5.52, p = .017$). There were no significant relationships between youth total eating scores and duration of treatment for diabetes, youth race or ethnicity, or diabetes type.

Gender differences in dietary adherence are significant. Austin et al. (2011) studied 289 Canadian adolescents aged 11-17 years old for the purpose of identifying nonmodifiable factors that influence dietary self-care in adolescents with T1DM. Correlational analysis demonstrated that dietary self-care was significantly associated

with perceived self-efficacy ($r = .56, p < .01$) and HbA1c levels ($r = -.23, p < .01$).

The diet subscale of the Summary of Diabetes Self-Care Activities was used to measure dietary self-care in this study (Toobert & Glasgow, 1994). Self-efficacy was measured on an instrument created by the authors (Senecal, Nouwen, & White, 2000).

Howe et al. (2008) reported on weight-related concerns and behaviors in a sample of 295 US adolescents and young adults with T1DM, aged 11-20 years old. In comparing groups, findings suggested that girls were more likely to report more unhealthy weight loss practices than boys. More girls than boys (20.7%, 3.9%, respectively, $p < .001$) reported eating very little food. Girls were more likely to report skipping meals than boys (16.3%, 5.2%, respectively, $p = .002$) and were more likely to report the use of laxatives than boys (2.9%, 0%, respectively, $p = .031$). HbA1c levels in both genders were higher in participants who skipped meals to lose weight ($M = 9.4%$) than in those not skipping meals ($M = 8.6%$, $p = .02$). HbA1c levels were also significantly higher in participants who reported skipping insulin doses to lose weight ($M = 12.5%$) than in those not skipping insulin doses ($M = 8.6%$, $p < .001$). Significantly more females than males (45.3%, 18.4%, respectively, $p = .0001$) reported feeling overweight. Similarly, more females than males (39.4%, 16.5%, respectively, $p = .0001$) reported dissatisfaction with weight. Measures used included the Diabetes Eating Problem Survey (Antisdel, Laffel, & Anderson, 2001) and selected items from the Project EAT survey (Neumark-Sztainer, Story, Hannan, Perry, & Irving, 2002).

In a large multicenter US study ($N = 3357$) of young adults less than 20 years old with T1DM or T2DM, Lawrence et al. (2008) reported that females were more likely than males to report unhealthy weight-loss practices such as dieting (81.1%, 66.3%, respectively, $p < .001$). Females reported using diet pills more often than males (9.5%, 4.3%, respectively, $p < .001$) as well as vomiting and using laxatives more often than males (3%, 1%, respectively, $p = .008$). In addition, females reported skipping insulin more often than males (5.9%, 1.4%, respectively, $p < .001$). Overall, females were more likely than males (18.6%, 11.5%, respectively, $p = .002$) to report any unhealthy weight loss practices including skipping insulin. Furthermore, these practices were associated with poor glycemic control for females ($HbA1C > 9.5\%$), but not for males ($OR = 1.82$, 95% CI [1.23, 2.70]). Measurement of unhealthy behaviors was through a questionnaire generated by the authors of this study.

In summary, females have more difficulty with dietary self-care practices and report a higher frequency of unhealthy weight loss practices than males; furthermore, these unhealthy weight loss practices negatively impact glycemic control in both genders. A significant gap in the literature includes the role of the school nurse in the dietary adherence of adolescents with T1DM. Methodological weaknesses of the dietary adherence literature include the lack of heterogeneity in study populations (Howe et al., 2008; Lawrence et al., 2008; Parker et al., 2013), and lack of study population demographics (Austin et al., 2011). Sample sizes were adequate in all studies.

Summary of diabetes in adolescents. Diabetes in adolescence is challenging and requires adherence to a complex treatment regime, in order to achieve the terminal goal of independent self-management. Adolescents struggle with the diabetes regimen (Chaney et al., 2011; Dickinson & O'Reilly, 2004) and the quest for independent self-management (Chaney et al., 2011; Dickinson & O'Reilly, 2004; Roper et al., 2009; Schilling et al., 2006), particularly in the area of dietary adherence (Schilling et al., 2006; Serrabulho et al., 2012). Glycemic control is influenced by many factors, such as BGM frequency (Helgeson et al., 2011; Johns et al., 2008; Levine et al., 2001; Serrabulho et al., 2012), age (Levine et al., 2011; Serrabulho et al., 2012; Urbach et al., 2005), diabetes duration (Levine et al., 2001), dietary adherence (Howe et al., 2008), and adherence to the overall regimen (Hsin et al., 2010).

Gender differences suggest that girls have more difficulty with dietary adherence practices. Females reported higher numbers of unhealthy weight loss behaviors (Howe et al., 2008; Lawrence et al., 2008), and had less healthy eating practices than boys (Parker et al., 2013). Lastly, higher levels of self-efficacy have been associated with increased BGM frequency (Helgeson et al., 2011) and better dietary self-care (Austin et al., 2011).

Methodological strengths include adequate sample sizes in all studies. The longitudinal design of Helgeson et al. (2011) allowed for measurement of BGM frequency, glycemic control, and self-efficacy over time. Weaknesses include the

relative homogeneity of the majority of the study populations, and more than one-third of the studies ($n = 5$) failed to report sample demographics.

There is little research in the empirical literature that addresses the supportive needs of adolescents struggling with the complexity of the diabetes regime. Increasing knowledge and self-efficacy for type 1 diabetes management is important, particularly for the newly diagnosed, in the achievement of adequate glycemic control. While school nurses may be individuals who can support adolescents by improving self-efficacy and glycemic control, there is no research on the role of the school nurse in the support of adolescents with T1DM.

Self-efficacy Theory

Humans have a need to control events that affect their lives in order to produce desirable outcomes and prevent undesirable ones. The term self-efficacy was first coined in Albert Bandura's *social learning theory* (Bandura, 1977), which he later renamed *social cognitive theory* (Bandura, 1986). Self-efficacy theory is a major construct of social cognitive theory and is defined as the "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p.3).

Self-efficacy beliefs are concerned not only with the exercise of control over actions, but also with the self-regulation of thought processes, motivation, and affective (emotional) and physiological states. Efficacy is a process which requires that cognitive, social, emotional, and behavioral skills be organized and coordinated in order to serve myriad purposes. Perceived self-efficacy, then, is concerned not only

with the attainment of a particular skillset, but also with what individuals believe they can do with that skillset under different circumstances. Efficacy beliefs differ in level, generality, and strength. Self-efficacy beliefs can be limited to simple task demands or include the most complex task demands. Activities which produce no obstacles are simpler to perform than those that do pose obstacles. Individuals can perceive themselves as efficacious across a wide variety of activities, or very specific domains. The strength of self-efficacy beliefs influences the degree of perseverance that individuals will exhibit. Weaker beliefs are reinforced through negative experiences. The stronger the sense of self-efficacy, the greater the perseverance and the higher the likelihood of meeting challenges successfully. Lastly, perceived self-efficacy is a major determinant of intention, affecting performance both directly and by influencing intentions (Bandura, 1997).

The four sources of self-efficacy are enactive mastery experiences, vicarious experiences, verbal persuasion, and physiological and affective states. Enactive mastery experiences are the most influential source of efficacy information in that they provide direct evidence of the ability of individuals to succeed. Negative effects of failure are mitigated when strong efficacy expectations are developed through repeated successes. Generally, performance success raises beliefs of self-efficacy, and failure lowers them, especially if they occur early on in the course of events. Enactive mastery produces stronger and more generalized efficacy beliefs than do methods that rely only on vicarious experience or verbal instruction. The degree to which individuals will modify their perceived efficacy through performance experiences

depends on many factors, including their preconceptions of capability, the perceived task difficulty, the amount of effort they apply, the amount of outside assistance they receive, the conditions under which they perform, the pattern of successes and failures, and lastly, the manner in which these experiences are cognitively arranged and recorded in memory (Bandura, 1997).

Vicarious experience through modeling allows individuals to judge their capabilities in relation to the attainments of others, although it is a less dependable source of efficacy information than enactive mastery experience. People often compare themselves to others in similar situations. Self-efficacy beliefs are increased when one believes himself to perform superiorly in relation to another, and consequently, self-efficacy beliefs are decreased when one believes his performance to be inferior in relation to another (Bandura, 1997).

Verbal persuasion can enhance perceived self-efficacy by strengthening people's beliefs that they have the capabilities to accomplish desired tasks; however, verbal persuasion alone may not be sufficient to result in sustained increases in self-efficacy. Those that are persuaded verbally that they possess the capabilities to master desired tasks are more likely to exert greater effort and sustain it than they would if they experienced self-doubt. Verbal persuasion leads to self-affirming beliefs, which in turn promote skill development and a sense of personal efficacy; therefore, verbal persuasion has the greatest impact on people who have reason to believe that they can produce effects through their actions (Bandura, 1997). This concept is particularly important for school nurses in fostering self-efficacy for type 1 diabetes management,

in that adolescents will achieve better success in self-management if they believe they have the skills to do so.

Individual physiological and affective states as a source of efficacy information are especially important in areas that involve physical accomplishments, health functioning, and coping with stressors. High arousal can weaken performance, which leads to physiological and affective stress reactions and elevated levels of distress. Perceived vulnerability to psychological stressors heightens the level and importance of physiological reactions, often to the point that one becomes physically ill. High levels of physical activity, such as those seen in athletes, produce a variety of somatic indicators that can either be ignored or dwelt upon. In addition, mood states affect individuals' judgment of personal efficacy (Bandura, 1997).

The integration of the four sources of efficacy information is a highly complex process. The importance of each of the sources varies across domains of functioning. Some information is indicative of personal capability while other sources may not be quite as reliable. Sources of efficacy information may be unique or redundant, relevant or irrelevant, simple or complex. Some view one source as more important than another, while others ascribe to the additive effect from all sources of efficacy information. A sense of personal efficacy is achieved through a complex process of self-persuasion. Efficacy beliefs are the end result of cognitive processing of the four sources of efficacy information (Bandura, 1997).

As self-efficacy is a major determinant of intention (Bandura, 1997), a great deal of empirical literature can be found across diverse disciplines, including

engineering (Fantz, Siller, & Demiranda, 2011), technology (Chester, Buntine, Hammond, & Atkinson, 2011; Huffman, Whetten, & Huffman, 2013; Papastergiou, Gerodimos, & Antoniou, 2011), education (Brudnik, 2009; Garvis & Pendergast, 2011; McMullan, Jones, & Lea, 2011; McMullan, Jones, & Lea, 2012; Pike & O'Donnell, 2010; Sohn, Ahn, Lee, Park, & Kang, 2013), sports (Brown, Malouff, & Schutte, 2005; Nwankwo & Onyishi, 2012), leadership and management (Nielsen, Yarker, Randall, & Munir, 2009; Salanova, Lorente, Chambel & Martinez, 2011; Wong, Lau, & Lee, 2012), psychology (Boardman, Catley, Mayo, & Ahluwalia, 2005; Hutchins, Drolet, & Ogletree, 2010; Koring et al., 2012; Pauline, 2013; Van Zundert, Ferguson, Shiffman, & Engels, 2010; Warner, Schuz, Knittle, Ziegelmann, & Wurm, 2011), and dentistry, medicine and nursing (Arbour-Nicitopoulos, Ginis, & Latimer, 2009; Buglar, White, & Robinson, 2010; Colbert, Sereika, & Erlen, 2013; Erlen, Cha, Kim, Caruthers & Sereika, 2010; Gao et al., 2013; Hiemstra, Otten, & Engels, 2012; Lee, Divaris, Baker, Rozier, & Vann, 2012; Lee & Lin, 2009; McQueen, Dennis, Stremler, & Norman, 2011; Nash, 2011; Otsuka et al., 2014; Wierdsma, van Zuilen, & van der Bijl, 2011; Wong, Chan, & Chair, 2010).

Measurement of self-efficacy. The measurement of self-efficacy for diabetes management in adolescents with T1DM has been examined through a variety of instruments. Only instruments based on Bandura's self-efficacy theory will be presented. One of the most widely utilized self-efficacy scales noted in the literature, the Self-Efficacy for Diabetes Scale (SED), was developed by Grossman, Brink, and Hauser (1987). Normed on a sample of 68 adolescents aged 12-16 years old, the 35

item measure (SED-T) has three subscales: diabetes (SED-D), medical (SED-M), and general (SED-G). Initial reliabilities reported were as follows: SED-T (Cronbach's $\alpha = .90$), SED-D ($\alpha = .92$), SED-M ($\alpha = .70$), and SED-G ($\alpha = .60$). The SED-D may be used either alone or in combination with the total scale (SED-T). Reported reliabilities for the SED-D range from .84 (Edmunds, Roche, Stratton, Wallymahmed & Glenn, 2007) to .90 (Pinar, Arslanoglu, Isguven, Cizmeci, & Gunoz, 2003); the SED-T has demonstrated consistent reliability ($\alpha = .88$) in several studies (Chiu, 2005; Edmunds et al., 2007; Grey, Davidson, Boland & Tamborlane, 2001).

Havermans and Eiser (1991) modified the SED (Grossman et al., 1987) for use in a younger British sample ($N = 61$, $M_{\text{age}} = 11.57$ years, $SD = 1.55$ years). The 22-item instrument, the Diabetes Efficacy scale, consists of the subscales of personal responsibility ($\alpha = .83$), social communication ($\alpha = .49$), and minimization of threat ($\alpha = .68$). In their study, Griva, Myers, and Newman (2000) reported a reliability of .85.

Further adaptations were made to the SED (Grossman et al., 1987) by Whittemore et al. (2012) for the purpose of including current T1DM treatment modalities. The study population was 320 adolescents aged 11-14 years old. The 35 item scale and three subscales were retained, and reported reliability for the SED-D was .90. The subscales SED-M ($\alpha = .62$) and SED-G ($\alpha = .54$) were found to be less reliable in this sample (R. Whittemore, personal communication, September 17, 2013). Reported reliabilities of the revised SED-D range from .84 (Grey et al., 2009) to .90 (Ambrosino et al., 2008).

Moens, Grypdonck, and van der Bijl (2001) developed the Diabetes Management Self-Efficacy Scale for Adolescents with Type 1 Diabetes. The 26-item instrument was administered to 84 adolescents aged 12-18 years old during the phase of reliability and validity testing, and was reported to be reliable ($\alpha = .86$). The author was contacted regarding use of the instrument, and is not aware of the instrument having been used in other research studies since it was created (J. van der Bijl, personal communication, August 27, 2013).

Iannotti et al. (2006) sought to create a more current instrument for measuring self-efficacy in younger adolescents aged 10-16 years old ($N = 168$) than those in the sample of Grossman et al. (1987). Due to the current regimen of intensive insulin management, and the frequency of blood glucose monitoring necessary, adolescents encounter different challenges and barriers today as compared to 25 years ago, when the SED was developed; therefore, this measure of self-efficacy reflects current diabetes self-management (DSM) regimens and is derived from situations identified by youth with T1DM as difficult. The SEDM measures adolescent self-efficacy for diabetes management in the presence of barriers such as diminished motivation, frustration, and feeling overwhelmed.

Development of the SEDM. In the first phase, items were generated through semi-structured interviews of 11 families with children aged 8-18 years addressing DSM behaviors and influences upon those behaviors. Items were reviewed by experts in developmental psychology, adolescent health behaviors, and pediatric endocrinology. Items were reworded, inappropriate items were discarded, and

coverage of relevant content areas was assured. Using a 10-point Likert scale (1 = *not at all sure* and 10 = *completely sure*), the final version of the long form included 42 items assessing self-efficacy. Items were tested with nine families, and it was determined that the instrument was age appropriate.

In the second phase of scale development, 168 youth-parent dyads were recruited. Youth aged 10-16 years old completed the self-efficacy and outcome expectation measures, and a modified version of the Diabetes Self-Management Profile (Harris et al., 2000). The 42-item SEDM had a very high Cronbach's alpha of .97. Using item analysis, items were eliminated, resulting in the 10-item SEDM. The short and long version of the SEDM were correlated ($r = .95$). Principal components analysis demonstrated that all items of the SEDM loaded onto one factor. Based on the reliability ($\alpha = .90$), no other modifications were necessary. Reported reliabilities for the SEDM range from .81 (Berg et al., 2009; Butner et al., 2009) to .88 (Berg et al., 2013).

In summary, there are five instruments that were created for the measurement of self-efficacy for diabetes management: the Self-Efficacy for Diabetes Scale (SED), original version (Grossman et al., 1987) and updated version (Whittemore et al., 2012), the Diabetes Efficacy scale (Havermans & Eiser, 1991), the Diabetes Management Self-Efficacy Scale for Adolescents with Type 1 Diabetes (Moens et al., 2001), and the Self-Efficacy for Diabetes Self-Management (SEDM) scale (Iannotti et al., 2006). The SED (Grossman et al., 1987) is the oldest and one of the most widely used instruments and has been modified by Whittemore et al. (2012) to reflect

current treatment modalities. Also reflecting current diabetes self-management modalities and barriers is the SEDM created by Iannotti et al. (2006). The Diabetes Management Self-Efficacy Scale for Adolescents with Type 1 Diabetes (Moens et al., 2001) has never been used in research, and the Diabetes Efficacy scale (Havermans & Eiser, 1991) has been used very infrequently in the adolescent population.

Self-efficacy in adolescents with diabetes. Chronic disease management is a costly social burden (Farrell, Wicks, & Martin, 2004); therefore, interdisciplinary research efforts are concentrated on ways to reduce morbidity and loss of functionality through increasing the self-efficacy of patients. Self-efficacy for type 1 diabetes management is essential in the area of treatment adherence and glycemic control.

Treatment adherence. Five quantitative studies were found examining the role of self-efficacy in adherence to the diabetes regimen in adolescents. Two studies originated in the US (Ott, Greening, Palardy, Holderby, & DeBell, 2000; Stupiansky, Hanna, Slaven, Weaver, & Fortenberry, 2013), one in Taiwan (Chih, Jan, Shu, & Lue, 2010), one in the United Kingdom (UK) (Griva et al., 2000), and one in Canada (Littlefield et al., 1992).

Self-efficacy was found to be significantly and directly associated with adherence to treatment (Griva et al., 2000; Littlefield et al., 1992; Ott et al., 2000) and diabetes management (Ott et al., 2000; Stupiansky et al., 2013). Self-efficacy mediated the relationship between impulse control and diabetes management (Stupiansky et al., 2013) and between adherence and metabolic control (Griva et al.,

2000). Self-efficacy beliefs were positively correlated with adherence to diet and blood glucose monitoring (Griva et al., 2000), and negatively correlated with HbA1c levels (Chih et al., 2010; Griva et al., 2000); moreover, it was estimated that self-efficacy accounted for 20% of the variance in adherence and was found to be the best predictor of adherence in the study conducted by Littlefield et al. Adolescents with higher self-efficacy scores were more likely to reach target glyceemic control than those with lower self-efficacy scores (Chih et al., 2010).

Stupiansky and colleagues (2013) studied high school seniors aged 17-19 years old ($N = 204$) to explore the relationships among impulse control, diabetes-specific self-efficacy, and diabetes management behaviors. Instrumentation used in this study included an adapted version of the Diabetes Self-Management Profile (Harris et al., 2000), the Diabetes-Specific Self-Efficacy Scale (Littlefield et al., 1992), and the Self-Regulation Questionnaire (Neal & Carey, 2005). Using path analysis, the investigators tested for direct and indirect effects of independent and mediating variables. Self-efficacy was found to be a partial mediator of impulse control and diabetes management (indirect effect = .35, $p < .001$), and was significantly associated with diabetes management ($r = .71$, $p < .001$).

Chih et al. (2010) sought to examine the relationship between self-efficacy and glyceemic control in their study of adolescents ($N = 52$) aged 12-20 years old in Taiwan. Using the Perceived Diabetes Self-Management Scale (Wallston, Rothman, & Cherrington, 2007), the researchers found that self-efficacy was negatively correlated with HbA1c levels ($r = -.295$, $p < .05$). Using multivariate logistic

regression analysis, adolescents with higher self-efficacy scores were more likely to reach target glycemic control after adjusting for age, sex, and duration of diabetes when compared to those with lower self-efficacy scores ($OR = 1.63$, 95% CI [1.03, 2.59]).

In a study of adolescents aged 15-19 years old ($n = 26$) and young adults aged 20- 25 years old ($n = 38$), Griva et al. (2000) studied the role of illness perceptions and self-efficacy in diabetes treatment adherence and metabolic control. Measures used included the Generalized Self-Efficacy scale (Jerusalem & Schwarzer, 1992), Illness Perception Questionnaire (Weinman, Petrie, Moss-Morris, & Horne, 1996), a modified version (Havermans & Eiser, 1991) of the SED Scale (Grossman et al., 1987), and an adherence scale constructed by the researchers. Results reported are for the combined sample ($N = 64$) as t-test comparisons of variables between young adults and adolescents revealed no significant differences. In this study, lower self-efficacy scores on the modified SED indicated stronger self-efficacy. The researchers found a moderate correlation between generalized self-efficacy and diabetes-specific self-efficacy ($r = -.48$, $p < .001$). Diabetes-specific self-efficacy was significantly correlated with adherence to diet ($r = -.38$, $p < .01$), blood glucose monitoring ($r = -.42$, $p < .001$), HbA1c ($r = .51$, $p < .001$) and total adherence ($r = -.42$, $p < .001$). Variables found to be significantly correlated (at $p < .01$) with HbA1c levels were included in a hierarchal multiple regression analysis to explain HbA1c variation. Diabetes-specific self-efficacy entered the model first, explaining 29.9% of the variance in HbA1c ($\beta = .548$, $t = 4.951$, $p < .001$) in this step of the equation. Further

analysis suggested that diabetes self-efficacy appeared to mediate the association between adherence and metabolic control.

Ott et al. (2000) conducted a study of adolescents aged 11-18 years old ($M_{\text{age}} = 13.97$ years, $SD = 1.76$ years) and parents ($N = 143$) for the purpose of testing self-efficacy as a mediating variable for hypothesized relationships between treatment adherence and two methods proposed to increase self-efficacy: mastery experience, and social persuasion in the form of supportive versus nonsupportive parental behaviors. Measures used in this study were the Diabetes Family Responsibility Questionnaire (Anderson, Auslander, Jung, Miller, & Santiago, 1990), Diabetes Family Behavior Checklist (Schafer, McCaul, & Glasgow, 1986), the Self-Efficacy for Diabetes (SED) Scale (Grossman et al., 1987), and Summary of Self-Care Activities (Schafer, Glasgow, McCaul, & Dreher, 1983). Diabetes self-efficacy was positively correlated with age ($r = .24, p < .005$), adherence ($r = .21, p < .01$), and adolescent personal responsibility ($r = .33, p < .005$).

Littlefield et al. (1992) tested the hypothesis that poorer adherence to the diabetes treatment regime among adolescents was related to self-esteem, self-efficacy, bingeing behavior and depression. Instrumentation used in this study included parallel forms of an adherence scale and a self-efficacy scale developed by the researchers for use in this study. In the sample of 193 adolescents aged 13-18 years old, lower adherence correlated significantly with lower self-efficacy ($r = .57, p < .001$). Using multiple regression, it was found that self-efficacy estimated 20% of the variance in adherence and was the best predictor of adherence in this study.

In summary, the empirical literature demonstrates that adolescent self-efficacy for type 1 diabetes management positively impacts many aspects of adherence and glycemic control; however, methodological weaknesses such as small sample sizes (Chih et al., 2010; Griva et al., 2000) and the use of four different self-efficacy instruments was noted. In addition, the ages of adolescents in the study samples varied considerably from 11 years old (Ott et al., 2000) to 25 years old (Griva et al., 2000). When reported, study samples were predominantly Caucasian (Griva et al., 2000; Ott et al., 2000; Stupiansky et al., 2013).

Dietary adherence. Dietary adherence is an important component of diabetes management and is especially difficult for adolescents (Chisholm et al., 2007). Only two quantitative studies examining dietary self-efficacy in adolescents with diabetes were located in the literature, one originating in the UK (Nouwen, Law, Hussain, McGovern, & Napier, 2009) and the other in the US (Remley & Cook-Newell, 1999).

Findings showed that higher levels of dietary self-efficacy were associated with better dietary self-care practices (Nouwen et al., 2009). In addition, meal planning self-efficacy was significantly and negatively correlated with HbA1c levels (Remley & Cook-Newell, 1999).

In a study of 151 adolescents aged 12-18 years old, Nouwen et al. (2009) studied adolescent dietary self-efficacy. Measures used included a dietary self-efficacy scale constructed by the researchers (Senecal et al., 2000) and the Summary of Diabetes Self-Care Activities Scale (Toobert & Glasgow, 1994). Among other

findings, the researchers found that higher levels of dietary self-efficacy were associated with higher dietary self-care practices ($r = .29, p < .001$).

In the development and psychometric testing of a meal planning self-efficacy index for adolescents with diabetes, Remley and Cook-Newell (1999) studied 88 adolescents aged 11-17 years old, and found a significant correlation between HbA1c levels and meal planning self-efficacy index scores ($r = -.27, p < .05$). In this study, HbA1c levels recorded from adolescents' medical histories indicated that 70% used identical immune-assay technology. When HbA1c measures from only this technology were analyzed, the correlation between HbA1c and meal planning self-efficacy index scores was stronger ($r = -.44, p = .002$).

In summary, the contribution and importance of these study findings is mitigated by several methodological weaknesses. The sample was not adequately described in either study in terms of demographic information; the ethnicity, socioeconomic status, and family structure of the participants were not addressed, all of which may impact an adolescent's dietary self-efficacy. The cross-sectional study designs do not allow for measurement of self-efficacy over time. The existing empirical literature on dietary self-efficacy is inadequate in both quantity and quality.

Summary of self-efficacy in adolescents with diabetes. Glycemic control and treatment adherence are essential in the prevention of long term complications associated with diabetes (CDC, 2011). Self-efficacy for type 1 diabetes management in adolescents originates from different sources and plays a crucial role in adolescents' ability to manage their diabetes (Chih, et al., 2010; Griva et al., 2000;

Littlefield et al., 1992; Nouwen et al., 2009; Ott et al., 2000; Remley & Cook-Newell, 1999; Stupiansky et al., 2013).

Methodological weaknesses were identified in the quantitative empirical literature on self-efficacy and diabetes management. Small sample sizes were observed in some studies (Chih, et al., 2010; Griva et al., 2000). The age range of the adolescents and young adults spanned 14 years; adolescents as young as 11 years old (Ott et al., 2000; Remley & Cook-Newell, 1999), and young adults as old as 25 years old (Griva et al., 2000) were included in the literature samples. As self-efficacy has been correlated with age (Ott et al., 2000), there may be a great deal of developmental variability in self-efficacy across such a large age span (Stupiansky et al., 2013). Of the studies reporting ethnic and racial demographics, all study populations were predominantly Caucasian (Griva et al., 2000; Ott et al., 2000; Stupiansky et al., 2013). There were four international studies; two studies originated in the UK (Griva et al., 2000; Nouwen et al., 2009), one in Taiwan (Chih et al., 2010), and one in Canada (Littlefield et al., 1992). Lastly, researchers used varying instruments to measure self-efficacy. The gaps in the current literature support the need for additional research on self-efficacy for type 1 diabetes management on diverse adolescent populations. Little, if any, research exists on school nursing as a source of self-efficacy for type 1 diabetes management in adolescents with type 1 diabetes.

Diabetes and the School Nurse

As diabetes in adolescents is a complex and demanding disease, the school nurse can play a role in promoting self-efficacy for type 1 diabetes management in

adolescents with T1DM. In addition to supervising and/or assisting with routine performance of BGM, carbohydrate counting, and insulin administration, the school nurse plays an important role in the education and counseling of adolescents with diabetes. Although diabetes self-management includes broad categories such as those listed above, each skill or concept involves many steps. For example, the insulin injection process comprises approximately 40 steps, excluding the knowledge base needed to determine the appropriate dose and the impact of exercise on that particular injection (Coffen & Dahlquist, 2009).

The current educational system in the US is neither designed nor appropriate for the management of complex chronic illnesses; therefore the role of the school nurse is crucial for the support of adolescents with T1DM in the school setting. In this review of the literature of diabetes and the school nurse, empirical literature will address perspectives of the adolescent, parent, teacher, and school nurse, as well as addressing the impact of school nurse interventions on diabetes management in the school setting. Some of the presented empirical literature contains more than one discrete perspective.

Youth perspectives. There are surprisingly very few studies in the literature examining the relationship between the school nurse and children and adolescents with diabetes. Only two studies were located, both originating in the US; one was a qualitative design (Hayes-Bohn et al., 2004) and the other was a mixed methods design (Nabors et al., 2003).

Children and adolescents voiced concerns that qualified personnel would not be available or know what to do in the event of hypoglycemia (Hayes-Bohn et al., 2004; Nabors et al., 2003). They felt that school personnel should have current information on the management of diabetes, and that ongoing training and education was important (Hayes-Bohn et al., 2004; Nabors et al., 2003). Lastly, parents, children and adolescents verbalized the importance of a school nurse presence to assist them in diabetes management (Hayes-Bohn et al., 2004; Nabors et al., 2003), citing inadequate care from health aides (Hayes-Bohn et al., 2004).

In summary, very little is known about the role of the school nurse on adolescent diabetes management from a youth perspective. The limited research available suggests that school nurses are important to youth and their parents, particularly in the treatment of hypoglycemia. Both study samples were primarily Caucasian, and socioeconomic status and other demographic information were not provided. The lack of any quantitative research on the role of the school nurse in diabetes management from a youth perspective is of concern, given the complexity of the disease process.

Parent perspectives. Many areas of the US, especially rural areas, do not have a large school nurse presence; therefore, much of the empirical literature regarding the parental perspective on school nursing and diabetes management addresses issues resulting from the absence of the school nurse. There were four quantitative studies found in the literature, all conducted in the US.

Parents expressed a lack of satisfaction with and confidence in diabetes care support for their children and adolescents in the school setting (Jacquez et al., 2008; Lewis et al., 2003; Skelley et al., 2013). The most often cited barriers to diabetes self-management in school were the lack of education and training of personnel (Lewis et al., 2003; Schwartz, Denham, Heh, Wapner & Shubrook, 2010; Skelley et al., 2013) and the lack of a full-time school nurse presence on site (Jacquez et al., 2008; Lewis et al., 2003; Schwartz et al., 2010; Skelley et al., 2013). Parents reported that their children were unable to participate in all school activities without restriction, particularly school trips and sports (Lewis et al., 2003; Skelley et al., 2013). In addition, parents also reported that children and adolescents were prevented from performing necessary activities related to diabetes management in general (Schwartz et al., 2010), and specifically insulin administration (Jacquez et al., 2008) and BGM (Lewis et al., 2003).

Skelley et al. (2013) sought to assess parental perceptions of the current state of care for children with diabetes in the Alabama public school system. The study sample was comprised of 170 parents of children in kindergarten through twelfth grade. The researchers used both electronic and in-person data collection methods. The research article provided a link to the survey measure, Survey of Parent Satisfaction with the Availability of School Resources for their Children with Diabetes, a 19-item multiple choice survey assessing parental satisfaction with school support for their children with diabetes. The authors of the survey were not identified by the researchers. Some questionnaires were missing data and were not included in

the statistical analysis. Overall, 83.1% ($n = 123$ of 148) of parents were satisfied with diabetes care in the schools; however, this is not consistent with the following challenges identified by parents. Challenges in providing care for students were identified as lack of trained personnel, lack of teacher involvement, and lack of a full-time school nurse on site daily. Almost 17% ($n = 26$ of 154) were unable to confirm the presence of a staff member trained in diabetes education at their child's school; it was not reported whether or not there was a school nurse assigned to these buildings. About 10% (n not reported) of parents stated that their child wasn't able to participate in all school activities, particularly school trips and sports activities; the reasons for this were not identified in the study. Parents reported that their children were being relocated to schools with school nurses. The researchers noted that in Alabama, the school nurse is the only staff member with the legal authority to administer injectable medications other than epinephrine, even in the event of an emergency. Yet, numerous parents responded that their school either shares a school nurse with one or more schools, or has a school nurse in the building for only part of the school day. This incongruity poses a life-threatening risk to the student with diabetes in the event of a severe hypoglycemic event. The authors noted that the number of respondents across districts varied considerably, necessitating removal of data. Consequently, lack of a large sample resulted in large confidence intervals.

In a survey of parents, children and adolescents, and schools, Schwartz and colleagues (2010) sought to assess the experiences of children and adolescents with T1DM in the school setting. The study sample consisted of 80 school-aged children

and adolescents in kindergarten through the twelfth grade, their parents or guardians (*n* unspecified), and 28 school personnel. Of the 28 school personnel, 85% were school nurses and the remaining 15% was comprised of teachers, dietitians, and other unspecified school personnel. Questionnaires were constructed by the researchers to identify the diabetes-related experiences of the children and adolescents, their parents, and the school personnel. Although 61% of parents reported that their experiences were above average or excellent, several problem areas were identified. The majority of children and adolescents (53.2%) and 20% of parents reported that students weren't able to attend to diabetes care needs and 30.8% of parents reported missing work to care for their children at school. Only 27.6% of children and adolescents, and 40% of parents felt that school personnel were knowledgeable in diabetes care. Only 45% percent of parents and 46% of school personnel felt that nonmedical school staff members were adequately trained to care for children and adolescents with diabetes. Thirty-eight percent of school personnel were very concerned about their ability to assist with hypoglycemia treatment and only 20% felt adequately prepared to assist a student in hypoglycemia management. Three-quarters of school personnel (76%) felt there should be a full-time school nurse presence.

Jacquez et al. (2008) studied 309 parents of children and adolescents aged 4-19 years old for the purpose of investigating parental reports of diabetes care support provided to their children in Florida and their concerns about diabetes management in school. Most of the sample belonged to minority groups (81%) and attended public school (82%). The measure used in this study was an author created survey

addressing areas including concerns about school, responsibility for medical needs in school, school staff ability and resources, and several open ended questions. Overall, 45% of parents responded that their child's school did not have a school nurse, and 24% reported that schools had been unable to meet their child's medical needs. Just 49% of schools had a GlucagonTM kit available. A quarter of students were not allowed to administer insulin anywhere in school. It was not reported if this applied when the school nurse was present. Most parents reported that they were either not at all or only a little confident that their child's school could care for diabetes (57%), or address hypoglycemia (60%).

In an effort to identify and quantify barriers to glyceemic control in the school setting, Lewis et al. (2003) conducted a study of 65 schools and 47 parents of children and adolescents attending elementary, middle, and high schools in Maryland, Virginia, and Washington, DC. Ages of the children and adolescents, and the key informant for the schools were not identified by the authors. Survey measures included two questionnaires created by the authors. The first addressed availability and quantity of resources available to the student with diabetes; the second focused on parental perception of and satisfaction with the adequacy of diabetes care support in the school setting. Notably, four of the 65 (6%) respondent schools stated they didn't know if they had students with diabetes enrolled in the school. Ten percent ($n = 6$) didn't have diabetes management policies and nearly 17% ($n = 11$) did not have staff trained in diabetes management. Both schools and parents cited lack of staff training and absence of a daily school nurse presence as the most common hindrances

to providing proper diabetes care support in the schools. Twenty-one percent of parents were dissatisfied with the care of their child in school, and nearly one-fifth ($n = 9$) of parents reported that their children were not allowed to participate in all school activities, particularly school trips and sports, unless accompanied by a parent or the school nurse. It is unclear from the publication how children and adolescents were managed in the school setting in light of these circumstances.

In summary, parents of adolescents with diabetes are dissatisfied with the diabetes support available in the school setting. School personnel lack the training and education necessary to care for students with complex needs. The lack of a full-time school nurse presence presents barriers to diabetes self-management and participation in school activities. The empirical literature has numerous methodological weaknesses. When described, samples were predominantly Hispanic (Jacquez et al., 2008) or Caucasian (Skelley et al., 2013). Two studies did not provide demographic information and had small sample sizes with different populations in the samples (Lewis et al., 2003; Schwartz et al., 2010). It was unclear who the school personnel respondents were in both of these studies. The use of two different methods of data collection may have resulted in a less rigorous study (Skelley et al., 2013). All studies lacked inferential statistics. While these studies address diabetes support from all school personnel, there is currently no empirical research on parent perspectives of the care and support provided to adolescents with T1DM by the school nurse.

School nurse perspectives. As with most of the empirical literature related to diabetes and the school nurse, there is also a paucity of research from the school nurse

perspective. Three studies, two phenomenological qualitative (Darby, 2006; Wang & Volker, 2013), and one quantitative (Nabors et al., 2005), were located in the empirical literature. One was conducted in Taiwan (Wang & Volker, 2013), and two were conducted in the US (Darby, 2006; Nabors et al., 2005).

School nurses viewed themselves as parental proxies, responsible for the health and safety of students (Darby, 2006; Wang & Volker, 2013). Communication between all members of the health care team was essential for successful management of diabetes in the school setting (Darby, 2006; Nabors et al., 2005; Wang & Volker, 2013). Teamwork was seen as a vital component in self-management of T1DM in school (Darby, 2006; Nabors et al., 2005; Wang & Volker, 2013). Education of school nurses, and all other school personnel (Darby, 2006; Nabors et al., 2005; Wang & Volker, 2013) was thought to play a critical role in the management of diabetes, particularly in the absence of the school nurse (Darby, 2006). School nurses identified the experience of feeling scared and overwhelmed (Darby, 2006), and some felt inadequately trained and lacking in confidence (Wang & Volker, 2013). Learning to count carbohydrates and calculate insulin doses was difficult for some (Darby, 2006). School nurses noted that hypoglycemia, hyperglycemia, and mechanical problems associated with continuous subcutaneous insulin infusion (CSII) were a common occurrence and easily managed by the school nurse; however, problem solving and assessment, critical to the management of hypoglycemia and hyperglycemia, were complex and required considerable skill (Darby, 2006). School nurses stated that the presence of a full-time school nurse in each school would

decrease barriers to self-management in adolescents with T1DM, as the coverage of more than one building decreases the availability of the school nurse (Nabors et al., 2005). Lastly, the importance of parental involvement was threaded throughout all studies (Darby, 2006; Nabors et al., 2005; Wang & Volker, 2013).

In summary, school nurses felt strongly about maintaining the health and safety of adolescents with T1DM. Communication, teamwork, parental involvement, and education were viewed as essential to the successful management of diabetes in the school setting. Although the study by Darby (2006) contributed to the body of knowledge regarding school nurse experiences caring for adolescents with diabetes, it was specific to CSII, and may not be transferable to school nurses caring for those adolescents receiving insulin injections. There remains little to no research in this area, especially within the US.

School nurse interventions. Little research exists on the impact of school nurse interventions on the self-management of diabetes of adolescents in the school setting. Located in the literature were three quantitative studies, all originating within the US. One study was an experimental design (Nguyen et al., 2008), and two studies related to case management by school nurses (Engelke, Swanson, Guttu, Warren & Lovern, 2011; Peery et al., 2012).

Case management, defined by Engelke, Guttu, Warren and Swanson (2008), is a process whereby the school nurse identifies children who are not reaching optimal levels of health or academic success due to chronic illness. Case management by the school nurse requires a thorough assessment, involving interventions that prevent and

reduce the occurrence of problems. Nursing care is child centered and requires coordination and communication with parents, teachers, and other providers. Interventions are goal oriented, based on specific needs of the child, and evaluated based on their effectiveness.

School nurse interventions have had a positive impact on the diabetes management of adolescents in the school setting. When school nurses were assigned to fewer schools, they were able to provide more direct care, counseling, and intervention days than when they were assigned to more schools (Engelke et al., 2011). In addition, students showing improvement in diabetes self-management scores received more counseling and education from the school nurse than students who showed no improvement in self-management scores (Peery et al., 2012). School nurse interventions contributed to significantly decreasing students' HbA1c levels through supervision of BGM (Nguyen et al., 2008).

Peery and colleagues (2012) sought to examine the relationship between school nurse interventions and parent and teacher perceptions of how well students can self-manage their diabetes. The sample consisted of 69 children and adolescents aged 5 to greater than 13 years old in elementary school, middle school, and high school in North Carolina. Each student had one parent and one teacher assessment completed at baseline, defined as the beginning of the academic year, and at the end of case management, defined as the end of the academic year. It was not specified which parent filled out the assessments. In addition to standard health assessments, school nurses conducted an expanded assessment that included written input from a

parent and a teacher on how well the child was managing in school. Goals were developed and interventions were identified. Interventions were classified as direct care; student education and counseling; family education; teacher and staff education; and coordination of care. Measures used included instruments created by the author specific to this study: demographics, teacher and parent assessments, goals, and interventions. Parent and teacher assessments were measured on a 10-point Likert scale (1 = *it is a big problem* and 10 = *no problem at all*). Scores were categorized as ≤ 7 as indicative of needing improvement with diabetes management, and ≥ 8 as indicative of a satisfactory level of self-management. Improvement was defined as end of case management scores at least two points higher than baseline scores. There were 29 students identified by their parents with low self-management scores at baseline who showed improvement by ≥ 2 scale points at the end of case management. Of these 29 students, 25 received one or more school nurse interventions related to living with their diabetes. Students identified by their parents as showing improvement in self-management were more likely to have had all three counseling and educational interventions: meal and snack planning, living with diabetes, and making good choices, compared with those with no improvement in self-management scores ($OR = 4.9$, 95% CI [1.3, 18.3], $p = .02$). Students identified by their teachers as showing improvement in self-management scores were more likely to have had the school nurse provide diabetes education to both the student's physical education teacher and guidance counselor ($OR = 3.5$, 95% CI [0.9, 13.0], $p = .06$). In addition, these students had more classroom visits that were directed toward

diabetes counseling and education of students by the school nurse ($M = 14.8$ intervention days) compared with students showing no improvement ($M = 11.7$ intervention days). Students showing improvement had more education sessions by the school nurse with their teachers ($M = 16.7$ intervention days) compared to students showing no improvement ($M = 12.1$ intervention days).

In a related study, Engelke et al. (2011) conducted research for various purposes: to describe care provided to children with diabetes; to identify differences in care based on school nursing workloads; to explore the role of the school nurse in responding to emergencies; and to describe the impact of school nurse interventions on quality of life. The sample consisted of 86 students aged 5-17 years old enrolled in case management, and 63 school nurses in North Carolina. Instrumentation used in this study included a standard and expanded health assessment completed by the school nurse as in the above study, with the addition of the Peds QL 3.0 Type 1 Diabetes Module (Varni et al., 2003). In this study, all interventions provided by the school nurse on a particular day were entered as one visit, and counted as one intervention day, even though there may have been several interventions provided in one day. The average number of intervention days (IDs) was greater for nurses covering one to two schools ($M = 40.3$, $SD = 31.6$) than for nurses assigned to three to four schools ($M = 24.4$, $SD = 13.9$, $p \leq .05$). School nurses assigned to one to two schools ($M = 25.3$, $SD = 31.8$) provided more direct care IDs than school nurses assigned to three to four schools ($M = 11.7$, $SD = 8.6$, $p \leq .05$). On average, elementary school students received 30.3 direct care IDs when the school nurse was

assigned to one or two schools, and 13.9 direct care IDs when the school nurse was assigned to three or four schools. High school students received 18.9 IDs of education and counseling when the school nurse covered one or two buildings and 10.4 IDs when assigned to three to four schools. There were 46 emergency events identified by school nurses involving 25 participants. Emergency events were not specifically defined by the authors. Most (68%) occurred in elementary school children, and most (72%) were documented by school nurses assigned to one or two schools. The school nurse was responsible for the treatment of hypoglycemia and hyperglycemia in all cases. Four children had blood glucose levels less than 50 mg/dl and three children had blood glucose levels above 500 mg/dl. Nurses' comments revealed that these issues were often related to equipment malfunction, particularly insulin pumps.

Nguyen et al. (2008) sought to test the hypothesis that school nurse supervision of blood glucose improves HbA1c in children with poor glycemic control, defined in this study as HbA1c \geq 9%. The researchers studied 36 children and adolescents aged 10-17 years old over three months in Texas. The study began at the second visit and concluded with the third and final visit, three months after the second visit. Participants were randomized to either the control group ($n = 18$) or the intervention group ($n = 18$). The control group received usual care, consisting of insulin dose adjustments and review of blood glucose log books at visits two and three. Students in the control group did not bring logbooks to the visits and two participants dropped out of the study before completion. The intervention group received usual care plus specific and different types of insulin at mealtimes; they

received insulin glargine (Lantus[®]) at lunch time, and insulin aspart (NovoLog[®]) for breakfast and dinner. In addition, the intervention group received BGM supervision by the school nurse at lunchtime on school days, and by the parent for mealtimes on weekends and holidays. At the end of the three month study period, the intervention group showed a significant decrease in HbA1c levels ($M = 9.2$, $SD = 1.1$, $p < .0001$) from baseline levels ($M = 10.8$, $SD = 1.6$) compared to the HbA1c levels in the control group at three months ($M = 11.5$, $SD = 1.7$) and baseline ($M = 11.2$, $SD = 1.3$).

Summary of diabetes and the school nurse. School nurses have made a positive impact on adolescents with T1DM through case management and BGM supervision. Methodological strengths include the experimental nature of one of the studies (Nguyen et al, 2008), and the socioeconomic diversity of two others (Engelke et al., 2011; Peery et al., 2012). Limitations of these studies include the small sample sizes (Engelke et al., 2011; Nguyen et al, 2008; Peery et al., 2012) and ethnic homogeneity of the samples (Engelke et al., 2011; Peery et al., 2012). In Nguyen et al. (2008), it was not possible to determine whether individual components of the intervention or all components collectively accounted for the observed decrease in HbA1c levels. In light of the paucity of research presented, there is little empirical research on the impact of school nurses on the health outcomes of adolescents with diabetes.

The empirical literature has shown that parents and youth with diabetes view the role of the school nurse in diabetes management as important. Yet, parents expressed diminished levels of confidence and satisfaction in the ability of school

personnel to provide diabetes support. School nurses believed that communication, teamwork, and education for all school personnel were essential in the management of diabetes in adolescents. A limited number of studies have demonstrated that school nurses can positively impact adolescent diabetes self-management and HbA1c levels. A number of methodological weaknesses, such as small sample sizes, missing demographic information, homogeneous samples, and lack of statistical information, however, limit the generalizability of the findings. Little to no research exists on the relationship between the school nurse and the adolescent with T1DM, both from a youth and parent perspective. There is also a lack of rigorous empirical literature demonstrating the impact of school nurses on glycemic control in adolescents with T1DM.

The School Nurse and Health Outcomes of Students

The empirical literature on the impact of school nursing on the health outcomes of students is limited to school nurse to student ratios; early dismissal from school and student attendance; and chronic illness, including asthma and diabetes.

School nurse to student ratio. NASN (2010) recommends minimum school nurse to student ratios depending on the needs of the population: 1:750 for the general population, 1:225 in the population requiring daily professional school nursing services or interventions, 1:125 in student populations with complex health care needs, and 1:1 for individual students with highly complex and continuous needs, yet only one quantitative study on school nurse to student ratios could be located. It was demonstrated that lower school nurse to student ratios, meaning less students per

school nurse, positively impacted counseling services and services provided to students with asthma and diabetes, as well as vision referral follow up.

Guttu et al. (2004) studied the impact of school nurse to student ratios on health outcomes related to asthma and diabetes, counseling services, and vision screening and referrals. Using a retrospective design, the authors examined three years of data from the North Carolina Annual Survey of School Health for 19 counties, yielding a sample size of 57 observations. In this study, the authors defined school nurse to student ratios as either good (1 nurse for < 1,000 students) or fair to poor (1 nurse for \geq 1,000 students). They further stipulated that low nurse to student ratios indicate better staffing, so that negative correlations signify a positive relationship between increased presence of school nurses and services available to students. Counseling sessions generally focused on the needs of students with psychosocial problems, such as depression, pregnancy, and learning difficulties. Other services provided are not defined in the study. Findings included a significant correlation between increased presence of school nurses and services provided to students with diabetes ($r = -.52, p = .000$) and asthma ($r = -.43, p = .002$); districts with lower nurse to student ratios were more likely to identify and be involved in the care of children with chronic diseases. School districts with lower ratios reported more counseling services to children ($r = -.38, p = .006$), and higher numbers of vision referrals receiving follow up care ($r = -.37, p = .007$) than districts with higher ratios. Limitations of the study are the small sample size, the retrospective design and the self-reporting of data by school nurses; it is not known who is responsible for

keeping and reporting data in schools with higher ratios. Furthermore, services provided are not defined in the study; it would be beneficial to study the impact of school nurse to student ratios on specific outcomes related to chronic health conditions.

Early dismissal and attendance. Three quantitative studies originating in the US examining the relationships between school nurse presence and attendance or early dismissal were located. It was found that school nurses release students from school for medical reasons with less frequency than unlicensed personnel (Pennington & Delaney, 2008), particularly full-time school nurses (Allen, 2003). Studies on the effect of full-time school nurses on attendance rates are inconclusive. While Telljohan, Dake, et al. (2004) found that students with asthma missed significantly less days with the presence of a full-time school nurse as compared to a part-time school nurse, the findings of Allen (2003) were not significant.

Pennington and Delaney (2008) conducted a descriptive study of four schools, grades kindergarten through twelfth grade, in eastern Kentucky for the purpose of determining if there was a difference in the number of students sent home by unlicensed personnel compared to the number sent home by the school nurse. An illness and injury report form, created by the district health coordinator, was used to track visits to the health office, and had been in use for three years before the study began. It contained information on the type of illness or injury, intervention, parental notification, and whether the student was returned to class or sent home. The form was initiated in most cases by the classroom teacher for student complaints of injury

or illness, and was then brought to the health office by the student, at which time an assessment was made by either the school nurse or unlicensed personnel. Over a period of five months, 3,132 illness and injury report forms were collected. Of the 3,132 report forms, 2,019 (64%) of the students were seen by the school nurse, and 1,113 (36%) were seen by unlicensed personnel. The school nurse sent home just 102 (5%) students, while unlicensed personnel sent home 195 (18%) students.

Telljohan, Dake, et al. (2004) conducted a study comparing the impact of full-time school nurses versus part-time school nurses on the attendance of students with asthma ($N = 569$). The sample consisted of students in 16 elementary schools, grades kindergarten through sixth grade, with either full-time school nurses ($n = 8$), defined as 5 days per week, or part-time school nurses ($n = 8$), defined as 2 days per week. Students with asthma in each school were identified by school nurses through the examination of their emergency medical cards. The eight schools with full-time school nurses identified 358 students, and the eight schools with part-time school nurses identified 211 students. School nurses filled out a demographic information form for each student identified as having asthma. The majority of the sample was male, African American, and receiving free school lunch. The study found that students with asthma with full-time school nurses missed significantly fewer school days ($M = 10.6$, $SD = 9.2$) than students with part-time school nurses ($M = 13.0$, $SD = 11.6$), $t(566) = -2.68$, $p \leq .05$. A gender effect for males was seen; males with full-time school nurses missed significantly fewer days ($M = 10.0$, $SD = 8.3$) than males with part-time school nurses ($M = 13.4$, $SD = 12.4$), $t(332) = -3.05$, $p \leq .05$. Ethnicity

was also a factor; African American students with full-time school nurses missed significantly fewer school days ($M = 9.9$, $SD = 9.1$) than those with part-time school nurses ($M = 13.0$, $SD = 12.6$), $t(409) = -2.78$, $p \leq .05$. Lastly, students who qualified for free lunch and had full-time school nurses missed significantly fewer days ($M = 10.9$, $SD = 9.5$) than students who qualified for free lunch and had part-time school nurses ($M = 14.6$, $SD = 13.1$), $t(450) = -3.36$, $p \leq .05$.

Allen (2003) sought to determine if schools with full-time school nurses have higher attendance rates and lower percentages of students leaving school for medical reasons than schools without a full-time school nurse. Using elementary schools with similar demographics ($N = 22$), the sample was comprised of 11 experimental schools with approximately 5,000 students, employing a full-time school nurse, and 11 control schools with approximately 5,000 students that did not employ a full-time school nurse. It was not stated whether the control schools had no school nurse on site or a part-time school nurse. Data collection spanned 20 days and included archived records, interviews with principals, parent surveys, and daily checkout forms. There were no significant differences in average daily or all-day attendance rates between schools; however, the percentage of students leaving school for medical reasons was significantly lower in the experimental schools with a full-time school nurse ($M = 11.1$, $SD = 3.0$) than in the control schools without a full-time nurse ($M = 15.7$, $SD = 6.0$), $t(20) = 2.27$, $p = .04$, $d = -.77$.

In summary, while it has been demonstrated that school nurses decrease the percentage of early release or dismissal of students from school, the impact on student

attendance has been inconclusive. Strengths of the studies include large sample sizes (Pennington & Delaney, 2008; Telljohan, Dake, et al., 2004) and comparison of control and experimental schools (Allen, 2003). Methodological weaknesses include the self-reporting of data by parents (Telljohan, Dake, et al., 2004) and school nurses (Pennington & Delaney, 2008). Although the study by Allen (2003) compared control and experimental schools, it was not reported whether the control schools had no school nurse on site or a part-time school nurse.

Chronic illness. In addition to the study by Telljohan, Dake, et al. (2004) on attendance rates of students with asthma, two other quantitative studies were located in the literature, both conducted in the US, measuring the impact of case management by school nurses on the health outcomes of students.

It was found that case management by school nurses had many positive effects on quality of life outcomes for students with asthma (Engelke et al., 2008; Engelke, Swanson & Guttu, 2013) and other chronic diseases, including diabetes (Engelke et al., 2008). Case management reduced the proportion of children reporting asthma symptoms and treatment barriers, as well as reducing the severity of symptoms (Engelke et al., 2013). Furthermore, parents' perceptions of how well their children managed their asthma showed a slight increase after case management (Engelke et al., 2013). Students with asthma who attended schools with full-time school nurses had fewer absences than students attending schools with part-time school nurses (Telljohan, Dake, et al., 2004). The effect of case management on academic outcomes is inconclusive; Engelke et al. (2013) found no significant association between overall

GPA and case management, while in an earlier study, Engelke et al. (2008) noted an increase in grades among the lowest achievers at the end of case management.

In summary, case management by school nurses positively impacts the quality of life of students with asthma and diabetes. Although Engelke et al. (2008) was unable to measure the effect of case management on student attendance, Telljohan, Dake, et al. (2004) demonstrated that students with asthma had improved attendance with the presence of a full-time nurse as compared to a part-time nurse. Strengths of the literature include adequate sample sizes (Engelke et al., 2008, Engelke et al., 2013; Telljohan, Dake, et al., 2004), consistent instrumentation (Engelke et al., 2008, Engelke et al., 2013), and ethnic diversity (Engelke et al., 2008, Engelke et al., 2013). However, it is unknown in Engelke et al. (2008) whether the increase in grades for the lowest achievers was related to attendance, as that information was unavailable. Furthermore, it would have been helpful to know if statistical significance was reached for this group.

Summary of the school nurse and health outcomes of students. The physical presence of school nurses in the school building has made a positive impact on early release or dismissal from school (Allen, 2003; Pennington & Delaney, 2008); however, the two studies examining the impact on student attendance have yielded conflicting results. Services provided to students with asthma and diabetes increased when the school nurse was present (Guttu et al., 2004). Through the use of case management interventions, school nurses have reduced illness severity and removed treatment barriers from chronic disease management (Engelke et al., 2013).

Methodological limitations included self-reporting of data (Guttu et al., 2004; Pennington & Delaney et al., 2008; Telljohan, Dake, et al., 2004), and small sample size (Guttu et al., 2004). Strengths of the literature include the use of control and experimental groups (Allen et al., 2003).

There is very little research in the area of school nursing and health outcomes of students, particularly in the field of chronic disease management. To date, there is no research on the relationship between the school nurse presence and the health outcomes of students with diabetes.

Conclusion

It is clear from the empirical literature that self-efficacy plays a significant role in the management of diabetes in adolescents (Chih et al., 2010; Griva et al., 2000; Littlefield et al., 1992; Ott et al., 2000; Stupiansky et al., 2013). As T1DM is one of the most challenging and complex chronic diseases, adolescents need a great deal of support from healthcare personnel, including school nurses. Adherence to the diabetes regimen is difficult, particularly in the area of dietary control (Chisholm et al., 2007). It is accepted that good glycemic control is instrumental in the prevention of diabetes-related complications (CDC, 2011), and that the long term outlook for adolescents with diabetes is directly linked to the level of glycemic control (Lewis et al., 2003).

Research on school nursing and the health outcomes of students has been limited to attendance rates for students with asthma (Telljohan, Dake, et al., 2004) and case management for students with asthma (Engelke et al., 2008; Engelke et al.,

2013) and diabetes (Engelke et al., 2008). Although school nurses are identified as being an important part of diabetes management in the school setting (Hayes-Bohn et al., 2004; Jacquez et al., 2008; Lewis et al., 2003; Schwartz et al., 2010; Skelley et al., 2013), little research exists on the relationship between the presence of a school nurse in the school building and the health outcomes of students with diabetes. A small number of studies, all with small sample sizes, have been conducted examining the effect of school nurse interventions on adolescents with diabetes (Nguyen et al., 2008; Peery et al., 2012). However, to date, there has been no research examining the relationship among the school nurse to student ratio, self-efficacy for type 1 diabetes management, and glycemic control in adolescents.

Chapter III

METHODS AND PROCEDURES

Introduction

The purpose of this study was to determine if there is a relationship among the school nurse to student ratio, self-efficacy for type 1 diabetes management, and glycemic control in adolescents. This chapter provides an overview of the research design, sample, sample size and power, setting, recruitment procedures, protection of research participants, instrumentation, data collection procedures and data analysis procedures.

Research Question

Is there a relationship among the school nurse to student ratio, self-efficacy for type 1 diabetes management, and glycemic control in adolescents?

Research Design

As there are no studies located in the literature examining the relationship among study variables, a descriptive correlational design was chosen. The purpose of a descriptive correlational design is to describe the strength and direction of relationships among variables rather than to determine causality (Polit & Beck, 2012). The independent variable in this study was the school nurse to student ratio; the dependent variables were self-efficacy for type 1 diabetes management as measured by the SEDM (Iannotti et al., 2006) and glycemic control, reported by the parent as the most recent HbA1c level on the demographic questionnaire. Age and diabetes

duration as independent variables were also examined to determine if relationships exist among these variables and self-efficacy for type 1 diabetes management and HbA1c levels.

Sample

The population for this study was adolescents with T1DM who were aged 10-16 years old, English speaking, enrolled in public or private school, able to read and understand grade level material, and did not have any comorbid disease processes or diagnoses that resulted in an increased interaction with the school nurse. Adolescents between the ages of 10 and 16 years old were included in this study, as this was the age range used for norming of the SEDM (Iannotti et al., 2006).

A convenience sample of 89 parent-adolescent dyads was recruited for this study through three separate recruitment methods which are described in more detail below. An email announcing the study was generated by the participating endocrinology practice and was sent to 434 parents of adolescents aged 10-16 years old (Appendix A). Of the 434 email announcements that were sent, 16 were returned as undeliverable, resulting in delivery to 418 recipients. Of the 418 delivered email announcements, 69 interested participants contacted the researcher requesting study materials. Of the 69 packets of study materials delivered, 54 completed packets were returned to the researcher, one of which did not meet the inclusion criteria for age, for a total of 53 completed packets. Reminder emails were sent to those requesting, but not returning study materials at 3 weeks and 6 weeks, as persistence has been shown to maximize response rates (Dillman, Smyth, & Christian, 2014).

In-person data collection yielded 36 parent-adolescent dyads. Forty-four parent-adolescent dyads were approached by the researcher. Of the 44 potential dyads, three declined to participate, four initiated but did not complete the study materials due to time constraints, and one did not meet age eligibility criteria.

Sample Size and Statistical Power

A power analysis was conducted to determine the appropriate sample size for a two-tailed bivariate normal correlational analysis. Using the a priori sample size calculator, G*Power 3.1.7 (Faul, Erdfelder, Buchner, & Lang, 2009), a minimum sample size of 84 was required achieve a power level of .80 at the alpha level of .05, with a medium effect size of .3 (Cohen, 1992). Thus, a sample size of 89 was sufficient to meet the requirements for a correlational analysis.

Setting

A convenience sample was recruited from a pediatric endocrinology practice associated with a large medical center in the Northeastern United States. The practice follows approximately 850 patients with diabetes, 434 of whom are aged 10-16 years old. The practice requests that patients be seen quarterly by either physicians or nurses.

Recruitment of Research Participants

A meeting was arranged with the clinical coordinator from the endocrinology practice to discuss the study. Approval from the institution's Nursing Research Council (Appendix B) was required and obtained prior to seeking approval from the Institutional Review Board (IRB) associated with the practice. IRB approval was

received from the cooperating institution (Appendix C) and from Seton Hall University (Appendix D).

Three methods of recruitment were used to solicit participants from the study institution. Using the first method, a blind copied email announcement of the study was sent by the endocrinology practice to all parents of adolescent patients aged 10-16 years after receiving IRB approval. The announcement included a brief description of the study, the researcher's contact information, and the study time period (Appendix A). Interested parent participants contacted the researcher via email. The researcher then mailed the study materials to the address provided by the parents and included a self-addressed stamped envelope for return of the study materials.

In the second method, an announcement of the study was placed in the monthly electronic newsletter generated by the endocrinology practice. As with the first method, the announcement included a brief description of the study, the researcher's contact information, and the study time period (Appendix E). All participants who responded electronically were recruited using the first method; no participants were recruited with the second method.

In the third recruitment method, study participants were recruited from the waiting area of the endocrinology practice. Using a prepared oral script (Appendix F), the researcher first approached parents as they entered the endocrinology office. After a brief explanation of the study, if parents were interested, the researcher then approached the adolescent children of interested parent participants. Parent-adolescent participants were then directed to a designated area in the office where the

researcher and the study materials were located. Parents and adolescents were informed that each would receive a \$10 Target gift card as a token of appreciation at the completion of the study questionnaires.

Protection of Research Participants

This study posed minimal risk to participants; no greater risk was incurred from participating in this study than ordinarily encountered in daily life. Permission to conduct this study was received from the IRBs of the cooperating institution and Seton Hall University prior to data collection. A letter of solicitation (Appendix G) was written, explaining the study, the purpose, eligibility requirements, the provision for informed consent and assent, the time requirements, the right to withdraw from the study at any time, data collection procedures, confidentiality, and the researcher's contact information. Participants were advised that every effort would be made by the researcher to keep shared information confidential. Surveys were numbered so that identifying information was not disclosed. Participation was completely voluntary, and participants were informed that they could elect to withdraw at any time throughout the study period. Consent from parents and assent from adolescents was obtained prior to the start of the survey materials using a combined consent and assent form that was approved by the cooperating institution (Appendix H). Written assent from adolescents was obtained as evidence of respect for the child's right to self-determination (Polit & Beck, 2012). Participants were escorted to a private area to discuss the study and for completion of the surveys. Completed surveys were returned

directly to the researcher and will be kept in a locked file cabinet accessible only to the researcher.

Participants were informed that collected data were recorded by packet number and the coding system used did not contain information that identified participants such as names, addresses, or social security numbers. Participant names appeared only on the consent and assent forms, which were put in an envelope separate from the envelopes with the completed surveys. Only the researcher had access to a list of participant names linked to the corresponding numerical code that appeared on the study materials. This list was kept on a single flash drive separate from the data and was stored in a locked file cabinet, accessible only to the researcher, in the researcher's office. The list was kept secure and confidential by the researcher as a single document. Identifying information was not entered into the statistical computer program. All information provided, including names on the consent and assent forms, was kept confidential by the researcher. Data were reported in aggregate, so that individual participants were not identified. To insure further confidentiality of all responses, submitted data were stored on a flash drive separate from the list of participants in a locked file cabinet in the researcher's office, accessible only to the researcher.

A list of school nurse to student ratios for all identified schools of attendance was generated and stored in a locked file cabinet, accessible only to the researcher, in the researcher's office.

In accordance with the Code of Federal Regulations, 45 CFR 46.115b, electronic and hard copy data will be kept by the researcher in a locked file drawer in the researcher's office for a minimum of three years after completion of the study (U.S. Department of Health & Human Services, 2009), after which point, all data will be discarded.

Research Instruments

The selection of study instruments was based on several considerations: the overall appropriateness of the instrument for measuring the intended study variable, congruence with the theoretical framework, the instrument's psychometric properties, past use in nursing research, the length of time to complete, and availability.

Parent questionnaire. The parent questionnaire (Appendix I) was developed by the researcher and based on the literature review. The questionnaire requested demographic information such as the adolescent's age, gender, most frequent HbA1c level, and school of attendance. Diabetes related questions included items such as the adolescent's age at diagnosis, mode of insulin delivery, frequency of endocrinology appointments, BGM frequency, history of hospitalizations with etiology, and diabetes camp attendance. Questions related to diabetes in the school setting included items about the school setting and the school nurse. Examples include the frequency of adolescent interaction with the school nurse, the physical presence of a school nurse in the school building, the occurrence of hypoglycemia or hyperglycemia and treatment of those conditions in school. The parent questionnaire also contained an

open ended question about anything learned from the school nurse that may have influenced the parent's ability to care for the adolescent's diabetes.

Adolescent questionnaire. The adolescent questionnaire (Appendix J) was a short 7-item survey developed by the researcher that asked about time and frequency of interaction with the school nurse and diabetes related activities performed in school. It contained an open ended question about anything learned from the school nurse that helped the adolescent take better care of his or her diabetes.

Self-Efficacy for Diabetes Self-Management (SEDM) scale. Based on Bandura's self-efficacy theory, the SEDM (Appendix K) was developed by Iannotti et al. (2006) for the purpose of measuring self-efficacy in children younger than those in the sample by Grossman et al. (1987). The development of the SEDM was presented in Chapter 2. The 10-item Likert-style instrument reflects present-day changes in diabetes treatment modalities. The SEDM asks adolescents, "How sure are you that you can do each of the following, almost all of the time?" The instrument then asks adolescents to rate themselves on a scale of 1-10 (1 = *not at all sure* and 10 = *completely sure*) in commonly encountered situations, such as "adjust your insulin correctly when you eat more or less than usual," and "do your blood sugar checks even when you are really busy." A mean score is calculated with possible scores ranging from 1-10. Higher mean scores indicate higher levels of self-efficacy for diabetes self- management (R. Iannotti, personal communication, January 16, 2014).

The SEDM has been widely used in research on self-efficacy in adolescents with T1DM. Butner et al. (2009) conducted a study of 185 adolescents with T1DM,

aged 10-14 years old, for the purpose of examining adolescent well-being. Reported reliability of the SEDM was .81. In a study investigating the relationship between parental negative affect and self-efficacy for diabetes management in adolescents ($N = 183$), Butler et al. (2009) reported adequate reliability of the SEDM ($\alpha = .83$) using a sample of adolescents aged 10-14 years old. Berg et al. (2009) conducted a study of adolescents with T1DM between the ages of 10 and 14 ($N = 252$) on stress appraisal, coping, and coping effectiveness in adolescents with T1DM. Reliability for the SEDM in this study was reported to be .81. Wysocki et al. (2009) studied 309 youth, aged 9-14.5 years old, for the purpose of examining the role of parental involvement on diabetes outcomes. In this study, the SEDM demonstrated good reliability ($\alpha = .82$). Using the same sample as in Berg et al. (2009), Berg et al. (2011) investigated the role of self-efficacy in parental involvement and adolescent diabetes management, reporting reliability of the SEDM as .83. In a study examining the relationship between the daily problems of adolescents with T1DM and parental persuasion, Berg et al. (2013) reported good reliability of the SEDM ($\alpha = .88$) in a sample of 180 adolescents aged 10.5-15.5 years old.

The SEDM has been shown to be a reliable and valid instrument that reflects current diabetes management modalities. In this study, the SEDM demonstrated good reliability ($\alpha = .85$). The brevity of the instrument made it a good choice for use with adolescents; therefore, it was appropriate for use in this study. Permission for use in this study was granted by the author (Appendix L).

All three study instruments were pilot tested on three parent-adolescent dyads meeting the inclusion criteria. The instruments were evaluated for the following: clarity of questions and statements, time needed to complete study instruments, and readability. The average time needed to complete the study instruments was approximately 10 minutes each for adolescents and parents.

Data Collection Procedures

The following is a description of the method used for in-person data collection. After verbal consent was obtained from each parent-adolescent dyad, a packet was given to each parent and adolescent participant. Within one large manila envelope, separate packets with the same numerical code in the upper right hand corner were prepared and color coded for each member of the parent-adolescent dyad in order to ensure proper completion of study materials by each dyad participant. A white packet consisted of materials that were to be read and taken home for reference by the parent, and included the letter of solicitation (Appendix G), one unsigned copy of the combined consent and assent form (Appendix H), and the institution's privacy practices notice (Appendix M). A peach packet was completed by the parent and returned to the researcher. The materials contained in the parent packet included one copy of the combined consent and assent form to be signed by both the parent and adolescent (Appendix H), the parent questionnaire with demographics (Appendix I), and a form to fill out should parents wish a copy of the study findings (Appendix N). A blue packet was completed by the adolescent and returned to the researcher. The materials contained in the adolescent packet included the adolescent questionnaire

(Appendix J), and the SEDM (Iannotti et al., 2006) (Appendix K). Both parent and adolescent study packets were returned in the manila envelope. Confidentiality of participants was maintained throughout the data collection process.

After reviewing the letter of solicitation, interested parent-adolescent dyad participants were escorted to a private location and given instructions on how to fill out the consent, adolescent assent, and surveys. Parents read and signed the informed consent portion and adolescents read and signed the assent portion of the combined form. Completion of the parent study materials took approximately 15 minutes, and completion of the adolescent study materials took approximately 5-10 minutes.

The following is a description of the method used for mailed survey data collection. As described above, interested participants contacted the researcher via email and provided their addresses. Study packets were prepared identical to those packets used for in-person data collection and mailed to interested participants. Participants were informed they could email the researcher if they had questions about any of the study materials. Completed packets were mailed back to the researcher in postage paid envelopes. Upon receipt and review of the study materials, the researcher then mailed two \$10 Target gift cards enclosed in a thank you card to participants.

Participants were informed that their participation in the study in no way influenced the attitudes of neither their health care providers nor the care received by their adolescents. Participants were informed that they had the right to refuse participation or withdraw from the study at any time without recourse simply by

informing the researcher. Participants who desired to receive a copy of the study findings provided the researcher with contact information on a separate form provided. Completed study packets were returned directly to the researcher, after which each parent and each adolescent participant were given a \$10 Target gift card as a token of appreciation.

The researcher obtained school nurse to student ratio data in the following manner. Parent participants identified the name and location of their adolescent's school on the demographic questionnaire. Prior to data analysis, the school nurses of identified schools of attendance were contacted via telephone by the researcher. The researcher requested the number of full-time and part-time school nurses employed and the total number of students enrolled at that point in time. As some school nurses did not have access to current enrollment data or provided an approximation of enrollment data, the researcher utilized the enrollment data for the school year 2013-2014 (NJDOE, 2014) for all schools attended by participants. Although the enrollment data available from the NJDOE may not have reflected changes in current enrollment, it was a more consistent method of obtaining enrollment data, eliminating potential errors or bias in school nurse reporting.

Analysis of Data

Collected data were analyzed by the researcher using IBM (2013) SPSS for Windows (Version 22.0). Data were examined for missing data, outliers, and accuracy of data entry prior to performing data analysis. The assumptions of interval

or ratio level of measurement, normality, linearity, and homoscedasticity (Pallant, 2013) were met by all main study variables.

Mean score, median, mode, standard deviation, and reliability coefficient were computed for the SEDM. Mean score, median, mode, and standard deviation were also computed for each of the 10 scale items of the SEDM.

Descriptive statistics, means, and standard deviations were computed for all continuous variables, including school nurse to student ratio, SEDM, HbA1c, age, and diabetes duration. Descriptive statistics were also computed for all ancillary variables, including but not limited to participant gender, parental education levels, BGM frequency, frequency of endocrinology visits, and frequency of visiting the school nurse.

Data were analyzed using the Pearson product-moment correlation coefficient to determine if there is a relationship among the main study variables of school nurse to student ratio, self-efficacy for type 1 diabetes management, and glycemic control in adolescents, as well as the variables of age and diabetes duration. An independent samples t-test was performed to determine if there were gender differences on the mean score and individual items of the SEDM.

School nurse to student ratio was defined as the number of full-time equivalent (FTE) school nurses in the building available for the total student enrollment for the school year 2013-2014. The number of FTEs was defined by the responses given by school personnel to the researcher's telephone inquiry regarding the number of full-time and the number of part-time school nurses in the building. For

schools that employed only one part-time school nurse, FTE status was calculated as follows: the number of hours the school nurse is present each day divided by 7.0, the number of hours that a school nurse is generally on site. For example, a school nurse that is present every day for 4.0 hours would be assigned a FTE value of .57. School nurses who were present for a combination of full-time and part-time days during the week would be assigned an FTE based on a 35-hour week. The same method was utilized to calculate FTE status for schools employing more than one full-time nurse.

The total student enrollment was defined as follows: New Jersey public and charter school total enrollment as reported by the NJDOE (2014) for the school year 2013-2014; New Jersey nonpublic school total enrollment as reported by the NJDOE Office of Nonpublic School Services (G. Kocher, personal communication, October 2, 2014) for the school year 2013-2014; and Pennsylvania nonpublic school total enrollment as reported by the Pennsylvania Department of Education (2014) for the school year 2013-2014.

For the purpose of this study, school nurse to student ratio was obtained by dividing the total student enrollment by the total number of FTE school nurses. Lower numbers indicate a lower ratio, meaning that the school nurse cares for fewer students. For example, a school with a total school enrollment of 800 students and two FTE school nurses has a ratio of 1:400, meaning that one school nurse cares for 400 students.

Spearman's rank order correlational analysis was conducted among continuous variables and categorical ancillary variables. Additional nonparametric testing using Spearman's rank order correlation was conducted among ordinal categorical ancillary variables (Witte & Witte, 2010), such as frequency of blood glucose monitoring and insulin administration, frequency of visiting the school nurse, parental satisfaction with diabetes care in school, and parental report of diabetes related safety in school.

Summary

A descriptive correlational design was used in this research study to examine the relationship among the school nurse to student ratio, self-efficacy for type 1 diabetes management, and glycemic control in adolescents. An adolescent questionnaire and the SEDM were administered to the adolescent participant sample. A parent questionnaire, including demographics, was administered to the parent participant sample. Data were entered into SPSS for statistical analysis.

Chapter IV

FINDINGS

Introduction

The purpose of this study was to determine if there is a relationship among the school nurse to student ratio, self-efficacy for type 1 diabetes management, and glycemic control in adolescents. Age and diabetes duration as independent variables were also examined to determine if relationships exist among these variables and self-efficacy for type 1 diabetes management and HbA1c levels. In addition to statistical analysis of numeric data, this chapter provides a summary of the responses to the open ended question contained in both the parent and adolescent questionnaires, which asks if participants learned anything from the school nurse about caring for diabetes.

Parent participants filled out a 42-item questionnaire. There were eight demographic questions, including three eligibility screening questions regarding the adolescent's age, ability to understand grade level material, and comorbid conditions that would increase contact with the school nurse. There were 11 diabetes related questions, such as the adolescent's most recent HbA1c level, age at diagnosis, method of insulin delivery, and BGM frequency. There were 23 questions regarding diabetes in the school setting, school nurse presence, and frequency of interaction with the school nurse, including the open ended question asking if parents have learned

anything from the school nurse that influenced their ability to care for their adolescent's diabetes.

Adolescent participants filled out the 10-item SEDM, described in more detail in Chapter 3, as well as a 7-item questionnaire about the frequency of school nurse interaction, activities performed with the school nurse, frequency of BGM, and feelings about the helpfulness of the school nurse. Adolescents and parents answered the same open ended question.

Description of the Sample

Participant demographic data are presented in the narrative as well as in table format. Adolescents were aged 10-16 ($M = 13.43$, $SD = 1.79$), with the majority of the sample represented by adolescents aged 13-16 years old ($n = 63$, 70.8%). There were 49 adolescent males (55.1%) and 40 adolescent females (44.9%). Table 1 denotes the frequencies for age and gender for adolescent participants.

Table 1.

Age and Gender of Adolescent Participant Sample (N = 89)

Characteristic	Grouping	Frequency	Percent
Age	10 years of age	7	7.9%
	11 years of age	9	10.1%
	12 years of age	9	10.1%
	13 years of age	17	19.1%
	14 years of age	17	19.1%
	15 years of age	18	20.2%
	16 years of age	11	12.4%
	Missing	1	1.1%
Gender	Male	49	55.1%
	Female	40	44.9%

Adolescent participants were reported by their parents to have HbA1c levels ranging from 6%-12.5% ($M = 8.12$, $SD = 1.37$). The age at diabetes diagnosis ranged from 2-15 years of age ($M = 8.07$, $SD = 3.47$); two participants were missing data for this variable (2.2%). Diabetes duration ranged from less than 1 to 12 years of age ($M = 5.23$, $SD = 3.19$). The majority of the adolescent sample had a diabetes duration of 0-5 years ($n = 49$, 57%). Three participants were missing data for this variable (3.3%), as it was computed in SPSS (IBM, 2013) using participant age and age at diagnosis. One participant was missing data for age and two participants were missing data for age at diagnosis. Most adolescent participants received insulin by injection ($n = 46$, 51.7%); the remaining sample received insulin via continuous subcutaneous insulin infusion (CSII) ($n = 42$, 47.2%). One participant was transitioning from injection to CSII (1.1%). Table 2 denotes the means and standard deviations for selected diabetes characteristics.

Table 2

Means and Standard Deviations of Diabetes Characteristics of Adolescent Participant Sample (N = 89)

Characteristic	Range	M	SD	N
Age in years	10-16	13.43	1.79	88
Most recent HbA1c %	6-12.5	8.12	1.37	89
Age at diagnosis in years	2-15	8.07	3.47	87
Diabetes duration in years	0-12	5.23	3.19	86

Note. Diabetes duration of 0 indicates duration of less than one year.

Parents reported on the parent questionnaire that almost one-quarter of the adolescent participant sample ($n = 20$, 22.5%) had a comorbid diagnosis. Of the 20 with comorbid conditions, four participants had two comorbid conditions. Half of this subset of the sample ($n = 10$) had a diagnosis of hypothyroidism. Other comorbid conditions included diagnoses such as attention deficit disorder, celiac disease, and asthma. None of these comorbid conditions resulted in increased interaction with the school nurse according to parent report. Table 3 denotes the frequencies of comorbid diagnoses.

Table 3

Comorbid Diagnoses of Adolescent Participant Sample (N = 89)

Diagnosis	Frequency	Percent
Attention deficit/Attention deficit hyperactivity disorder	3	3.4%
Asthma	3	3.4%
Autism spectrum disorder	1	1.1%
Celiac disease	2	2.2%
Food allergy	1	1.1%
Hypothyroidism	10	8.9%
Learning disability	1	1.1%
Myoclonic epilepsy	1	1.1%
Obsessive compulsive disorder	1	1.1%
Thalassemia	1	1.1%

Note. Percentages will not total 100%, as not all participants reported comorbid diagnoses. There were 16 participants reporting one comorbid diagnosis and 4 participants reporting two diagnoses.

The majority of the adolescent participant sample attended either elementary or middle school ($n = 56$, 62.9%), with the remaining sample attending high school

($n = 33$, 37.1%). One participant attended a public charter school (1.1%), 11 participants (12.4%) attended nonpublic schools, and 77 participants (86.5%) attended public schools. All participants attended schools in New Jersey, with the exception of one participant, who attended a nonpublic school in Pennsylvania.

The parent participant sample was predominantly female ($n = 79$, 88.8%) and well educated. The majority of the parent participant sample held baccalaureate degrees or higher ($n = 60$, 67.4%), and 21 parent participants (23.6%) held graduate degrees. One participant was missing data for this variable. Respondents indicated that the adolescent's other parent was also well educated, holding a baccalaureate degree or higher ($n = 54$, 60.7%), with 20 parents (22.5%) holding graduate degrees. Table 4 denotes the educational levels of both parents of the adolescent participant. Data were not collected regarding parents' marital status or the structure of the household; therefore it is not known whether adolescents resided with one or both parents.

Table 4

Educational Levels of Parent Participant Sample and Other Parent (N = 89)

Educational level	Parent participants		Other parents	
	Frequency	Percent	Frequency	Percent
Less than high school graduate	2	2.2%	0	0.0%
High school graduate/GED	11	12.4%	17	19.1%
Some college/vocational training	15	16.9%	18	20.2%
College graduate	37	41.6%	32	36%
Some graduate school	2	2.2%	2	2.2%
Graduate degree	21	23.6%	20	22.5%
Missing	1	1.1%	0	0.0%

Description of the Main Study Variables

The main study variables examined were school nurse to student ratio, self-efficacy for type 1 diabetes management measured by the SEDM, glycemic control measured by the most recently reported HbA1c level, and the variables of age and diabetes duration. HbA1c level and the variables of age and diabetes duration have been described above.

School nurse to student ratio. There were 79 reported schools of attendance for the sample. Nine of the schools were listed as the school of attendance for more than one sample participant. As stated in the previous chapter, school nurse to student ratio was defined as the number of full-time equivalent (FTE) school nurses in the building available for the total student enrollment for the school year 2013-2014. The

number of FTEs was defined by the responses given by school personnel to the researcher's telephone inquiry regarding the number of full-time and the number of part-time school nurses in the building. For schools that employed only one part-time school nurse, FTE status was calculated as follows: the number of hours the school nurse is present each day divided by 7.0, the number of hours that a school nurse is generally on site. For example, a school nurse that is present every day for 4.0 hours would be assigned a FTE value of .57. School nurses who were present for a combination of full-time and part-time days during the week would be assigned an FTE based on a 35-hour week. The same method was utilized to calculate FTE status for schools employing more than one full-time nurse.

The total student enrollment was defined as follows: New Jersey public and charter school total enrollment as reported by the NJDOE (2014) for the school year 2013-2014; New Jersey nonpublic school total enrollment as reported by the NJDOE Office of Nonpublic School Services (G. Kocher, personal communication, October 2, 2014) for the school year 2013-2014; and Pennsylvania nonpublic school total enrollment as reported by the Pennsylvania Department of Education (2014) for the school year 2013-2014.

For the purpose of this study, school nurse to student ratio was obtained by dividing the total student enrollment by the total number of FTE school nurses. Lower numbers indicate a lower ratio, meaning that the school nurse cares for fewer students. For example, a school with a total school enrollment of 800 students and

two FTE school nurses has a ratio of 1:400, meaning that one school nurse cares for 400 students.

From this point forward, data reported in text and in tables referring to any component of the school nurse to student ratio, pertains to the entire participant sample of 89, unless otherwise specified. The majority of the adolescent participant sample attended elementary or middle school ($n = 56, 62.9\%$) in public institutions ($n = 77, 86.5\%$). Almost all participants attended schools with at least one FTE school nurse ($n = 85, 95.4\%$). The four participants (4.5%) attending schools with less than one FTE school nurse attended nonpublic schools. The range of FTE school nurses was 0.5-4.0 ($M = 1.33, SD = .62$). Total school enrollment ranged from 84-2953.5 ($M = 827.1, SD = 576.45$). The majority of participants attended schools with enrollments between 84 and 500 ($n = 33, 37.1\%$) or between 501 and 1000 ($n = 27, 30.3\%$). Nearly half of participants ($n = 41, 46.1\%$) attended schools with school nurse to student ratios of 1:500 or less. Eleven participants (12.4%) attended schools with school nurse to student ratios of 1:1001 to 1:1500 and one participant (1.1%) attended a school with a school nurse to student ratio of 1:1531. The range of school nurse to student ratios was 1:105 to 1:1531 ($M = 602.97, SD = 295.58$). Table 5 denotes the school characteristics in greater detail.

Table 5

Characteristics of Schools of Attendance for Adolescent Participant Sample (N = 89)

Demographic	Grouping	Frequency	Percent
School level	Elementary/Middle	56	62.9%
	High school	33	37.1%
School type	Public	77	86.5%
	Nonpublic	11	12.4%
	Charter	1	1.1%
Full-time equivalent status*	< 1.0	4	4.5%
	1.1-1.9	60	67.4%
	2.0-2.9	22	24.7%
	3.0-3.9	2	2.2%
	4.0	1	1.1%
Total school enrollment	84-500	33	37.1%
	501-1000	27	30.3%
	1001-2000	24	27.0%
	2001-3000	5	5.6%
School nurse to student ratio	105-500	41	46.1%
	501-1000	36	40.4%
	1001-1500	11	12.4%
	1500-2000	1	1.1%

Note. *Full-time equivalent status percentages do not equal 100% due to rounding.

Elementary and middle schools varied greatly in the composition of grade levels contained within each building. All public high schools and one nonpublic high school were comprised of grades 9-12. Table 6 denotes the grade level characteristics of both public and nonpublic schools of attendance for the adolescent participant sample. It should be noted that although one of the nonpublic schools included grades 6-12, the participant attending that particular school was 12 years old; therefore the school was included under nonpublic middle/elementary schools. Similarly, another

participant, aged 16 years old, attended a nonpublic school comprising grades 7-12, therefore, that particular school was included under nonpublic high schools.

Table 6

Grade Level Characteristics of Schools of Attendance for Adolescent Participant Sample (N = 89)

Demographic	Grouping	Frequency	Percent
Public schools			
Elementary/Middle	K-4	1	1.1%
	K-5	5	5.6%
	K-6	5	5.6%
	K-8	8	9.0%
	1-5	1	1.1%
	3-8	1	1.1%
	5-6	2	2.2%
	5-8	4	4.5%
	6-8	17	19.1%
	7-8	3	3.4%
High school	9-12	31	34.8%
Nonpublic schools			
Elementary/Middle	K-8	7	7.9%
	4-8	1	1.1%
	6-12*	1	1.1%
High school	7-12**	1	1.1%
	9-12	1	1.1%

Note. Percentages will not total 100 due to rounding. *Participant attended middle school. ** Participant attended high school.

Self-efficacy for type 1 diabetes management. Self-efficacy for type 1 diabetes management in adolescents was measured using the SEDM (Iannotti et al., 2006). As discussed previously, the SEDM is a 10-item one-dimensional scale. A

mean score is calculated with possible scores ranging from 1-10. The range of SEDM mean scores was 3-10 ($M = 7.71$, $SD = 1.51$). Higher mean scores indicate higher levels of self-efficacy for diabetes self-management. Adolescents reported a lower level of self-efficacy in choosing healthful foods when dining outside the home ($M = 6.90$, $SD = 2.19$), and a higher level of self-efficacy in adjusting insulin correctly when eating more or less than usual ($M = 8.55$, $SD = 2.23$). Items 8 and 10 were each missing one data point; therefore, the computed reliability for this study ($\alpha = .85$) is based on 87 participants. Table 7 denotes the means and standard deviations for individual items of the SEDM, as well for the SEDM mean score.

Table 7

Item Means and Standard Deviations for the Self-Efficacy for Diabetes Self-Management Scale (N = 89)

Scale items	<i>M</i>	<i>SD</i>
1. Adjust your insulin correctly when you eat more or less than usual?	8.55	2.23
2. Choose healthful foods when you go out to eat?	6.90	2.19
3. Exercise even when you don't really feel like it?	7.25	2.38
4. Adjust your insulin or food accurately based on how much exercise you get?	7.35	2.51
5. Talk to your doctor or nurse about any problems you're having with taking care of your diabetes?	7.63	2.64
6. Do your blood sugar checks even when you are really busy?	7.70	2.23
7. Manage your diabetes the way your health care team wants you to?	7.81	2.26
8. Manage your diabetes even when you feel overwhelmed?†	8.13	2.33
9. Find ways to deal with feeling frustrated about your diabetes?	7.85	2.40
10. Identify things that could get in the way of managing your diabetes?†	7.91	2.21
SEDM mean score	7.71	1.51

Note. SDs are rounded to the nearest hundredth. Range of possible scores is 1-10. Higher scores indicate higher levels of self-efficacy. † denotes ($n = 88$).

Statistical Analyses

Prior to performing bivariate correlational analysis, the distributions of main study variables, age, and diabetes duration were examined for normality, outliers and missing data. The following represents the skewness and kurtosis in the distributions of the continuous variables, respectively: school nurse to student ratio (.827, .266);

SEDM (-.858, .691); HbA1c levels (1.20, 1.22); age (-.370, -.825); and diabetes duration (.187, -.861). Although all continuous variables had some degree of skewness and kurtosis, according to the central limit theorem, the distributions are considered normally distributed if the sample size is between 25 and 100 (Witte & Witte, 2010). The sample size of 89 in this study meets the requirements to apply the central limit theorem.

Several of the continuous variables contained outliers in their distributions. The school nurse to student ratio had one outlier; the SEDM had three outliers; and HbA1c level had five outliers. Outliers were not excluded from data analysis for the following reasons: they are a legitimate part of the sample intended for this study (Tabachnick & Fidell, 2013); none of the outlier scores identified by SPSS (IBM, 2013) were extreme scores (Pallant, 2013); and based on the comparison and similarity of the mean and 5% trimmed mean, the outlier scores did not have a strong influence on the mean (Pallant, 2013).

Missing data analysis was performed on all numeric and ancillary variables ($n = 75$). Of 6,675 data points in the data file, there were 70 missing data points (1.05%). Thirty-nine participants (43.8%) had at least one missing data point and the range of missing data points per participant was 1-11. The participant with 11 missing data points was not excluded from the study, as all questions pertaining to the main study variables were fully answered. Little's MCAR test was performed on all main study variables and was nonsignificant (.345), indicating that data were missing completely at random (Polit, 2010).

One main study variable, the SEDM, and both variables of age and diabetes duration had minimal missing data points. The SEDM had two missing data points from two different participants; age had one missing data point; and diabetes duration had three missing data points. For the two participants missing one data point each on the 10-item SEDM, the SEDM mean score was calculated based on 9, rather than 10 items, which is an acceptable method of accounting for a missing data point when a scale is computed by taking the mean score of valid responses (Bannon, 2013, p.169). The missing data points for age and diabetes duration were addressed by a pairwise deletion when conducting all correlational analyses. Pairwise deletion was an appropriate method to address the missing data in the main study variables as the data were missing completely at random, and the percentage of missing data was small (Polit, 2010, p.370). Table 8 denotes a summary of outliers, missing data, mean, and 5% trimmed mean for the main study variables and variables.

Table 8

Summary of Outliers, Missing Data, Mean, and 5% Trimmed Mean for Main Study Variables (N = 89)

Variable	Outliers	Missing data points	Mean	5% trimmed mean
School nurse to student ratio	1	0	602.97	589.39
SEDM	3	2	7.71	7.80
HbA1c level	5	0	8.12	8.02
Age	0	1	13.43	13.48
Diabetes duration	0	3	5.23	5.19

Note. SEDM is the Self-Efficacy for Diabetes Self-Management scale (Ianotti et al., 2006).

Bivariate correlation of main study variables. The continuous variables of school nurse to student ratio, self-efficacy for type 1 diabetes management, measured by the SEDM, glycemic control measured by HbA1c level, and the variables of age and diabetes duration were analyzed using the Pearson product-moment correlation coefficient (Pearson's r). The assumptions of interval or ratio level of measurement, normality, linearity, and homoscedasticity (Pallant, 2013) were met by all main study variables.

Table 9 denotes the correlation matrix for the main study variables. The level of significance was set at $p < .05$. The strength of the relationship was determined by the r value; r values of .1, .3, and .5 are considered to be small, medium, and large, respectively (Pallant, 2013). For the purpose of reporting the findings, correlations will be noted as follows: small ($r = .10$ -.29), medium ($r = .30$ -.49), and large ($r = .50$ -1.0) (Pallant, 2013, p. 139). School nurse to student ratio had a small, negative correlation with HbA1c level ($r = -.244$, $p = .021$) and a large, positive correlation with age ($r = .539$, $p < .01$). SEDM mean score had a small, positive correlation with age ($r = .224$, $p = .036$). No other significant correlations among main study variables were noted.

Table 9

Means, Standard Deviations, and Bivariate Correlations of Main Study Variables (N = 89)

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5
1. School nurse to student ratio	602.97	295.58	—	.165	-.244*	.539**	-.057
2. SEDM mean score	7.71	1.51		—	-.125	.224*	.004
3. HbA1c %	8.12	1.37			—	.082	.117
4. Age in years†	13.43	1.79				—	.135
5. Diabetes duration in years††	5.23	3.19					—

Note. SEDM is the Self-Efficacy for Diabetes Self-Management scale (Iannotti et al., 2006). * denotes significance at $p < .05$ and ** significance at $p < .01$. † denotes ($n = 88$). †† denotes ($n = 86$).

The small, positive correlation between age and SEDM mean scores suggests that older adolescents have higher levels of self-efficacy. The large, positive correlation between age and school nurse ratio suggests that older adolescents attend schools with larger school nurse to student ratios, meaning that the school nurse cares for larger numbers of students. The small, negative correlation between HbA1c levels and school nurse to student ratio suggests that adolescents with higher HbA1c levels attend schools with lower school nurse to student ratios, meaning that the school nurse cares for fewer numbers of students. Conversely, the negative correlation also suggests that adolescents with lower HbA1c levels attend schools with higher school nurse to student ratios (Green & Salkind, 2011).

Correlations of main study variables and ancillary variables. In addition to analysis of main study variables, demographic and ancillary variables were also analyzed. Spearman's rank order correlation coefficient was used for correlations between two categorical ancillary variables and correlations between categorical ancillary variables and continuous variables. An independent samples t-test was performed to determine if there were gender differences on the mean score and individual items of the SEDM. The t-test assumptions of interval or ratio level of measurement, normality, and homogeneity of variance (Pallant, 2013) were met.

Due to missing data ($n = 12$ not applicable; $n = 6$ not answered) for the number of times per day visiting the school nurse, the sample size for any correlation using this variable is reduced ($n = 71$).

School nurse to student ratio. School nurse to student ratio had a large, positive correlation with level of school (elementary/middle or high school) of attendance ($r_s = .617, p < .01$), and a medium, negative correlation with the number of times per day with which the adolescent participant visits the school nurse ($r = -.306, p = .009$). These correlations suggest that higher school nurse to student ratios are associated with high schools, rather than elementary or middle schools, as well as a lower daily frequency with which adolescents visit the school nurse. Also noted were two small, negative correlations: between school nurse to student ratio and parental report of feelings of diabetes related safety in school ($r_s = -.291, p = .006$), and between school nurse to student ratio and parental satisfaction with diabetes care in school ($r_s = -.296, p = .005$). These findings suggest that parents are less satisfied with

diabetes care in school and feel their adolescents are less safe with higher school nurse to student ratios.

SEDM. The self-efficacy measure was significantly associated with gender, $t(87) = -2.00, p = .048$; SEDM mean scores were higher in girls ($M = 8.06, SD = 1.32$) than in boys ($M = 7.42, SD = 1.60$). The negative t value is an artifact of how the gender variable was coded. An independent samples t-test was also conducted between gender and individual items of the SEDM. Three of the items showed a gender difference. Girls had statistically significant higher scores on item 2, “Choose healthful foods when you go out to eat?”, $t(87) = -2.30, p = .024$; item 7, “Manage your diabetes the way your health care team wants you to?”, $t(87) = -2.59, p = .011$; and item 10, “Identify things that could get in the way of managing your diabetes?”, $t(86) = -2.67, p = .009$. Table 10 denotes overall SEDM mean, item means and standard deviations by gender. There was a small, negative correlation between SEDM mean scores and time spent with the school nurse ($r_s = -.263, p = .015$), suggesting that adolescents with higher levels of self-efficacy spend less time with the school nurse.

Table 10

Gender Differences in Item Means and Standard Deviations for the Self-Efficacy for Diabetes Self-Management Scale (N = 89)

Scale items	Gender	<i>M</i>	<i>SD</i>
1. Adjust your insulin correctly when you eat more or less than usual?	Male	8.20	2.53
	Female	8.98	1.73
2. Choose healthful foods when you go out to eat?*	Male	6.43	2.31
	Female	7.48	1.89
3. Exercise even when you don't really feel like it?	Male	7.39	2.23
	Female	7.08	2.56
4. Adjust your insulin or food accurately based on how much exercise you get?	Male	6.90	2.57
	Female	7.90	2.36
5. Talk to your doctor or nurse about any problems you're having with taking care of your diabetes?	Male	7.35	2.89
	Female	7.98	2.29
6. Do your blood sugar checks even when you are really busy?	Male	7.53	2.30
	Female	7.90	2.16
7. Manage your diabetes the way your health care team wants you to?*	Male	7.27	2.56
	Female	8.48	1.62
8. Manage your diabetes even when you feel overwhelmed? †	Male	8.02	2.48
	Female	8.25	2.17
9. Find ways to deal with feeling frustrated about your diabetes?	Male	7.80	2.32
	Female	7.93	2.53
10. Identify things that could get in the way of managing your diabetes?* †	Male	7.37	2.48
	Female	8.59	1.59
SEDM mean score*	Male	7.42	1.60
	Female	8.06	1.32

Note. SDs are rounded to the nearest hundredth. Range of possible scores is 1-10. Higher scores indicate higher levels of self-efficacy. * denotes significance at $p < .05$. † denotes ($n = 88$).

Age. Age was negatively correlated with the number of times per day ($r = -.393, p = .001$), and the number of times per week ($r_s = -.252, p = .018$), with which adolescent participants visit the school nurse, suggesting that older adolescents visit the school nurse with less frequency than younger adolescents during the day and during the week. Also noted were medium, negative correlations between age and parental report of feelings of diabetes related safety in school, ($r_s = -.337, p = .001$), parental satisfaction with diabetes care in school ($r_s = -.379, p < .01$), and adolescent report of helpfulness of the school nurse ($r_s = -.342, p = .001$). These findings suggest that parents of older adolescents feel their adolescents are less safe and parents are less satisfied with diabetes care in school. Additionally, older adolescents tend to report that the school nurse is less helpful, and younger adolescents report that the school nurse is more helpful.

Also noted was a small, negative correlation between age and parental report that parents would keep their adolescents home if there was no school nurse available on that day ($r_s = -.283, p = .008$), suggesting that younger adolescents would be kept home more often than older adolescents.

Correlations of ancillary variables. There were a number of significant correlations between ancillary variables such as parental satisfaction with diabetes care in school, adolescent report of helpfulness of the school nurse, and correlations between parent and adolescent reports of diabetes related activities.

Parental satisfaction with diabetes care. Parental satisfaction with diabetes care in school showed large, positive correlations with parental report of feelings of

diabetes related safety in school ($r_s = .682, p < .01$) and adolescent report of helpfulness of the school nurse ($r_s = .563, p < .01$). This finding suggests that parental satisfaction is higher when parents feel their adolescents are safer in school. It also suggests that when adolescents feel the school nurse is more helpful, the level of parental satisfaction with diabetes care is higher.

Adolescent report of helpfulness of the school nurse. Adolescent report of helpfulness of the school nurse had a medium, positive correlation with parental report of feelings of diabetes related safety in school ($r_s = .330, p = .002$) and a medium, negative correlation with gender ($r_s = -.304, p = .004$), suggesting that when adolescents feel the school nurse is more helpful, parents feel their adolescents are safer in school. The direction of the correlation between adolescent report of helpfulness of the school nurse and gender is an artifact of coding. As females were coded in SPSS with a higher number than males, this suggests that adolescent boys feel the school nurse is more helpful than do girls. Also noted were small, positive correlations between adolescent report of helpfulness of the school nurse and time spent with the school nurse ($r_s = .239, p = .028$), number of times per day ($r_s = .274, p = .022$), and number of times per week with which adolescents visit the school nurse ($r_s = .239, p = .025$). In general, the more time adolescents spent with the school nurse, the more likely they were to feel that she was helpful.

Parent and adolescent correlations. There was a large, positive correlation between parent report and adolescent report of BGM frequency ($r_s = .624, p < .01$), and a medium correlation for frequency of insulin administration ($r_s = .479, p < .01$).

Also notable was a positive correlation between parent report and adolescent report of the number of times per day ($r = .763, p < .01$) and the number of times per week ($r_s = .459, p < .01$) with which the adolescent visits the school nurse. These findings suggest that parents and adolescents report similar frequencies of BGM, insulin administration, and frequency of visiting the school nurse.

Descriptive statistics from adolescent questionnaire. Adolescents were asked what activities they were involved in when visiting the school nurse. In addition to selected responses, they were able to write a response. Table 11 denotes the responses given by adolescents.

Table 11

Adolescent Report of Activities Performed with the School Nurse (N = 89)

Activity	Frequency	Percent
Checking blood glucose	81	91.0%
Receiving insulin	62	69.7%
Checking ketones	31	34.8%
Counting carbohydrates	41	46.1%
Learning something from the school nurse	7	7.9%
Calling parents	24	27.0%
Other activities	17	19.1%
Treating low blood glucose	7	7.9%
Insulin pump maintenance	5	5.6%
Recording blood glucose, insulin, carbohydrates	3	3.4%
Retrieving supplies	2	2.2%

Note. Percentages will not equal 100% as participants were able to select more than one activity. Percentages are rounded to the nearest tenth.

Nearly three-quarters of adolescent participants visited the school nurse every day ($n = 66, 74.2\%$). The number of times per day that adolescents visited the school

nurse ranged from 1-4.5 ($M = 1.90$, $SD = 1.0$). Almost one-third visited the school nurse once per day ($n = 29$, 32.6%). When participants provided a range of responses, the mean was entered into SPSS. Most adolescent participants performed BGM 5-6 times per day ($n = 41$, 46.1%) and received insulin 5-6 times per day ($n = 39$, 43.8%). The range of possible answers for frequency of BGM ($M = 3.02$, $SD = .758$) and insulin administration ($M = 2.68$, $SD = .796$) was from 1-2 times per day to ≥ 7 times per day. They were also asked to describe their feelings about the helpfulness of the school nurse with regards to diabetes care. The majority of adolescents reported the school nurse as being somewhat helpful ($n = 20$, 22.5%) or very helpful ($n = 50$, 56.2%). Table 12 denotes their responses.

Table 12

Adolescent Report of Helpfulness of School Nurse (N = 89)

Question	Response	N	Percent
How would you describe your feelings about the helpfulness of your school nurse with regards to your diabetes care?	Not at all helpful	3	3.4%
	Not very helpful	3	3.4%
	Neither helpful nor unhelpful	12	13.5%
	Somewhat helpful	20	22.5%
	Very helpful	50	56.2%
	Missing	1	1.1%

Descriptive statistics from parent questionnaire. The parent questionnaire asked a variety of questions, some of which are presented in tables for a more detailed analysis. The majority of parents stated that their adolescents visited the endocrinologist four times per year ($n = 70, 78.7\%$). Approximately 13% of parents indicated that their adolescent was hospitalized for a diabetes related condition in the last year ($n = 11, 13.3\%$); one was hospitalized twice for diabetic ketoacidosis (DKA). Reasons for hospitalizations were DKA ($n = 4, 4.5\%$), initial diagnosis ($n = 4, 4.5\%$), hypoglycemic seizure ($n = 1, 1.1\%$), ketones ($n = 1, 1.1\%$), and influenza ($n = 1, 1.1\%$).

Parents reported on the number of hypoglycemic episodes in the school setting that required the assistance of another person during the last 6 and 12 months. When parents provided a range of episodes, the mean was entered into SPSS. The range of hypoglycemic episodes requiring assistance in the last 6 months was 0-78 ($M = 4.37, SD = 11.20$), and in the last 12 months was 0-120 ($M = 7.39, SD = 16.70$). The majority of parents reported no hypoglycemic episodes in school in the last 6 or 12 months ($n = 49, 55.1\%$; $n = 45, 50.6\%$, respectively). Of the 39 respondents who indicated at least one hypoglycemic episode in the last 6 or 12 months, 34 reported that the school nurse was the person providing assistance. Only one adolescent participant experienced hypoglycemia related loss of consciousness at school. Glucagon™ was administered by the school nurse and 911 was called.

Parents reported on topics such as diabetes camp, the presence of a school nurse in adolescents' schools, field trips, and diabetes care in the school setting.

Parents reported missing work when they have had to keep their adolescent home ($n = 8$, 9.0%), go to school to care for their adolescent's diabetes ($n = 10$, 11.2%), or go on a field trip ($n = 22$, 24.7%) because there was no school nurse available. Table 13 denotes selected questions from the parent questionnaire and parent participant answers.

Table 13

Select Questions from Parent Questionnaire (N = 89)

Question	Response	N	Percent
Has your adolescent ever attended diabetes camp?	Yes	26	29.2%
	No	63	70.8%
Does your adolescent have a Glucagon delegate in school?	Yes	76	85.4%
	No	4	4.5%
	Not sure	8	9.0%
	Missing	1	1.1%
Would you keep your adolescent home if there was no school nurse present on that day?	Yes	16	18.0%
	No	73	82.0%
Have you kept your adolescent home because there was no school nurse present on that day?	Yes	11	12.4%
	No	78	87.6%
If you have kept your adolescent home, did you miss work?*	Yes	8	9.0%
	No	2	2.2%
	Missing	1	1.1%
Have you ever had to go to your adolescent's school to care for his or her diabetes because no one was available to help?	Yes	24	27.0%
	No	63	70.8%
	Missing	2	2.2%
If you have gone to your adolescent's school to care for his or her diabetes, did you miss work?*	Yes	10	11.2%
	No	14	15.7%
	Missing	2	2.2%
Has your adolescent ever missed a field trip because there was no school nurse available to go on the field trip?	Yes	3	3.4%
	No	86	96.6%
Have you ever had to go on a field trip because there was no school nurse available?	Yes	38	42.7%
	No	46	51.7%
	Missing	5	5.6%
If you have gone on a field trip, did you miss work?*	Yes	22	24.7%
	No	16	18.0%
	Missing	5	5.6%

Note. *Responses not applicable to entire sample. Percentages based on $N = 89$.

As discussed in the section on correlational analysis, parents also reported on their feelings about their adolescent's safety and their satisfaction in terms of diabetes care in school. Almost all parents reported feeling that their adolescent was somewhat safe ($n = 19$, 21.3%) or very safe ($n = 66$, 74.2%). Almost 90% of parents reported their satisfaction with diabetes care in schools as somewhat satisfied ($n = 16$, 18%) or very satisfied ($n = 63$, 70.8%). Table 14 denotes parent responses.

Table 14

Parental Report on Safety and Satisfaction Related to Diabetes Care in School from Parent Questionnaire (N = 89)

Question	Response	N	Percent
How would you describe your feelings about your adolescent's safety in school related to diabetes care?	Not at all safe	1	1.1%
	Not very safe	3	3.4%
	Neither safe nor unsafe	0	0.0%
	Somewhat safe	19	21.3%
	Very safe	66	74.2%
How would you describe your satisfaction with the diabetes care your adolescent receives at school?	Not at all satisfied	3	3.4%
	Not very satisfied	1	1.1%
	Neither satisfied nor unsatisfied	5	5.6%
	Somewhat satisfied	16	18.0%
	Very satisfied	63	70.8%
	Missing	1	1.1%

Adolescent questionnaire open ended question. Adolescents were asked, “What, if anything, have you learned from your school nurse that has helped you take better care of your diabetes?” Three-quarters of the adolescent participant sample ($n = 67$, 75.3%) wrote a response to the question, and the remaining quarter left it blank. Of these 67 participants, 18 (26.9%) wrote “none” or “nothing”.

Overwhelmingly, the comments were positive, indicating a range of learning activities that occurred between the school nurse and the adolescent. Many of the comments involved daily care of diabetes, such as changing lancets ($n = 2$), reminders to check blood glucose frequently ($n = 4$), counting carbohydrates ($n = 2$), logging blood glucose and carbohydrates ($n = 2$), and administering insulin ($n = 4$). One participant indicated that the school nurse taught him how to inject insulin in a site that typically requires two people.

Adolescent participants reported that they learned better management of hypoglycemia ($n = 9$); how to manage blood glucose levels during physical activity ($n = 3$); ways to enhance nutrition ($n = 5$); how to manage field trips ($n = 1$) and parties ($n = 1$); and how to prepare for diabetic emergencies ($n = 1$). Adolescents reported that the school nurse taught them how to deal with diabetes ($n = 4$) and the importance of caring for oneself to prevent long-term complications ($n = 1$). School nurses were a source of emotional support and reassurance for some adolescents; they were encouraged to be responsible ($n = 2$) and independent ($n = 2$) with diabetes care, and maintain a positive attitude ($n = 2$). One adolescent reported that “she cares about me more than the old one did. She’s interested in learning more.” Another wrote,

“She reinforces things I already know in a kind manner. She advocates for me, especially with the gym teacher.”

Some adolescents reported that the school nurse knows little to nothing about diabetes ($n = 1$) and that they teach the school nurse, rather than the opposite ($n = 3$). Two participants indicated that they learned more from their middle school nurses than from their high school nurses.

Parent questionnaire open ended question. Parents were asked, “What, if anything, have you learned from the school nurse that influenced your ability to care for your son or daughter’s diabetes?” Parent participant comments were mostly positive, but there were more negative responses from parents than from adolescents.

Fewer parents responded to this question than did their adolescents ($n = 54$, 60.1%). Of the 54 responses, 16 (29.6%) responded “none” or “nothing”. Some parents ($n = 7$) reported that their adolescents’ school nurses were well educated about diabetes. Several reported that school nurses enrolled in continuing education classes ($n = 1$) and attended insulin pump classes with parents ($n = 2$). Parents learned the importance of documentation ($n = 2$); how to count carbohydrates ($n = 1$); how to make healthy nutrition choices at home and in school ($n = 1$); and how to treat low and high blood glucose ($n = 2$).

In addition to commenting on the education and training of the school nurse, parents also reported on the psychosocial aspects of diabetes management. Several parents learned that their adolescents were more ready to become independent in diabetes self-management than they had thought ($n = 3$), and one parent learned that

her adolescent was not ready to become fully independent. One parent reported learning from the school nurse that trusting in her daughter would create a team to care for her adolescent, so that the responsibility was not completely on the parent. One participant reported that she was able to work full-time only because of the comfort level she felt with the school nurse's knowledge in diabetes care. Another reported that the school nurse was a "lovely, supportive and caring lady. We admire her and cherish her support." Adjectives used by parent participants to describe their adolescents' school nurses included: caring, reassuring, lovely, supportive, amazing, helpful, and knowledgeable.

Some parents ($n = 7$) reported that the school nurse needs additional education or training in diabetes care. More parents ($n = 7$) than adolescents ($n = 3$) reported that they teach the school nurse, rather than the opposite. Several parents ($n = 3$) reported that they felt there were not enough school nurses in the building to care for the number of adolescents with diabetes. One parent stated, "Too many kids. Not enough nurses. I'm frightened all the time." Another commented that the school nurse could not handle the eight students with diabetes in a school with more than 800 students. One parent of an adolescent attending a nonpublic school reported that the school nurse was not following the protocol for the "Safe at School" program, and that she needed to speak with the head of the school to "get the school nurse to understand it is her job to educate the coaches and teachers" about the adolescent's diabetes. Another reported that the school nurse was not pump trained, necessitating the parent to come into school 2-4 times per week. As a result of the lack of school

support, the adolescent was unable to continue with CSII, and transitioned back to injection.

More parents ($n = 5$) than adolescents ($n = 2$) reported on the differences between middle school and high school. One participant felt that high school was easier because her adolescent was more independent. Another felt that the high school nurse was more available than the middle school nurse. Two parents reported that middle school nurses were more supportive and helpful than the high school nurses, especially during the period of initial diagnosis. The last reported that due to her adolescent's age and inexperience, there was greater reliance on the middle school nurse than on the high school nurse.

Summary

This correlational study examined the relationships among school nurse to student ratio, self-efficacy for type 1 diabetes management, and HbA1c levels in adolescents. Also examined were the independent variables of age and diabetes duration on the dependent variables of self-efficacy and HbA1c levels. The findings from this study indicate a small, positive correlation between age and the SEDM, suggesting that older adolescents have higher levels of self-efficacy for type 1 diabetes management. Age and school nurse to student ratio had a large, positive correlation, meaning that older adolescents attend schools with higher school nurse to student ratios. HbA1c levels had a small, negative correlation with school nurse to student ratio, suggesting that higher HbA1c levels are associated with lower school

nurse to student ratios. There were no other significant correlations among study variables and variables.

There were a number of significant correlations between the main study variables and some of the ancillary variables. The SEDM mean score was associated with gender and time spent with the school nurse. School nurse to student ratio was correlated with parental report of feelings of diabetes related safety at school and parental satisfaction with diabetes care in school. Age was correlated with number of times per day and number of times per week that adolescents visit the school nurse, parental report of feelings of diabetes related safety, parental satisfaction with diabetes care, and adolescent report of helpfulness of the school nurse.

Significant correlations between ancillary variables were also noted. Parental satisfaction with diabetes care was correlated with parental report of feelings of diabetes related safety and adolescent report of helpfulness of the school nurse. Adolescent report of helpfulness of the school nurse was correlated with parental report of feelings of diabetes related safety, gender, time spent with the school nurse, and the number of times per day and number of times per week that adolescents visit the school nurse. Also correlated were parent and adolescent reports of the following: BGM and insulin administration frequency, and the number of times per day and number of times per week that adolescents visit the school nurse.

The majority of adolescents found the school nurse very helpful, and the majority of parents reported being very satisfied with diabetes care and felt their adolescents were very safe in school. In response to the open ended question,

adolescent responses were overwhelmingly positive, citing numerous ways in which their school nurses helped, taught, and supported them in diabetes management.

Parents reported on psychosocial aspects of diabetes management, such as learning how to foster independence and responsibility in their adolescents. Although many found the school nurse well-educated in diabetes care, some reported feeling that their school nurses needed more training and education in diabetes care. A number of parent participants commented on the inadequate numbers of school nurses to care for the number of students with diabetes in their buildings.

Chapter V

DISCUSSION OF FINDINGS

Introduction

This correlational study sought to examine if a relationship exists among school nurse to student ratio, self-efficacy for type 1 diabetes management, and glycemic control in adolescents. The variables of age and diabetes duration were also examined for correlation between self-efficacy for type 1 diabetes management, and glycemic control in adolescents. Data were collected by the principal investigator from 89 parent-adolescent dyads from a large pediatric endocrinology practice in the Northeastern United States. Parent participants were asked to fill out a 42-item researcher generated questionnaire. Adolescents were asked to fill out a 7-item adolescent questionnaire and the Self-Efficacy for Diabetes Self-Management scale (SEDM). Data were analyzed using IBM (2013) SPSS for Windows (Version 22.0).

Statistical analyses conducted included descriptive statistics, bivariate analysis, and reliability of the study instrument (SEDM). Of a possible 10 correlations among main study variables, age, and diabetes duration, three were statistically significant. HbA1c showed a small, negative correlation with school nurse to student ratio. There was a small, positive correlation between age and self-efficacy scores as measured by the SEDM, and a large, positive correlation between age and school nurse to student ratio. Although no other significant relationships were noted among

main study variables and variables, a number of significant correlations important to school nursing were revealed through examination of main study variables with ancillary and demographic data.

This chapter discusses the study findings in the context of the background literature, the study aim, and theoretical underpinnings of self-efficacy theory. Additionally, strength and limitations of the current study will also be addressed.

The Sample

The majority of the adolescent participant sample in this study was male ($n = 49, 55.1\%$) and aged 13-16 years old ($n = 63, 70.8\%$). The mean HbA1c level for the entire sample for the current study was 8.12% ($SD = 1.37$), which was lower than that reported from a recent multinational study (T1D Exchange, 2014); US children less than 18 years old ($n = 13,966$) were found to have average HbA1c levels of 8.2% using CSII and 8.6% using injection. The mean age of the multinational sample is unknown at this point, as study findings were recently presented at a conference and are not yet available in print; therefore, it's possible that the mean age of the multinational sample differs from the mean age of 13.43 in this study.

Diabetes duration ranged from less than 1 to 12 years ($M = 5.23, SD = 3.19$), and seven participants (7.9%) had diabetes duration less than one year, indicating a diagnosis less than a year from the date of data collection. The majority of adolescent participants received insulin by injection ($n = 46, 51.7\%$). The percentage of the sample receiving CSII ($n = 42, 47\%$) is consistent with findings from the multinational study cited above (T1D Exchange, 2014). Parents reported concomitant

thyroid disease in 10 participants (8.9%), which is lower than the approximated estimate of 25% in children with T1DM (ADA, 2014a). In this study, six females and four males reportedly had hypothyroidism, which is consistent with demographic findings that women are more commonly affected than men (Chiang et al., 2014).

The parent participant sample in the current study was well educated. Parental education has been negatively correlated with HbA1c levels in previous research (Hsin et al., 2010, Johns et al., 2008), although no significant correlation was found in the current study.

This section discusses the significant findings among the main study variables and ancillary variables.

School Nurse to Student Ratio

This study was the first to examine the relationship among school nurse to student ratio, self-efficacy for type 1 diabetes management, and glycemic control in adolescents. In this study, school nurse to student ratio was not correlated with self-efficacy, but was negatively correlated with HbA1c levels ($r = -.244, p = .036$), suggesting that adolescents with lower HbA1c levels attend schools with higher school nurse to student ratios. This may be explained by the finding that higher self-efficacy scores were associated with older sample participant age. The positive correlation between school nurse to student ratio and age found in this study ($r = .539, p < .01$) suggests that older adolescents attend schools with higher school nurse to student ratios, which is consistent with the correlation between school nurse to student ratio and level of school.

School nurse to student ratio and ancillary variables. Other findings from this study suggest that higher school nurse to student ratios negatively impact the frequency per day with which adolescents visit the school nurse ($r = -.306, p = .009$), parental report of feelings of diabetes related safety at school ($r_s = -.291, p = .006$), and parental satisfaction with diabetes care in school ($r_s = -.296, p = .005$). This is particularly important to school nurses working in schools with higher school nurse to student ratios. Although school nurse to student ratio was correlated with level of school in this study, several participants attended middle schools with ratios greater than 1:1000 and therefore, may not be as independent or confident in self-management as adolescents attending high school. There may be several reasons for the negative correlation between school nurse to student ratio and frequency with which adolescents visit the school nurse. Adolescents may have higher levels of self-efficacy for type 1 diabetes management, feel the nurse is too busy to tend to them, or simply self-manage in the classroom.

As noted in responses to the open ended question, parents may feel the school nurse is unable to safely take care of a number of students with diabetes as well as the rest of the student enrollment, leading to decreased satisfaction with diabetes care. This may partially explain the negative correlations between school nurse to student ratio and parental report of feelings of diabetes related safety at school, and school nurse to student ratio and parental satisfaction with diabetes care in school. It is also possible that parental report of safety and satisfaction was influenced by their

adolescents' knowledge of, understanding of, and capacity for diabetes self-management.

Self-Efficacy for Type 1 Diabetes Management

Self-efficacy for type 1 diabetes management was measured using the Self-Efficacy for Diabetes Self-Management scale (SEDM). The range of SEDM mean scores for the current study was 3-10 ($M = 7.71$, $SD = 1.51$). The SEDM has been used in a number of previous studies. In the initial norming study of the instrument, Iannotti et al. (2006) reported a scale mean of 7.5 ($SD = 1.6$), and range of 2.5-10 in a sample of 168 adolescents aged 10-16 years old ($M = 13.6$, $SD = 1.9$). The initial norming study also analyzed scale means and standard deviations by age groups of 10-12 year olds ($N = 68$) and 13-16 year olds ($N = 100$). There were no statistical differences in scale means or standard deviations between the two groups of 10-12 year olds ($M = 7.6$, $SD = 1.5$) and 13-16 year olds ($M = 7.5$, $SD = 1.6$). Although not statistically significant, in the current study, there were larger differences than those reported by Iannotti et al. in scale means and standard deviations between the age groups of 10-12 year olds ($N = 25$, $M = 7.23$, $SD = 1.99$) and 13-16 year olds ($N = 63$, $M = 7.87$, $SD = 1.24$), consistent with the findings of a small, positive correlation between age and self-efficacy, which has been demonstrated in previous research (Ott et al., 2000; Winsett et al., 2010). Mean scale scores in the current study were higher than those reported in previous studies conducted by Berg et al. (2009) ($M = 6.7$, $SD = 1.7$), Butler et al. (2009) ($M = 6.74$, $SD =$ not reported), and Butner et al. (2009) (M

= 6.59, $SD = 1.64$), although all had younger participants (10-14) than in the current study.

Numerous studies have not demonstrated gender differences in self-efficacy scores (Chih et al., 2010; Grossman et al., 1987; Pinar et al., 2003, Winsett, Stender, Gower, & Burghen, 2010). Yet, in the current study, higher self-efficacy scores were associated with female gender, $t(87) = -2.00, p = .048$. The mean age for boys ($M = 13.39, SD = 1.85$) and girls ($M = 13.49, SD = 1.75$) in this sample did not differ statistically, $t(86) = -.257, p = .798$, suggesting that age was not a factor in this finding.

Correlations between self-efficacy and diabetes duration have yielded inconsistent results in the literature. While self-efficacy has been negatively correlated with diabetes duration in Chih et al. (2010), there were no significant findings in the study conducted by Ott et al. (2000). As in Ott et al., the current study did not yield significant findings. One explanation may be that the length of diabetes duration in Chih et al. was longer ($M = 7.9, SD = 4.3$) than in the current study ($M = 5.23, SD = 3.19$), most likely due to the older age of the sample ($M = 16, SD = 2.4$) in Chih et al. The length of diabetes duration in Ott et al. ($M = 5.63, SD = 3.73$) more closely approximates the length of diabetes duration in the current study, which may account for similar findings.

Self-efficacy and ancillary variables. Although self-efficacy was not correlated with school nurse to student ratio, there was a small, negative correlation between self-efficacy and time spent with the school nurse ($r_s = -.263, p = .015$); it is

possible that adolescents with higher self-efficacy for type 1 diabetes management do not need to spend as much time with the school nurse as those with lower levels of self-efficacy. This finding is not explained by the age of the participants, as there was no significant correlation between age and time spent with the school nurse.

HbA1c Levels

In the current study, adolescent participants were reported by their parents to have HbA1c levels ranging from 6%-12.5% ($M = 8.12$, $SD = 1.37$). HbA1c levels and self-efficacy have been negatively correlated in previous studies (Chih et al., 2010; Griva et al., 2000; Iannotti et al., 2006), yet the current study showed no significant findings. This may be due to the fact that the participants' ages were somewhat older in Chih et al. ($M = 16$, $SD = 2.4$) and Griva et al. ($M = 20.6$, $SD = 4.68$) than in the current study ($M = 13.43$, $SD = 1.79$), as age has been positively correlated with self-efficacy in previous research (Ott et al., 2000; Winsett et al., 2010).

Although previous research has found a correlation between HbA1c levels and age (Iannotti et al., 2006; Levine et al., 2001; Serrabulho et al., 2012; Urbach et al., 2005; Winsett et al., 2010), in this study, there was no statistically significant correlation noted.

In the current study, HbA1c levels were not associated with either self-efficacy ($r = -.125$, $p = .244$), or age ($r = .082$, $p = .449$). In a recent position statement, the ADA (2014a) recommended a target HbA1c of < 8% for children aged 6-12 years old and < 7.5% for adolescents and young adults aged 13-19 years old (p. S51). In this study, just 52% ($n = 13$) of adolescents aged 10-12 years old ($n = 25$)

and 44.4% ($n = 28$) of adolescents aged 13-16 years old ($n = 63$) met the ADA's recommendations for target HbA1c levels, although these percentages are higher than those reported in previous research (Hilliard, Wu, Rausch, Dolan, & Hood, 2013; Wood et al., 2013). Wood and colleagues reported in their study that 43% of 6-12 year olds and 21% of 13-19 year olds met the ADA target for HbA1c, while Hilliard et al. found in their study of 13-18 years olds ($N = 150$), that just 39.8% met ADA recommendations of HbA1c < 7.5. Of note, a more recent publication states that the ADA will begin recommending a target HbA1c level of < 7.5% across all pediatric groups in order to foster consistency with ISPAD recommendations (Chiang et al., 2014). This change in recommendation means that even fewer adolescents ($n = 8$, 32%) in the younger age group ($n = 25$) would meet ADA target recommendations. This is important because early and intensive management has been associated with fewer and delayed diabetes related complications (Chiang et al., 2014; Rewers et al., 2014).

Age and Ancillary Variables

The negative correlations noted between age and the number of times per day ($r = -.393$, $p = .001$), and the number of times per week ($r_s = -.252$, $p = .018$), with which adolescent participants visit the school nurse, suggests that older adolescents visit the school nurse with less frequency than younger adolescents during the day and during the week. This may be explained from a developmental perspective; older adolescents are expected to be more independent in diabetes self-

management (Schilling et al., 2006), and are often given more responsibility for such by their parents (Hanna & Guthrie, 2000).

The medium, negative correlations between age and parental report of feelings of diabetes related safety at school, ($r_s = -.337, p = .001$), parental satisfaction with diabetes care in school ($r_s = -.379, p < .01$), and adolescent report of helpfulness of the school nurse ($r_s = -.342, p = .001$), suggest several things. In this study, parents of older adolescents feel their children are less safe and parents are less satisfied with diabetes care in school. While this study did not elucidate all of the reasons for these findings, several possible explanations exist. It's possible that this finding is related to the higher school nurse to student ratios associated with high schools in this study. While some adolescents in high schools may be independent in self-management, especially if they have longer diabetes duration, those adolescents who are newly diagnosed need more supervision, guidance, and support from the school nurse. As parental satisfaction with diabetes care has been correlated in this study with adolescent report of helpfulness of the school nurse ($r_s = .563, p < .01$), it seems likely that parents would report less satisfaction with diabetes care if their older adolescents were reporting that the school nurse is less helpful.

The negative correlation between age and parental report that parents would keep their adolescents home if there was no school nurse available on that day ($r_s = -.283, p = .008$), suggests that parents would be less likely to do so with older adolescents who may be more capable and independent in diabetes self-management.

This highlights the perceived value of a school nurse presence to parents, especially those of younger adolescents with T1DM.

Diabetes Duration

In previous research with adolescents, longer diabetes duration has been significantly associated with higher HbA1c levels (Herzer & Hood, 2010; Levine et al., 2001; McGrady, Laffel, Drotar, Repaske & Hood; 2009). In the current study, however, there was no association found between these two variables. This may be partially explained by fewer years of diabetes duration in the current sample ($M = 5.23$, $SD = 3.19$) than in previous studies. For example, the means and standard deviations for diabetes duration were noted for the following samples: Herzer and Hood ($M = 6.6$, $SD = 4.0$); Levine et al. ($M = 6.2$, $SD = 2.9$); and McGrady et al. ($M = 6.6$, $SD = 1.81$).

Other Ancillary Variables

Several significant correlations important to school nursing were found in the current study, although they are unrelated to the main study variables. There was a strong association between parental satisfaction with diabetes care and parental report of feelings of diabetes related safety in school. Nearly all parents reported that they were either somewhat satisfied or very satisfied with diabetes care ($n = 79$) and that they felt their adolescents were somewhat safe or very safe ($n = 85$). As both of these variables have been correlated negatively with school nurse to student ratio, it seems likely that parents would feel their adolescents are less safe, and consequently, parents would be less satisfied, when the school nurse to student ratio is high. All of

the public schools in the sample had full-time school nurses present on site, which also likely contributes to feelings of safety and satisfaction. Parents identified the importance of school nurse education in diabetes care, and their satisfaction with such, on the open ended question.

Previous descriptive research from the parent perspective has identified the lack of trained personnel and lack of knowledge in diabetes care as barriers to the provision of diabetes care in schools (Hayes-Bohn et al., 2004; Lewis et al., 2003; Schwartz et al., 2010; Skelley et al., 2013). While parents reported an 83.1% satisfaction rate with diabetes care in schools (Skelley et al., 2013), Schwartz et al. found that only 61% of parents reported their experiences related to diabetes care as above average or excellent. Additionally, Jacquez et al. (2008) found that 57% of parents reported they were either not at all or only a little confident that their child's school could provide diabetes care. Lastly, Lewis et al. reported that 21% of parents were dissatisfied with diabetes care in school. It should be noted that the settings for these studies were in states and schools that did not have a full-time school nurse presence.

Also noted was a large correlation between parental satisfaction with diabetes care and adolescent report of helpfulness of the school nurse. These variables have not previously been studied together.

Adolescent report of helpfulness of the school nurse was positively correlated with several other important variables: parental feelings of safety with diabetes care in school, male gender, time spent with the school nurse, number of times per day and

number of times per week with which adolescents visit the school nurse. The majority of the adolescent sample (78.7%) reported that the school nurse was either somewhat helpful ($n = 20$) or very helpful ($n = 50$). Although these variables have not been studied together in previous research, there may be several reasons for these findings. This adolescent sense of comfort with the school nurse likely contributes to parental feelings of safety with diabetes care in school. It is probable that when adolescents have a good relationship with the school nurse, they are more likely to visit the school nurse more frequently, and spend more time. Many adolescents reported on the helpfulness of their school nurses and the diabetes care they have received. It's interesting to note that this variable was associated with male gender, suggesting that adolescent boys feel the school nurse is more helpful than do girls. As this variable was also found to be negatively correlated with age, school nurses need to be mindful that it would be beneficial to foster similar feelings with older adolescents, particularly females.

Also noted were medium to large positive correlations between parental and adolescent report of frequencies of BGM, insulin administration, times per day and times per week with which adolescents visit the school nurse, suggesting that parents and adolescents communicate effectively.

Descriptive Statistics From Adolescent Questionnaire

Significant correlations involving the following variables from the adolescent questionnaire have been previously discussed: time spent with the school nurse,

number of times per day and number of days per week with which adolescents visit the school nurse, and adolescent report of helpfulness of the school nurse.

While almost all participants reported BGM ($n = 81, 91\%$) as an activity performed when visiting the school nurse, only 62 (69.7%) reported receiving insulin, most likely because of NJ laws that allow students to perform BGM and administer insulin in the classroom, if desired (NJDOE, 2009). Interestingly, only seven participants reported learning something from the school nurse as one of the activities performed, yet 19 participants reported learning something from the school nurse in response to the open ended question.

The majority of the adolescent sample (74.2%) reportedly performed BGM ($M = 3.02, SD = .758$) either 5-6 times per day ($n = 41, 46.1\%$) or ≥ 7 times per day ($n = 25, 28.1\%$). This frequency meets ISPAD recommendations of an average of 4-6 times daily (Rewers et al., 2014). While the ADA does not recommend a specific number for BGM frequency, they recommend, at a minimum, the following times: prior to meals and snacks, occasionally postprandially, at bedtime, prior to exercise, before and after treatment for hypoglycemia, and before performing critical tasks, such as driving (ADA, 2014a), indicating that some individuals may need to perform BGM 6-10 times per day (Chiang et al., 2014). The percentage of adolescents meeting ISPAD recommendations in the current study may be higher than reported due to the structuring of the BGM frequency categories on the questionnaire; twenty one participants ($n = 23.6\%$) responded that they performed BGM 3-4 times per day. Although these variables were not correlated in the current study, it is encouraging

that the majority of adolescents met ISPAD recommendations, given the strong support in the literature linking BGM frequency and HbA1c levels (Helgeson et al., 2011; Hilliard et al., 2013; Johns et al., 2008; Levine et al., 2001; Miller et al., 2013; Rausch et al., 2012; Serrabulho et al., 2012).

Descriptive Statistics From Parent Questionnaire

The majority of parents ($n = 74$, 83.1%) reported that their adolescents visited the endocrinology practice at least four times yearly, which is consistent with ADA recommendations (ADA, 2014b). Parents reported diabetes related hospitalizations in the past year ($n = 11$, 13.3%) similar to those reported by Levine et al. (2001). Previous research has demonstrated associations between HbA1c levels and rates of hospitalization (Levine et al., 2001), and frequency of clinic visits (Urbach et al., 2005); none of these variables were correlated in the current study.

Less than half of parents ($n = 39$, 43.8%) reported hypoglycemic episodes requiring the assistance of another person in the last 6 or 12 months; however, there were wide ranges reported for the previous 6 months (0-78) or 12 months (0-120). This demonstrates the degree of uniqueness regarding the diabetes characteristics of the sample. Almost all ($n = 34$) parents reported the school nurse as the person providing assistance with hypoglycemia management; others included a parent ($n = 3$), a friend of the adolescent ($n = 1$), and teacher ($n = 1$). Interestingly, of the five participants receiving care from a person other than the school nurse, three attended large public high schools with full-time school nurses, and two attended nonpublic elementary/middle schools with part-time school nurses. Parents were not asked the

reason for another person providing assistance to their adolescents; however, as the two nonpublic schools did not provide full-time school nurse coverage, it is reasonable that someone else would need to assist in hypoglycemia management. Two of the three adolescent participants attending the public high schools provided negative comments on the helpfulness and attitude of the school nurse in response to the open ended question, which most likely necessitated parent involvement. Other parents reported text messaging with their adolescent regarding hypoglycemia management as they felt the school nurse was unhelpful. This places a disproportionate amount of responsibility on some parents to be available during the school day to assist their adolescents, should it be needed. Fortunately, just one student suffered a hypoglycemia related loss of consciousness in school, which was treated promptly by the school nurse.

The majority of the parent participant sample ($n = 76$, 85.4%) reported that their adolescents had a trained Glucagon™ delegate. Interestingly, the adolescents of the four parent participants who responded that their adolescents did not have a trained delegate attended public high schools. The reasons for this finding are unclear, as parents were not asked to provide an explanation.

Sixteen parents (18%) responded that they would keep their adolescents home if there was no school nurse available on that day. This was associated with age ($r_s = -.283$, $p = .008$), but not diabetes duration. This is an interesting finding in that the youngest participants of this subsample, aged 10 years old ($n = 4$), had diabetes durations ranging from 5-8 years. It may be that these adolescents are not yet capable

of self-management, or perhaps their parents lack confidence in either the ability of the adolescent or the school nurse, despite the years of diabetes duration. Eleven parent participants (12.4%) reported that they have kept their adolescents home, but this was not correlated significantly with age or diabetes duration.

More than a quarter of parents ($n = 24$, 27%) reported having gone to their adolescents' schools for diabetes care because no one was available to help him or her. This variable was not correlated with age or level of school. This finding is surprising as most schools attended by participants ($n = 85$) had at least one full-time school nurse. Reasons for this are unclear, as parents were not asked to explain.

A very small percentage ($n = 3$, 3.4%) of parents reported that their adolescents missed field trips because no school nurse was available to go; however, 38 (42.7%) parents reported going on field trips because there was no school nurse available to go. This number does not include parents who chose to go even though the school nurse was available to go. Because of the wording of the questionnaire, it is unclear if these adolescents would have missed the field trip had parents not been able to accompany them. In previous studies, parents have reported that their children were unable to participate in all school activities, particularly field trips (Lewis et al., 2003; Skelley et al., 2013). While the number of adolescents in this study reported as missing field trips is low, it is nonetheless alarming. New Jersey educational law, N.J.S.A. 18A:40-12.11-21, provides for such accommodations for students with diabetes so that they may fully participate in all school activities (NJDOE, 2009).

One of the more disturbing findings in this study is the percentage of parents who have missed work due to one of the following situations: keeping their adolescents home because there was no school nurse available on that day ($n = 8$, 72.7%), having gone to their adolescents' schools for diabetes care because no one was available to help him or her ($n = 10$, 41.7%), or going on a field trip because there was no school nurse available to go ($n = 22$, 57.9%). These percentages are based on the number of participants who responded yes to one or more of those questions ($n = 73$) and not the total sample of 89. The findings in this study regarding parents missing work are consistent with previous research (Schwartz et al., 2010).

Open Ended Question Responses

It is encouraging to note that the majority of responses from parents and adolescents regarding the school nurse were positive. The open ended question format provided for a deeper description of the relationship between the school nurse and adolescents and between the school nurse and parents, although the question asked participants to state something learned from the school nurse. The adolescent and parent responses strongly suggested that the school nurse was an important source of support as well as education. Some participants reported learning a variety of things from the school nurse, such as hypoglycemia management, fostering self-management skills, and making sound nutrition choices.

Notably, more than one-quarter of adolescent participants (26.9%) and nearly one-third of parent participants (29.6%) responded "none" or "nothing" to the open ended question. This response implies consideration of the question, rather than

simply leaving the question blank. Other findings in this study suggest two areas that are problematic for adolescents and parents: school nurse education and higher school nurse to student ratios. Consistent with previous research (Hayes-Bohn et al., 2004; Nabors et al., 2003), some adolescent and parent participants responded that the school nurse's education in diabetes care is lacking. Some parents felt their adolescents were not safe in schools with higher school nurse to student ratios, which was supported by correlational analysis in this study.

While school nurses reportedly are doing many things right in diabetes care from the perspectives of adolescents and parents, the areas that need improvement may require institutional support. The school nurse is solely responsible for maintaining professional educational standards in diabetes management; however, school nurses need administrative support to do so. Typically, this is facilitated by providing time, either paid or unpaid, for the school nurse to attend outside conferences, in-services, or pump class with their students. As budgetary constraints on school districts may be problematic, school nurses may need to meet their educational needs through continuing education courses offered in journals and online formats. These are often offered either at no cost or for a nominal fee.

Strengths of the Study

The strengths of this correlational study include the adequacy of the sample size, recruitment methods, the insignificant amount of missing data, the provision of an incentive, and the self-efficacy measurement scale. Although a sample size of 84 was required to conduct bivariate correlational analysis (Faul et al., 2009), five

additional participants were recruited for the purpose of ensuring an adequate sample size in the event of missing data for the main study variables.

Electronic recruitment via an email announcement from the endocrinology practice allowed interested parents to contact the researcher directly, thus maximizing the response rate. Of 69 surveys mailed to those expressing interest in the study, just 15 were unreturned after all reminders were sent.

Although almost half of participants had at least one missing data point ($n = 39, 43.8\%$), overall, a relatively small amount of data (1.05%) was missing on 75 numeric and ancillary variables.

As incentives have been noted to increase participation in a research study (Polit & Beck, 2012), the researcher decided to offer \$10 Target gift cards to both adolescent and parent participants. However, in this study, it is not known whether or not the incentive had any effect on the response rate.

The self-efficacy measure, SEDM, was a sound choice for this study. The brevity of the SEDM was appealing to both parents and adolescents, as there was very little time for completion of study materials in the waiting room. The SEDM has demonstrated reliability and validity in previous research, as well as in the current study ($\alpha = .85$).

Lastly, to the researcher's knowledge, this is the first study to examine the relationships between this set of variables. While the study found no relationship between the main study variables of school nurse to student ratio and self-efficacy for type 1 diabetes management in adolescents, other relationships between ancillary

variables and the main study variables were found that have significance for school nursing. The findings from this study add to the limited body of knowledge regarding students with diabetes in the school setting and the school nurse. Furthermore, findings serve as a foundation for future research.

Limitations of the Study

There were several methodological limitations to this study. The study recruited a convenience sample from one large pediatric endocrinology practice; therefore, findings are not generalizable outside this specific group. Two separate data collection methods were employed to recruit the sample: via the US postal service ($n = 53$) and in-person ($n = 36$). Although the use of both methods served to expedite the recruitment process, it may have diminished the rigor of the study for the following reasons: participants who were recruited electronically to receive the study materials by mail may have been reluctant to ask for clarification regarding the questionnaires, while in-person data collection participants had the opportunity to ask the researcher questions as they progressed through the study materials. While the overall amount of missing data was just over 1%, the percentage of participants with missing data was somewhat higher for those responding by mail ($n = 24$, 45.3%) than that of those responding in-person ($n = 15$, 41.7%).

The study employed self-report methods for both adolescent and parent participants, which may be subject to response bias (Polit & Beck, 2012). Nonresponse bias could not be evaluated, as characteristics of nonresponders receiving the recruitment email were unknown. The adolescent sample in the current

study had higher self-efficacy scores on the SEDM and slightly lower HbA1c levels than those reported in previous research, and parent participants were well educated. It is unclear if the sample in the present study is representative of the endocrinology practice population, as data for the practice were unavailable.

Chapter VI

SUMMARY, IMPLICATIONS, AND CONCLUSIONS

Summary

The purpose of this correlational study was to determine if relationships exist among school nurse to student ratio, self-efficacy for type 1 diabetes management, and glycemic control in adolescents. Age and diabetes duration were also explored as independent variables. A convenience sample of 89 parent-adolescent dyads was recruited from a large pediatric endocrinology practice in the Northeastern United States. The target adolescent sample population consisted of adolescents aged 10-16 years old with T1DM. Parent participants were generally well educated and the majority of the adolescent sample was male and aged 13-16 years old.

Among the three main study variables, age, and diabetes duration, three significant relationships were found. There was a small, negative correlation between school nurse to student ratio and HbA1c levels ($r = -.244, p = .021$), and a large, positive correlation between school nurse to student ratio and age ($r = .539, p < .01$). Also noted was a small, positive correlation between self-efficacy for type 1 diabetes management and age ($r = .224, p = .036$). There was no relationship found between school nurse to student ratio and self-efficacy for type 1 diabetes management. HbA1c levels and diabetes duration were not correlated with any other main study variables.

Higher self-efficacy scores on the SEDM were associated with female gender and less time spent with the school nurse. School nurse to student ratio was negatively associated with the frequency with which adolescents visit the school nurse, parental satisfaction with diabetes care, and feelings of diabetes related safety in school. Older adolescents tended to visit the nurse with less frequency than younger adolescents. Furthermore, parents of older adolescents were less satisfied with diabetes care and felt their adolescents were less safe in school. Parents were more satisfied with diabetes care when they felt their adolescents were safer and when adolescents felt the school nurse was more helpful. In addition, when adolescents felt the school nurse was more helpful, they spent more time with the school nurse, and parents felt their adolescents were safer.

Most adolescents ($n = 70$) reported the school nurse as being somewhat helpful or very helpful. The school nurse was a source of support and reassurance for some adolescents. They reported learning a variety of things from the school nurse, such as daily diabetes care; how to manage hypoglycemia; how to choose nutritious foods; how to manage field trips and parties; and to take care of themselves to avoid long-term complications. Several adolescents reported that the school nurse knows little to nothing about diabetes and that they teach the school nurse.

Almost all parents ($n = 85$) reported feeling that their adolescent was somewhat safe or very safe, and 90% reported their satisfaction with diabetes care as somewhat satisfied or very satisfied. Yet, many parents reported missing work when they have kept their adolescents home; gone to school for diabetes care; or attend a

field trip because no school nurse was available. Some parents reported that their adolescents' school nurses were well educated about diabetes, while others felt that their school nurses needed additional training and education about diabetes. Some learned from the school nurse how to make healthy nutrition choices; how to manage high and low blood glucose; and that their adolescents were ready to exert more independence in diabetes self-management. Although most comments were positive, some parents reported a lack of diabetes support in the school setting as well as inadequate numbers of school nurses.

Implications

This study was the first to examine the variables of school nurse to student ratio, self-efficacy for type 1 diabetes management, and glycemic control in adolescents. The current study did not find significance between school nurse to student ratio and self-efficacy for type 1 diabetes management in adolescents, but did find a significant relationship between school nurse to student ratio and glycemic control, albeit in the opposite direction of what was expected. Several other findings contribute new knowledge to the paucity of existing literature on school nursing and adolescents with type 1 diabetes, with numerous implications for nursing practice, education, research, and policy.

Nursing practice. Findings from the current study provide new information relevant to school nursing practice about T1DM in adolescents in the school setting, particularly as they pertain to the relationship with the school nurse. Although higher self-efficacy scores were associated with female gender and older age of adolescents,

school nurses need to be mindful that expectations of self-efficacy must be tailored to each adolescent's unique needs. These findings present an opportunity for school nurses to enhance self-efficacy levels of younger students with T1DM, through the reinforcement of self-efficacy sources of enactive mastery experience, vicarious experience, and verbal persuasion. Whether or not adolescents are successful in meeting the developmental challenges they face depends largely on their sense of personal efficacy, gained primarily through prior mastery experiences (Bandura, 1997).

Although school nurses generally have no direct control over the school nurse to student ratio, findings between this and other variables from this study may provide guidance to improve care of students with T1DM. Higher ratios and older age correlated negatively with the number of times per day with which adolescents visit the school nurse, parental report of feelings of diabetes related safety in school, and parental satisfaction with diabetes care in school. Although older adolescents may appear to be more independent and capable of self-management, school nurses need to develop and maintain strategies to enhance communication, as adolescents are at risk for diminished treatment adherence (Hilliard et al., 2013; Rausch et al., 2012). As some adolescents in this study reported not visiting the school nurse, it seems prudent that the school nurse check in with these adolescents periodically to maintain an open line of communication. Regular contact with parents, particularly parents of adolescents who don't visit the school nurse, may positively impact both parental satisfaction with diabetes care and feelings of diabetes related safety in school.

Additionally, if adolescents view the school nurse as helpful, they are more likely to increase the number of times they visit the school nurse and the amount of time spent, which provides opportunities for school nurses to impact the sources of efficacy information: enactive mastery experiences, vicarious experiences, verbal persuasion, and physiological and affective states.

Also noted in this study was a large correlation between parental satisfaction with diabetes care and adolescent report of helpfulness of the school nurse. Although these two variables have not been previously studied in a quantitative manner, school nurses can contribute to parental satisfaction with diabetes care by addressing fully all the needs of the adolescent with T1DM, including psychosocial needs, which were identified in the current study as important to parents.

While school nurse to student ratios are driven largely by budgetary constraints (NASN, 2010), professional organizational membership can support advocacy efforts of school nurses. Membership in county, state, and national school nursing organizations provides many resources for the school nurse in preparing presentations for administrators, boards of education, and policymakers at the local and state level. In addition, school nurses can engage their professional organizations in advocacy efforts for safer care for students with diabetes in the school setting. Of note is a recent joint initiative between NASN and the National Association of State School Nurse Consultants, encouraging school nurses to collect data on the number of nurses in schools, the number of children with diagnosed chronic health conditions, and the disposition of children seen in the school nurse office (NASN, 2014).

Advocacy efforts at the local and state level may be more fruitful with the collection and quantification of data. While school nurse to student ratios are not something under control of the school nurse, school nurses need to engage school administrators and boards of education with presentations that may facilitate a better understanding of the importance of the role of the school nurse in diabetes management.

Lastly, findings from the open ended question suggested that some school nurses need to have additional training and education in diabetes management. Although Fisher (2006) found that school nurses ($N = 70$) were moderately confident in providing diabetes care, only nine reported having a structured diabetes curriculum. There are numerous resources available to school nurses so that they may keep abreast of changes in diabetes care. If possible, school nurses should request time off from administrators to attend pump class with adolescents and parents. In addition to decreasing anxiety in school nurses, it demonstrates commitment and caring to adolescents and parents. In addition to outside conferences, which may be problematic for some, numerous web based resources provide valuable tools for school nurses. The ADA provides an abundance of information on their website for parents, adolescents, and healthcare professionals, and NASN provides many diabetes resources for school nurses.

Nursing education. Type 1 diabetes is one of the most common chronic diseases of childhood (Kelo et al., 2011), yet its complexity can be daunting for the school nurse. School nursing is a specialty practice, and as such, school nurses need to receive certification to ensure that they receive additional, in-depth education in

complex and chronic disease management, particularly diabetes management.

Programs designed to educate future school nurses need to address the following: the challenges to glycemic control that occur during adolescence, state and federal diabetes legislation, ADA resources, the importance of communication, and the development of a strong relationship with parents and adolescents.

Nursing research. The results of the current study provide a foundation for further exploration of self-efficacy for type 1 diabetes management in adolescents and school nursing in the United States. The SEDM was a sound choice in this study due to its brevity and demonstrated reliability in this study ($\alpha = .85$). Recommendations for future research include utilizing a more ethnically and socioeconomically diverse sample, varied geographic locations, different research designs, and expanding the research question.

Future research efforts should focus on the replication of this study in other types of samples and geographic locations. This study was limited by data collection at a single site with a homogeneous sample; therefore findings and sample characteristics may not be reflective of other areas of the state or across the nation. It would be useful to replicate the current study at more than one pediatric endocrinology practice in NJ, particularly a practice that serves ethnically and economically diverse groups of adolescents. Although the target sample age was 10-16 years old, the majority of the sample was 13-16 years old. It would be beneficial to solicit a quota sample, so that all ages are represented equally (Polit & Beck, 2012).

It is particularly important to continue this line of inquiry across the nation, where school nurse to student ratios are not as low as those in NJ, and where there is not a school nurse presence in every school, as was found in the current study. Additionally, since the beginning of this research study, there has been a transition in focus by NASN from school nurse to student ratios to caseload assignments, described in Chapter 1 (E. Maughan, personal communication, February 21, 2014). The primary reason for the transition to caseload assignment measurement was to improve accuracy; state ratios did not depict an accurate picture, given that there are areas in each state with no school nurses, yet the overall school nurse to student ratio appears to be in alignment with NASN recommendations (E. Maughan, personal communication, February 21, 2014). It is essential to ensure accurate reporting of the number of children with diabetes and other chronic illnesses requiring school nurse assessment and intervention in the school setting. Accurate reporting and documentation may aid advocacy efforts of school nurses and their professional organizations to promote the health and self-efficacy of adolescents with T1DM.

Self-efficacy for type 1 diabetes management in adolescents can also be explored through a comparison of self-efficacy levels between schools with a school nurse presence and schools without a school nurse presence. As all the sample participants attended schools with at least a part-time school nurse presence every day, it would be interesting to note whether any differences exist when there is no school nurse presence.

In addition to soliciting a more diverse sample, increasing the sample size would allow researchers to explore other factors associated with self-efficacy for type 1 diabetes management in adolescents, such as adherence (Griva et al., 2000; Littlefield et al., 1992; Ott et al., 2000). The current study findings suggest that adolescent participants, particularly males, have less confidence in choosing healthful foods when they dined outside the home. Studies have shown that dietary adherence is one of the most problematic areas for adolescents with T1DM (Chisholm et al., 2007; Parker et al., 2013; Schilling et al., 2006; Serrabulho et al., 2012). In addition, better dietary care has been associated with higher levels of self-efficacy (Austin et al., 2011). An experimental or quasi-experimental study involving the administration of a structured education program on nutrition in diabetes, given by school nurses, may have a measureable impact on self-efficacy for type 1 diabetes management.

Lastly, there is a great deal of literature on the support of adolescents with T1DM as they transition to independent self-management (Chiang et al., 2014; Dashiff, Riley, Abdullatif, & Moreland, 2011; Hanna & Guthrie, 2000; Hanna & Guthrie, 2001). This expansion of research on adolescents with diabetes in the school setting is an important area for school nursing, particularly as it pertains to older adolescents nearing the transition period, who will undoubtedly need support from the school nurse. A longitudinal study examining the role of the school nurse in the transition process to independent self-management would be timely given the recent trend in the rise in T1DM among adolescents.

Policy implications. The findings in this study suggest that higher school nurse to student ratios are problematic for adolescents with T1DM and their parents. Engaging parents in advocacy efforts can be done through presentations to parents of adolescents with chronic diseases, boards of education, and state legislators. School nurses need to collect data on the number of nurses in schools, the number of children with diagnosed chronic health conditions, and the disposition of children seen in the school nurse's office (NASN, 2014) in order to aid advocacy efforts to keep adequate numbers of school nurses in schools.

Conclusions

The findings of the current study add to the very small body of knowledge regarding the relationship between school nurses and adolescents with T1DM. In addition, this is the first study to examine the relationships among the school nurse to student ratio, self-efficacy for type 1 diabetes management, and glycemic control in adolescents. The study did not show significant findings between the main study variables of school nurse to student ratio and self-efficacy for type diabetes management, although there was an unexpected negative correlation between school nurse to student ratio and glycemic control in adolescents. Of note, an independent samples t-test was significant for gender and the SEDM; females scored higher than males on the SEDM mean score and on three of the 10 SEDM items.

Ancillary findings revealed that parents are less satisfied and feel that their adolescents are less safe in schools with higher school nurse to student ratios. Adolescents who feel the school nurse is more helpful spend more time with the

school nurse. Adolescents reported learning many things from the school nurse that helped them take better care of their diabetes, and found her to be a source of emotional support. Parents reported the school nurse as a source of psychosocial support and well educated, but some felt that additional training or education was needed.

Although most correlations found were weak to moderate, findings from this study have implications for nursing practice, education, and research. As the prevalence rate of diabetes is increasing, particularly in the 15-19 year old age group (Dabelea et al., 2014), it is crucial that school nurses not only stay current in diabetes management strategies, but acquire and maintain the capability to increase self-efficacy in adolescents.

Replication and expansion of this study will increase the small body of knowledge regarding school nurses and adolescents with T1DM. Suggested lines of inquiry include studies on school nurse related factors affecting self-efficacy for diabetes management and the ways in which school nurses can support adolescents as they transition to self-management.

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APPENDIX A

Recruitment Email Announcement

The BD Pediatric Diabetes Center is working with Lori Wilt, a PhD nursing candidate from Seton Hall University. Lori is investigating the relationship between the school nurse to student ratio and the confidence of children and teenagers with type 1 diabetes to manage their diabetes. We are asking families of children with type I diabetes, **10- 16 years of age**, to consider participating. Your participation is voluntary. Your child must only be diagnosed with diabetes, and cannot have additional diagnoses such as asthma or celiac disease. He/she must be able to read and write in English and attend public or private school. You will sign an informed consent for yourself and your child. Lori will be using a written survey for the parent and the child. You will have a code on your survey; no names are used and all information is confidential. It should take you no more than 10 minutes. Upon completion of both surveys the parent and child each will receive a \$10.00 Target gift card. The study will begin in July, 2014, and continue throughout the summer months. If you want to participate in this research project or have any questions please contact Lori at lori.wilt@student.shu.edu.

APPENDIX B

Nursing Research Council Approval



**Morristown
Medical Center**

ATLANTIC HEALTH SYSTEM

Nursing Research Council
100 Madison Avenue, Box
Morristown, NJ 079
973-971-4

NURSING RESEARCH COUNCIL

APPROVAL LETTER

Date Submitted for Review 04/28/2014

TITLE The Relationships Among School Nurse to Student Ratios, Self-efficacy for Type 1 Diabetes Management and Glycemic Control in Adolescents _____

INVESTIGATOR Lori Wilt

CO-INVESTIGATOR(S) Fran Melchionne, RN Advisor

TYPE OF REVIEW	Expedited <input type="checkbox"/>	Full <input checked="" type="checkbox"/>
TYPE OF APPROVAL	New <input checked="" type="checkbox"/>	Revision <input type="checkbox"/>
ITEMS APPROVED:	Protocol <input checked="" type="checkbox"/>	Dated _____
	Consent <input checked="" type="checkbox"/>	Dated _____
	Recruitment Tools <input checked="" type="checkbox"/>	

FOR FULL REVIEW:

NURSING RESEARCH COUNCIL PRESENTATION DATE: Introduced as pending
04/17/2014 _____

REVIEWED BY: Mary Beth Leaton, MS, RN, APN, CCRN

REVIEWED BY: Mildred Kowalski, PhD, RN

The Nursing Research Council at Morristown Medical Center has reviewed the above Research Proposal per the Criteria for Review of Research Proposals.

ACTION: Approved Approved Pending Review Not Approved

(Electronic Signature) *Mildred Kowalski*

Mildred Kowalski
Nursing Research Chair
Morristown Medical Center
100 Madison Ave., Morristown, NJ Box 163

APPENDIX C

Atlantic Health Institutional Review Board Approval

**Atlantic
Health System**

Institutional Review Board
475 South Street
Morristown, NJ 07960
Phone: (973) 660-3128
Fax: (973) 292-7923

Morristown Medical Center
Overlook Medical Center
Newton Medical Center
Chilton Medical Center
Goryeb Children's Hospital

TO: Lori Wilt, MSN, RN

PROJECT TITLE: [602907-1] The Relationships Among School Nurse to Student Ratios, Self-efficacy for Type 1 Diabetes Management, and Glycemic Control in Adolescents

REFERENCE #:

SUBMISSION TYPE: New Project

ACTION: APPROVED

REVIEW DATE: 6/5/2014

APPROVAL DATE: 6/5/2014

EXPIRATION DATE: 6/4/2015

REVIEW TYPE: Expedited Review

NUMBER OF APPROVED CONSENT FORMS: [1]

REVIEW CATEGORY: Expedited review category # [7]

HIPAA: Obtain Authorization Waiver of HIPAA Authorization

CONSENT: Obtain Consent Waiver of Consent

Alteration of Consent Waiver of Documentation of Consent

The submission reviewed for above-referenced protocol has received approval based on applicable federal regulations.

No investigator involved in the above referenced protocol participated in the vote to approve the study.

The following items were reviewed with this submission:

- Application Form - IRB application Form 1 (UPDATED: 05/6/2014)
- Child Assent - Permission to participate and assent for minors Form 22 (UPDATED: 05/22/2014)
- CV/Resume - CV (UPDATED: 04/29/2014)

- Investigator Agreement - Unaffiliated Investigator Agreement (UPDATED: 05/22/2014)
- Other - Nursing Research Approval Form Wilt (UPDATED: 05/2/2014)
- Other - Sub-Investigator Face Sheet IRB Form 27 (UPDATED: 04/28/2014)
- Other - Pediatric Risk Assessment IRB Form 11 (UPDATED: 04/28/2014)
- Protocol - Protocol summary.docx (UPDATED: 05/6/2014)
- Training/Certification - CITI training (UPDATED: 04/28/2014)

The following items were approved with this submission:

- Child Assent - Permission to participate and assent for minors Form 22 (UPDATED: 05/22/2014)
- Protocol - Protocol summary.docx (UPDATED: 05/6/2014)

Report all events that are unanticipated problems, unanticipated problems, which are also adverse events, deaths occurring in subjects enrolled at an AHS facility, and deviations from the approved protocol that would place the subject at greater risk than anticipated, to the AHS IRB in writing immediately.

The Food and Drug Administration Amendment Act of 2007 requires that Phase II-IV trials of drugs and biologics and trials of devices be registered in ClinicalTrials.gov. The responsibility of registering these trials falls on the sponsor of the trials and/or the Principal Investigator. If you are conducting an "Investigator-initiated" study that fits the criteria above, you must register. If you are conducting a sponsored trial fitting the criteria, you must ensure that the sponsor registers.

Modifications to the study must be submitted in writing and approved by the AHS IRB prior to implementation of the changes.

Investigators are required (by Federal Regulations) to submit reports on the status and/or results of clinical studies approved by the AHS IRB. For the above-referenced study, status/result reports will be due on the basis indicated above and/or within 30 days of the termination of the investigation. It is the Principal Investigator's responsibility to secure continuing approval or notify the AHS IRB of termination of the study.

No subjects may be enrolled into this study after the above expiration date unless a continuation report is submitted and approved by the AHS IRB.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within Atlantic Health System IRB's records.

APPENDIX D

Seton Hall University Institutional Review Board Approval

June 25, 2014

Lori Wilt
1 Bailey Drive
Glenwood, NJ 07418

Dear Ms. Wilt,

The Seton Hall University Institutional Review Board has reviewed and approved as submitted under expedited review your research proposal entitled "The Relationship Among School Nurse to Student Ratios, Self-Efficacy for Type 1 Diabetes Management, and Glycemic Control in Adolescents". The IRB reserves the right to recall the proposal at any time for full review.

Enclosed for your records is the signed Request for Approval form.

The Institutional Review Board approval of your research is valid **until June 4, 2015**. During this time, any changes to the research protocol must be reviewed and approved by the IRB prior to their implementation.

According to federal regulations, continuing review of already approved research is mandated to take place on June 4, 2015. You will receive communication from the IRB Office for this several months before this date.

Thank you for your cooperation.

In harmony with federal regulations, none of the investigators or research staff involved in the study took part in the final decision.

Sincerely,



Mary F. Ruzicka, Ph.D.
Professor
Director, Institutional Review Board

cc: Dr. Marie Foley
Dr. Phyllis Hansell

Office of Institutional Review Board

Presidents Hall • 400 South Orange Avenue • South Orange, New Jersey 07079 • Tel: 973.313.6314 • Fax: 973.275.2361 • www.shu.edu

A HOME FOR THE MIND, THE HEART AND THE SPIRIT

APPENDIX E

E-Newsletter Announcement

Upcoming Study Announcement: Lori Wilt is a Certified School Nurse and a PhD student in nursing at Seton Hall University. She will be conducting a study in person at the BD Pediatric Diabetes Center at Goryeb Children's Hospital beginning in July, 2014, and continuing throughout the summer months. The purpose of the study is to examine the relationship between the school nurse and the confidence and ability of children and teenagers with type 1 diabetes, between the ages of 10 and 16, to manage their diabetes. The study involves completion of a parent survey and two brief child/teenager surveys. If you are interested in participating, or would like additional information, you may contact Lori Wilt at lori.wilt@student.shu.edu.

APPENDIX F

Oral Script

Approach parent(s) and child together.

Hi, my name is Lori Wilt. I am a PhD student in the College of Nursing at Seton Hall University in NJ. I am conducting a research study to evaluate the relationship between school nurses and the confidence and ability of children and teenagers between the ages of 10 and 16 to manage their diabetes. In the study, confidence is called self-efficacy.

This study will provide information on ways that the school nurse helps students manage their diabetes. One of the study goals is to see if the school nurse to student ratio has any effect on the confidence level of children and teenagers to manage their diabetes. The ratio looks at how many school nurses take care of how many students.

The research study involves completing three short questionnaires. (**Speaking to parent**): There is a short parent questionnaire, which will take no more than 10 minutes to complete. It asks questions about your son or daughter's age, gender, ethnicity, school of attendance, and most recent HbA1c level, the blood test that measure's your child's average blood glucose over the last 2-3 months. It also asks questions about your son or daughter's diabetes in general and diabetes related to the school setting and the school nurse.

(**Speaking to child/teenager**): There are two short questionnaires for you to complete, which should take no more than 10 minutes. The Self-Efficacy for Diabetes Self-Management scale measures your confidence in your ability to manage your diabetes activities not only on a daily basis but in specific situations such as going out to eat. There is also a short questionnaire about diabetes and the school nurse.

(**Speaking to parent**): Before I tell you more about the study, I need to ask you a few questions about your son or daughter to see if he/she is eligible to participate in the study.

Does your son or daughter have type 1 diabetes? (YES to be eligible)

Is your son or daughter between the ages of 10 and 16? (YES to be eligible)

Does your son or daughter attend public or private school? (YES to be eligible)

Does your son or daughter speak English? (YES to be eligible)

Does your son or daughter have difficulty reading or understanding grade level material in English? (NO to be eligible)

Does your son or daughter have any other chronic, long-term medical conditions or diagnoses? (NO to be eligible)

The study is completely voluntary, meaning that neither of you have to participate in the study unless you want to. If one of you does not wish to participate, then neither of you can. You may withdraw from the study at any time. Study packet materials are numbered so that I know which questionnaires belong together should they become separated. All data will be coded when it is entered into the computer, and your responses will be kept confidential. Your names on the consent forms will not be transferred into the computer program. As I said earlier, the study involves completing three questionnaires. The parent questionnaire should take no more than 10 minutes to complete. The two child/teenager questionnaires should take no longer than 10 minutes to complete.

The study packet contains a letter of solicitation describing the research study and my contact information, three questionnaires, a consent form for the parent to sign, and an adolescent assent form for your son or daughter to sign. I'd like you both to review the letter of solicitation before completing any of the study materials, so we can discuss any questions or concerns that you may have about the study. By signing the consent and assent forms, you and your son or daughter agree to be part of the study. You and your son or daughter may decide at any time to stop participation in the study, without any consequences to either of you. If you choose to participate, you will each be provided with a \$10 Target gift card as a token of appreciation after you've completed the questionnaires.

You may complete the questionnaires in a private location in the office. After you and your son or daughter have completed the questionnaires, you may give them back to me. If you choose not to participate in the study after reading the letter of solicitation, I ask that you return the study packet to me. You can keep the letter of solicitation for your reference.

Would you be willing to participate in this study? (If NO, thank them for their time. Continue for YES)

Thank you for agreeing to participate. If, at any time, either of you feels uncomfortable with any of the questions, please let me know. All of the information provided on the questionnaires will be kept confidential and secure. Completed study packet materials will be locked in a file drawer in my office. You and your son or daughter will be provided with copies of the informed consent and assent. After all the study participants have completed the study materials, a computer program will group all answers together and there will be no way to identify individual participants. Please remember that your participation is voluntary and whether or not you choose to participate will not affect the medical care your teenager receives.

I will now bring you to a private location to complete the study packet.

APPENDIX G

Letter of Solicitation

Study title: The relationships among school nurse to student ratios, self-efficacy for type 1 diabetes management, and glycemic control in adolescents

My name is Lori Wilt and I am a PhD student in the College of Nursing at Seton Hall University in NJ. As part of the requirements for a PhD degree in nursing, I am conducting a research study. I am looking at the relationship between the school nurse to student ratio and the confidence (self-efficacy) of children and teenagers with type 1 diabetes to manage their diabetes. The ratio means how many school nurses take care of how many students. I will also be looking to see if there's a relationship between the school nurse to student ratio and HbA1c levels of children and teenagers. HbA1c measures the average blood glucose levels over the past 2-3 months.

Children and teenagers with diabetes need a great deal of support in learning how to manage their diabetes. This study will provide important information about the effect of school nurses on helping children and teenagers with type 1 diabetes achieve this goal.

You and your son or daughter are invited to participate in this study. Your son or daughter is eligible to participate if he/she is between the ages of 10 and 16, and has type 1 diabetes. He/she needs to be able to speak and write in English. He/she must attend public or private school. He/she cannot have any other medical conditions or diagnoses. Your son or daughter also needs to be able to read and understand grade level material.

As participants, you will be asked to sign a consent form. Your son or daughter will be asked to sign an assent form, indicating agreement to participate in the study. You will be asked to fill out a brief parent questionnaire. It asks questions about your son or daughter's age, gender, ethnicity, school of attendance, and most recent HbA1c level. You will also be asked questions about your son or daughter's diabetes in general. You will also be asked about the management of diabetes in the school setting. The parent questionnaire should take no longer than 10 minutes to complete. Your son or daughter will be asked to fill out a short survey about diabetes and the school nurse. He/she will also be asked to fill out one brief questionnaire about confidence (self-efficacy) in his/her ability to manage his/her diabetes. This is called the Self-Efficacy for Diabetes Self-Management scale. Both questionnaires should take no longer than 10 minutes to complete.

Your participation is completely voluntary. You and your son or daughter may choose not to participate in the study. You may withdraw from the study at any time, with no consequences to either of you. Participation in the study will not affect the attitudes of your doctors and nurses. Nor will it affect the quality of medical care your son or daughter receives. If you and your son or daughter decide to participate, each of you (parent or set of parents, and each adolescent) will be provided a \$10 Target gift card as a token of appreciation after completion of the questionnaires.

You and your son or daughter will be provided with copies of this letter, the informed consent and adolescent assent form. Your responses on the questionnaires will be coded numerically and entered into a computer program. Your name will not be transferred into the computer program. There will be no way to identify who participated in the study and who did not. The information obtained in this study will be seen by myself, and will be kept confidential. No information will be stored on a computer, laptop, or other device. It will be stored on a special device known as a flash drive or thumb drive. It will be accessible only to me. It will be stored in a locked file cabinet in my office. Data will be stored for 3 years following completion of the study.

Your contribution to this study is greatly appreciated. There are no risks associated with the study. If, at any time, you or your son or daughter feels uncomfortable with any of the questions, please let me know. Questionnaires will be completed in a designated private location.

Contact information: All questions or concerns regarding the study must be directed to Lori Wilt at (973) 271-1926 or Fran Melchionne at (973) 971-4024. Thank you again for your contribution and participation in this study.

APPENDIX H

Combined Consent/Assent Form

**PERMISSION TO PARTICIPATE
IN RESEARCH (Child)**

Title of Research Study: The Relationships Among School Nurse to Student Ratios, Self-efficacy for Type 1 Diabetes Management, and Glycemic Control in Adolescents

Principal Investigator/s: Lori Wilt

Sub-Investigator/s: None

Department: Nursing

Phone: (973) 971-4024

Medical Records labels/IRB stamp

This document describes a research study. Research studies include only individuals who voluntarily choose to participate. Please take your time to make your decision. Discuss it with your friends, family and other advisors. This form is designed to provide you with information about this study that you should know prior to allowing your child to participate.

WHY IS THIS RESEARCH BEING DONE?

Diabetes is a complex disease that requires intensive management in order to prevent complications. Adolescents with type 1 diabetes typically experience difficulty following the medical treatment plan. Self-efficacy for diabetes management is a concept related to the confidence and ability of adolescents to follow the prescribed treatment plan. Higher levels of self-efficacy are associated with increased treatment adherence and lower HbA1c levels (the average blood glucose levels over the past 2-3 months). Lower HbA1c levels reduce complications often associated with diabetes. The school nurse is in a position to influence the level of self-efficacy for diabetes management in adolescents.

Researchers are looking at the relationship between the school nurse to student ratio and the confidence (self-efficacy) of children and teenagers with type 1 diabetes to manage their diabetes. The ratio means how many school nurses take care of how many students. The

*Atlantic Health System
Consent to Participate in Research (01/14)
Version Date: 5/21/14*

Parent/Legal Guardian Initials _____

**AHS IRB APPROVED: 6/5/2014
EXPIRES: 6/4/2015
IRBNet ID: 602907-1**

Title of Protocol: The Relationships Among School Nurse to Student Ratios, Self-efficacy for Type 1 Diabetes Management, and Glycemic Control in Adolescents
Principal Investigator: Lori Wilt
Phone #: 973-271-1926

researchers will also be looking to see if there's a relationship between the school nurse to student ratio and HbA1c levels of children and teenagers. HbA1c measures the average blood glucose levels over the past 2-3 months.

HOW MANY PEOPLE WILL TAKE PART IN THE STUDY?

The researchers are seeking 84-100 participants from Atlantic Health Systems.

WHY IS YOUR CHILD BEING ASKED TO TAKE PART IN THIS RESEARCH STUDY?

Children and teenagers with diabetes need a great deal of support in learning how to manage their diabetes. This study will provide important information about the effect of school nurses on helping children and teenagers with type 1 diabetes achieve this goal.

WHO IS CONDUCTING THE STUDY:

The Principal Investigator is Lori Wilt. There is no sponsor and Lori Wilt is not being paid to conduct this study.

WHAT IS INVOLVED IN THE STUDY?

You will be asked to complete a parent questionnaire, which asks demographic questions, questions related to your child's diabetes in general, and questions related to your child's diabetes in the school setting. The adolescent questionnaire asks questions about diabetes in the school setting, and the Self-Efficacy for Diabetes Self-Management scale asks questions about the confidence of adolescents in managing your diabetes.

WHAT IS THE DURATION OF THE STUDY:

Estimated time to complete all study questionnaires is 10 minutes.

WHAT ARE THE RISKS FROM PARTICIPATING IN THE STUDY?:

There are no anticipated risks associated with this study.

ARE THERE BENEFITS TO TAKING PART IN THE STUDY?:

If you agree to allow your child to take part in this study, there may not be direct medical benefits to your child. It is hoped that the information shared by you and your son or daughter will benefit others in the future. The results of the study may benefit the practice of school

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Title of Protocol: The Relationships Among School Nurse to Student Ratios, Self-efficacy for Type 1 Diabetes Management, and Glycemic Control in Adolescents
Principal Investigator: Lori Wilt
Phone #: 973-271-1926

nurses caring for children and teenagers with type 1 diabetes in helping them learn to self-manage their diabetes.

WHAT ARE ALTERNATIVE TREATMENT OPTIONS?:

You have the option of not participating in the study.

WHAT ARE THE COSTS OF PARTICIPATING IN THIS STUDY?:

There will be no cost to you for participating in this study. Upon completion of the study, each parent(s) and each adolescent participant will be given a \$10 Target gift card as a token of appreciation.

DO YOU AND YOUR CHILD HAVE TO PARTICIPATE IN THIS STUDY?:

You and your child's participation is completely voluntary. You and your child may withdraw from the study at any point by informing the researcher of your wish to stop the survey. The decision to participate will in no way affect the attitudes of your health care providers or the quality of care that your child or teenager will continue to receive from this endocrinology practice.

Choosing not to participate or to withdraw from the study will not harm your relationship with the attending staff, nor will it prejudice any further treatment at this institution. You will not be penalized, nor will you lose any benefits to which you would be otherwise entitled.

WHAT ARE YOU AND YOUR CHILD'S RIGHTS AS STUDY PARTICIPANTS?:

If you wish further information regarding you and your child's rights as research subjects, you may contact the Institutional Review Board through the Atlantic Center for Research at 973-660-3128.

WHO CAN YOU CALL IF YOU HAVE QUESTIONS OR PROBLEMS:

You have talked to Lori Wilt about this study and he/she has answered your questions. Lori Wilt can be reached at (973) 271-1926, or via email at lori.wilt@student.shu.edu. She will be available to answer any questions or concerns that you may have. You may also contact the pediatric diabetes clinical coordinator, Fran Melchionne, at (973) 971-4024. You will be informed of any significant findings discovered during the course of the study, which might influence your willingness to allow your child to participate.

Atlantic Health System
 Permission to Participate in Research (01/14)
 Version Date: 5/21/14

Parent/Legal Guardian Initials _____

AHS IRB APPROVED: 6/5/2014
 EXPIRES: 6/4/2015
 IRBNet ID: 602907-1

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Title of Protocol: The Relationships Among School Nurse to Student Ratios, Self-efficacy for Type 1 Diabetes Management, and Glycemic Control in Adolescents
Principal Investigator: Lori Wilt
Phone #: 973-271-1926

HOW WILL INFORMATION BE KEPT PRIVATE (CONFIDENTIAL) AND AUTHORIZATION TO USE PRIVATE HEALTH INFORMATION:

While the researchers will make every effort to maintain confidentiality of information obtained about you and your child, it cannot be absolutely guaranteed, in part because other people may need to look at the information.

The federal Health Insurance Portability and Accountability Act (HIPAA) requires that the investigators get your permission to use health information about your child that is either created by or used in connection with the research. This permission is called an Authorization. The information used includes the entire research record and supporting information from your child's medical records, including HIV/AIDS related information (if any), and both clinical and research observations made during your child's participation in the research or other research-related activities.

In this research, your child's health information will be collected and used to conduct the study, to monitor your child's health status, to measure effects of drugs/devices/procedures, to determine research results, and possibly to develop new tests, procedures, and commercial products. Health information is used to report results of research to sponsors and federal regulators and may be reviewed when studies are audited for compliance with study plans, regulations and research policies.

The results of the study may be presented at scientific meetings or published in the medical literature. Any such use will not contain information that will identify you or your child by name. Identifiers such as photographs, audio or videotapes will only be used with your special written permission. You may see the photographs and videotapes and hear the audiotapes before giving this permission.

The study investigator may share this consent form and records that identify you or your child to meet regulatory requirements or for purposes related to this research to:

- Other medical centers/institutions/investigators outside of Atlantic Health System participating in the research
- Federal and state agencies that have authority over the research, Atlantic Health System, or patients (for example: the Department of Health and Human Services, the Food and Drug Administration, the National Institutes of Health, the Office of Human Research Protection, or other governmental offices as required by law)
- Hospital or other accrediting agencies
- A data safety monitoring board, if applicable
- Clinical staff not involved in the study who may become involved in your child's care, if such involvement is potentially relevant to treatment

Atlantic Health System
 Permission to Participate in Research (01/14)
 Version Date: 5/21/14

Parent/Legal Guardian Initials _____

AHS IRB APPROVED: 6/5/2014
 EXPIRES: 6/4/2015
 IRBnet ID: 602907-1

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Title of Protocol: The Relationships Among School Nurse to Student Ratios, Self-efficacy for Type 1 Diabetes Management, and Glycemic Control in Adolescents
Principal Investigator: Lori Wilt
Phone #: 973-271-1926

- Your health insurer, or payer, if necessary, in order to secure their payment for any covered treatment not paid for through the research
- The Institutional Review Board of Atlantic Health System and other Institutional departments involved in research oversight and/or management

Once Atlantic Health System discloses information in your child's study records or medical records, Atlantic Health System cannot guarantee that the recipient of the information will not redisclose your child's information and it may no longer be protected by federal law.

Atlantic Health System has a Notice of Privacy Practices (the "Notice") that explains, among other things, the definitions of research, treatment, payment, health care operations, and the types of uses or disclosures that Atlantic Health System can make if you sign this consent document. You have the right to review the Notice before you sign this consent document. Atlantic Health System may change the terms of the Notice from time to time. You may contact the Compliance Officer, at the address listed below, to obtain a revised version of the Notice at any time.

If you decide to allow your child to participate in this study, your Authorization will not expire unless you revoke (cancel) it in writing to the Compliance Officer at the address listed below. If you revoke your Authorization, you and your child will also be removed from the study, but standard medical care and any other benefits to which your child is entitled will not be affected. Revoking your Authorization only affects uses and sharing information collected after your written request has been received. Information collected prior to your revoking your authorization will still be used and disclosed as described above.

The address of the Compliance Officer is as follows:

Eva J. Goldenberg, Esq.
 Director, Corporate Compliance and Internal Audit/Compliance Officer
 Atlantic Health System
 475 South Street
 PO Box 1905
 Morristown, NJ 07962-1905
 973-660-3143
 E-mail: Eva.Goldenberg@atlantichhealth.org

Subject to certain legal limitations, you have the right to access your child's protected health information that is created during this research that relates to your child's treatment or payment provided and is not exempted under certain laws and regulations. You may access this information only after the study analyses are complete.

Atlantic Health System
 Permission to Participate in Research (01/14)
 Version Date: 5/21/14

Parent/Legal Guardian Initials _____

AHS IRB APPROVED: 6/5/2014
 EXPIRES: 6/4/2015
 IRBNet ID: 602907-1

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Title of Protocol: The Relationships Among School Nurse to Student Ratios, Self-efficacy for Type 1 Diabetes Management and Glycemic Control in Adolescents
Principal Investigator: Lori Wilt
Phone #: 973-271-1926

You have the right to refuse to sign this consent document/Authorization and not to allow your child to be part of the study. You can also withdraw your child from the study at any time without canceling the Authorization to use your child's data. By signing this research consent form, you authorize the use and/or sharing of your child's protected health information.

Atlantic Health System
Permission to Participate in Research (01/14)
Version Date: 5/21/14

Parent/Legal Guardian Initials _____

AHS IRB APPROVED: 6/5/2014
EXPIRES: 6/4/2015
IRBNet ID: 602907-1

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Title of Protocol: The Relationships Among School Nurse to Student Ratios, Self-efficacy for Type 1 Diabetes Management, and Glycemic Control in Adolescents
Principal Investigator: Lori Wilt
Phone #: 973-271-1926

AGREEMENT TO PARTICIPATE

RESEARCH STUDY: The Relationships Among School Nurse to Student Ratios, Self-efficacy for Type 1 Diabetes Management, and Glycemic Control in Adolescents

PARTICIPANT'S NAME: _____

I have read the above description of the research study and general conditions.

I have discussed this study with the investigator to my satisfaction. I understand the purpose of the research, the study procedures that I will undergo and my child will undergo, the possible risks, discomforts and benefits that I may experience and my child may experience during the study. I understand that my participation and my child's participation is voluntary and that I can withdraw myself or my child from the study at any time.

In consideration of this understanding, I voluntarily agree to participate and to allow my child to participate in this research.

I have read and will be given a copy of this document for my records.

I authorize the use and disclosure of my child's protected health information in the manner described in this document.

Signature of Parent or Legal Guardian	Date/Time	Printed Name of Parent or Legal Guardian

To the best of my ability, I have explained the purpose of the research required, and the risks and benefits of this study to the participant and his/her parent or legal guardian.

Individual Obtaining Consent	Date	Printed Name

I acknowledge that I have received a copy of Atlantic Health System's Notice of Privacy Practices.

Signature of Parent or Legal Guardian	Date	Printed Name of Parent or Legal Guardian

Atlantic Health System
Permission to Participate in Research (01/14)
Version Date: 5/21/14

Parent/Legal Guardian Initials _____

AHS IRB APPROVED: 6/5/2014
 EXPIRES: 6/4/2015
 IRBnet ID: 602907-1

Title of Protocol: The Relationships Among School Nurse to Student Ratios, Self-efficacy for Type 1 Diabetes Management, and Glycemic Control in Adolescents
 Principal Investigator: Lori Wilt
 Phone #: 973-271-1926

Assent Form for Minors

You are being asked to be in a research study. You may say yes or you may say no. You may ask as many questions as you like before you decide.

The researchers want to know if your visits to your school nurse have any effect on your belief in your ability to manage your diabetes. This study may help school nurses learn more about helping children and teenagers manage their diabetes.

If you are in the study, you and your parent(s) will be asked some questions about your diabetes. The researchers will also ask you questions about how you take care of diabetes in school. The questions asked will be on two questionnaires. They should take about 10 minutes to finish.

Being in this study may not help you. The results of the study may benefit the practice of school nurses caring for children and teenagers with type 1 diabetes in helping them learn to self-manage their diabetes.

You may say “no.” No one will be mad at you. If you say “yes” now, you may change your mind later.

You may talk to your parents and the doctors or nurses about the study.

___ **YES, I want to be in the study.** ___ **NO, I do not want to be in the study.**

 Name of Child

 Signature

 Date

 Name of Individual
 Conducting Assent Interview

 Signature

 Date

*Atlantic Health System
 Permission to Participate in Research (01/14)
 Version Date: 5/21/14*

Parent/Legal Guardian Initials _____

AHS IRB APPROVED: 6/5/2014 EXPIRES: 6/4/2015 IRBNet ID: 602907-1
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APPENDIX I

Parent Questionnaire

INSTRUCTIONS: Please select or write in the best response to the following questions.

Demographics		
1.	What is your son or daughter's birthdate?	_____
2.	What is your son or daughter's gender?	<input type="checkbox"/> Male <input type="checkbox"/> Female
3.	What is the name of your son or daughter's school? In which town is your son or daughter's school located?	_____ _____
4.	Does your son or daughter have difficulty reading or understanding grade level material in English?	<input type="checkbox"/> Yes <input type="checkbox"/> No
5.	Does your son or daughter have any other medical conditions or diagnoses? Please explain.	<input type="checkbox"/> Yes _____ _____ <input type="checkbox"/> No
6.	What is your highest completed grade in school?	<input type="checkbox"/> Less than high school graduate <input type="checkbox"/> High school graduate or GED <input type="checkbox"/> Some college or vocational training <input type="checkbox"/> College graduate <input type="checkbox"/> Some graduate school <input type="checkbox"/> Graduate degree
7.	What is your child's other parent's highest completed grade in school?	<input type="checkbox"/> Less than high school graduate <input type="checkbox"/> High school graduate or GED <input type="checkbox"/> Some college or vocational training <input type="checkbox"/> College graduate <input type="checkbox"/> Some graduate school <input type="checkbox"/> Graduate degree <input type="checkbox"/> Not sure
8.	What is your gender?	<input type="checkbox"/> Male <input type="checkbox"/> Female

INSTRUCTIONS: Please select or write in the best response to the following questions.

Questions related to diabetes		
1.	What is your son or daughter's most recent HbA1c, the blood test that measures average blood glucose levels over the past 2-3 months?	_____
2.	What is the date of the most recent HbA1c?	_____
3.	How old was your son or daughter when s(he) was diagnosed with diabetes?	_____
4.	On average , how many times a day does your son or daughter check his/her blood sugar?	<input type="checkbox"/> Not at all <input type="checkbox"/> 1-2 <input type="checkbox"/> 3-4 <input type="checkbox"/> 5-6 <input type="checkbox"/> ≥ 7 <input type="checkbox"/> Not sure
5.	On average , how many times a day does your son or daughter receive insulin?	<input type="checkbox"/> 1-2 <input type="checkbox"/> 3-4 <input type="checkbox"/> 5-6 <input type="checkbox"/> ≥ 7 <input type="checkbox"/> Not sure
6.	Does your son or daughter receive insulin by injection or continuous infusion (pump)?	<input type="checkbox"/> Injection <input type="checkbox"/> Continuous infusion <input type="checkbox"/> Injection and transitioning to continuous infusion
7.	On average , how many times a year does your son or daughter visit the endocrinologist (diabetes doctor) or nurse practitioner?	<input type="checkbox"/> ≤ 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> ≥ 5

8.	Has your son or daughter ever attended diabetes camp?	<input type="checkbox"/> Yes <input type="checkbox"/> No (SKIP TO QUESTION 10)
9.	How many times has your son or daughter attended diabetes camp?	<input type="checkbox"/> 1-2 <input type="checkbox"/> 3-4 <input type="checkbox"/> ≥ 5
10.	In the last year , how many times has your son or daughter been hospitalized for diabetes related issues?	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> ≥ 3
11.	What was(were) the reason(s) for hospitalization?	_____ _____ _____ _____

INSTRUCTIONS: Please select or write in the best response to the following questions.

Questions related to diabetes in the school setting		
1.	Which best describes the presence of a school nurse in your son or daughter's school?	<input type="checkbox"/> Full-time (every day for the duration of the school day) <input type="checkbox"/> Part-time How many days per week ? _____ How many hours per day ? _____ <input type="checkbox"/> There is no school nurse <input type="checkbox"/> Not sure <input type="checkbox"/> Other _____
2.	On average , if your son or daughter has a school nurse in school, how often does s(he) visit the school nurse?	<input type="checkbox"/> Every day How many times per day ? _____ <input type="checkbox"/> 3-4 times per week How many times per day ? _____ <input type="checkbox"/> 1-2 times per week How many times per day ? _____ <input type="checkbox"/> There is no school nurse <input type="checkbox"/> Does not visit the school nurse <input type="checkbox"/> Not sure

<p>3.</p>	<p>If your son or daughter's school does not have a school nurse, who is responsible for his/her diabetes care in school?</p>	<p><input type="checkbox"/> Teacher <input type="checkbox"/> Health office aide or assistant <input type="checkbox"/> Principal <input type="checkbox"/> Secretary <input type="checkbox"/> Parent <input type="checkbox"/> Other personnel (specify) _____ <input type="checkbox"/> No one <input type="checkbox"/> There is always a school nurse available <input type="checkbox"/> Not sure</p>
<p>4.</p>	<p>In the last month, about how many times has your son or daughter experienced hypoglycemia in school that required the assistance of another person?</p>	<hr/>
<p>5.</p>	<p>In the last 6 months, about how many times has your son or daughter experienced hypoglycemia in school that required the assistance of another person?</p>	<hr/>
<p>6.</p>	<p>In the last year, about how many times has your son or daughter experienced hypoglycemia in school that required the assistance of another person?</p>	<hr/>
<p>7.</p>	<p>If your son or daughter needed assistance, who was the person who most frequently helped him or her?</p>	<hr/>
<p>8.</p>	<p>Has your son or daughter ever experienced severe hypoglycemia in school that resulted in a loss of consciousness?</p>	<p><input type="checkbox"/> Yes <input type="checkbox"/> No (SKIP TO QUESTION 12) <input type="checkbox"/> Not sure</p>

9.	If your son or daughter experienced a loss of consciousness at school, how was it treated? (Check all that apply)	<input type="checkbox"/> Glucagon <input type="checkbox"/> Cake gel/frosting <input type="checkbox"/> Calling 911 <input type="checkbox"/> Not sure
10.	Who administered the Glucagon or cake gel/frosting?	_____
11.	Was there a school nurse present in the school on that day?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not sure
12.	Does your son or daughter have a specific person in the school that is trained to administer Glucagon?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not sure
13.	At this point in time, would you ever keep your son or daughter home from school because there was no school nurse present on that day?	<input type="checkbox"/> Yes <input type="checkbox"/> No
14.	Have you ever kept your son or daughter home from school because there was no school nurse present on that day?	<input type="checkbox"/> Yes <input type="checkbox"/> No (SKIP TO QUESTION 16)
15.	If you have kept your son or daughter home from school because there was no school nurse present on that day, did you miss work?	<input type="checkbox"/> Yes <input type="checkbox"/> No
16.	Have you ever had to go to your son or daughter's school to care for his/her diabetes because no one was available to help him or her?	<input type="checkbox"/> Yes <input type="checkbox"/> No (SKIP TO QUESTION 18)

17.	If you have had to go to your son or daughter's school to care for his/her diabetes because no one was available to help him or her, did you miss work?	<input type="checkbox"/> Yes <input type="checkbox"/> No
18.	Has your son or daughter ever missed a field trip because there was no school nurse available to go on the field trip?	<input type="checkbox"/> Yes <input type="checkbox"/> No
19.	Have you ever had to go on a field trip because there was no school nurse available to go on the field trip?	<input type="checkbox"/> Yes <input type="checkbox"/> No
20.	If you have had go on a field trip because there was no school nurse available, did you miss work?	<input type="checkbox"/> Yes <input type="checkbox"/> No
21.	How would you describe your feelings about your son or daughter's safety at school in terms of diabetes care?	<input type="checkbox"/> Not at all safe <input type="checkbox"/> Not very safe <input type="checkbox"/> Neither safe nor unsafe <input type="checkbox"/> Somewhat safe <input type="checkbox"/> Very safe
22.	How would you describe your satisfaction with the diabetes care your son or daughter receives at school?	<input type="checkbox"/> Not at all satisfied <input type="checkbox"/> Not very satisfied <input type="checkbox"/> Neither satisfied nor unsatisfied <input type="checkbox"/> Somewhat satisfied <input type="checkbox"/> Very satisfied
23.	What, if anything, have you learned from the school nurse that influenced your ability to care for your son or daughter's diabetes?	<hr/> <hr/> <hr/> <hr/> <hr/>

APPENDIX J

Adolescent Questionnaire

Questions about school		
1.	When you visit the school nurse, about how much time do you spend with the school nurse?	<input type="checkbox"/> Less than 5 minutes <input type="checkbox"/> About 5-10 minutes <input type="checkbox"/> More than 10 minutes <input type="checkbox"/> My school doesn't have a school nurse <input type="checkbox"/> I don't visit the school nurse <input type="checkbox"/> Not sure
2.	On average , if you have a school nurse in school, how often do you visit the school nurse?	<input type="checkbox"/> Every day How many times per day ? _____ <input type="checkbox"/> 3-4 times per week How many times per day ? _____ <input type="checkbox"/> 1-2 times per week How many times per day ? _____ <input type="checkbox"/> My school doesn't have a school nurse <input type="checkbox"/> I don't visit the school nurse <input type="checkbox"/> Not sure
3.	When you visit the school nurse, what activities are you involved in? (Check all that apply)	<input type="checkbox"/> Checking blood sugar <input type="checkbox"/> Injecting insulin <input type="checkbox"/> Checking urine for ketones <input type="checkbox"/> Counting carbohydrates <input type="checkbox"/> Learning something from the school nurse <input type="checkbox"/> Calling my parent(s) for something <input type="checkbox"/> Other _____ <input type="checkbox"/> My school doesn't have a school nurse <input type="checkbox"/> I don't visit the school nurse
4.	On average , how many times a day do you check your blood sugar?	<input type="checkbox"/> Not at all <input type="checkbox"/> 1-2 <input type="checkbox"/> 3-4 <input type="checkbox"/> 5-6 <input type="checkbox"/> ≥ 7

5.	On average , how many times a day do you receive insulin?	<input type="checkbox"/> 1-2 <input type="checkbox"/> 3-4 <input type="checkbox"/> 5-6 <input type="checkbox"/> ≥ 7
6.	What, if anything, have you learned from your school nurse that has helped you take better care of your diabetes?	<hr/> <hr/> <hr/> <hr/> <hr/>
7.	How would you describe your feelings about the helpfulness of your school nurse with regards to your diabetes?	<input type="checkbox"/> Not at all helpful <input type="checkbox"/> Not very helpful <input type="checkbox"/> Neither helpful nor unhelpful <input type="checkbox"/> Somewhat helpful <input type="checkbox"/> Very helpful

APPENDIX K

Self-Efficacy for Diabetes Self-Management (SEDM) Scale

INSTRUCTIONS: Please read the following questions about taking care of your diabetes. Please **circle** the number that best describes how you feel about the following statements.

How sure are you that you <u>can</u> do each of the following, almost all of the time?	Not at All Sure									Completely Sure
1. Adjust your insulin correctly when you eat more or less than usual?	1	2	3	4	5	6	7	8	9	10
2. Choose healthful foods when you go out to eat?	1	2	3	4	5	6	7	8	9	10
3. Exercise even when you don't really feel like it?	1	2	3	4	5	6	7	8	9	10
4. Adjust your insulin or food accurately based on how much exercise you get?	1	2	3	4	5	6	7	8	9	10
5. Talk to your doctor or nurse about any problems you're having with taking care of your diabetes?	1	2	3	4	5	6	7	8	9	10
6. Do your blood sugar checks even when you are really busy?	1	2	3	4	5	6	7	8	9	10
7. Manage your diabetes the way your health care team wants you to?	1	2	3	4	5	6	7	8	9	10
8. Manage your diabetes even when you feel overwhelmed?	1	2	3	4	5	6	7	8	9	10

9. Find ways to deal with feeling frustrated about your diabetes?	1	2	3	4	5	6	7	8	9	10
10. Identify things that could get in the way of managing your diabetes?	1	2	3	4	5	6	7	8	9	10

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APPENDIX L

Permission to use the Self-Efficacy for Diabetes Self-Management (SEDM) Scale

From: Iannotti, Ron (NIH/NICHD) [E] <iannottr@mail.nih.gov>
Sent: Friday, July 26, 2013 2:50 PM
To: Lori R Wilt
Subject: RE: Self-efficacy for diabetes self-management scale

Lori,
The measure and scoring suggestions are attached.
Best of luck with your research.
Ron

From: Lori R Wilt [<mailto:lori.wilt@student.shu.edu>]
Sent: Friday, July 26, 2013 2:48 PM
To: Iannotti, Ron (NIH/NICHD) [E]
Subject: Self-efficacy for diabetes self-management scale

Good afternoon Dr. Iannotti,

I am a doctoral student in nursing at Seton Hall University in New Jersey and a Certified School Nurse. My research area of interest is in the school nurses' impact on the self-efficacy for diabetes management in adolescents with T1DM. I am interested in securing your instrument along with permission and scoring guidelines for use in my dissertation. I welcome any feedback, comments, or discussion that you feel appropriate. Should you need to reach me by telephone, my cell number is 973-271-1926. Thank you for your time.

Lori Wilt, MSN, RN, NJ-CSN
Robert Wood Johnson New Jersey Nurse Scholar
Seton Hall University
College of Nursing
South Orange, NJ 07079
lori.wilt@student.shu.edu

APPENDIX M

Atlantic Health Notice of Privacy Practices**NOTICE OF PRIVACY PRACTICES**

THIS NOTICE DESCRIBES HOW MEDICAL INFORMATION ABOUT YOU MAY BE USED AND DISCLOSED AND HOW YOU CAN GET ACCESS TO THIS INFORMATION. PLEASE REVIEW IT CAREFULLY.

I. Who We Are:

We are a member of Atlantic Health System, Inc. This Notice describes the privacy practices of Atlantic Health (its hospitals, other medical facilities and companies) and the physicians, nurses, technicians and other individuals that work at or in conjunction with Atlantic Health ("Atlantic", "we" or "us").

II. Our Commitment to Your Privacy:

We are dedicated to maintaining the privacy of your medical information. In conducting our services, we will create records regarding you and the treatment and services we provide to you (including records relating to psychiatric treatment, drug and alcohol treatment or abuse or HIV status, if any). These records are our property; however, we are required by law to maintain the privacy of medical and health information about you ("Protected Health Information" or "PHI") and to provide you with this Notice of our legal duties and privacy practices with respect to PHI. When we use or disclose PHI, we are required to abide by the terms of this Notice (or other notice in effect at the time of the use or disclosure).

III. Uses and Disclosures With Your Authorization:

A. Use or Disclosure with Your Authorization. We may use or disclose PHI only when (1) you give us your written authorization on a form that complies with the Health Insurance Portability and Accountability Act ("Your Authorization") or (2) there is an exception described in Section IV below. Further, except to the extent that we have taken action in reliance upon it, you may revoke Your Authorization by delivering a written revocation statement to the Privacy Officer identified in Section VII below.

B. Genetic Information. Except in certain cases (such as a paternity test for a court proceeding, anonymous research, newborn screening requirements or pursuant to a court order), we will obtain Your Authorization prior to obtaining or retaining your genetic information (for example, your DNA sample). We may use or disclose your genetic information for any reason only when Your Authorization expressly refers to your genetic information or when disclosure is permitted under New Jersey State law (including, for example, when disclosure is necessary for the purposes of a criminal

investigation, to determine paternity, newborn screening, identifying your body or as otherwise authorized by a court order).

C. AIDS or HIV Related Information. If PHI contains AIDS or HIV related information, that information is confidential and shall not be disclosed without Your Authorization expressly releasing AIDS or HIV related information except as follows. Such information may be released without Your Authorization to medical personnel directly involved in your medical treatment. If you are deemed to lack decision-making capacity, we may release such information (only if necessary and unless you request otherwise) to the person responsible for making health care decisions on your behalf (spouse, primary caretaking partner, an appropriate family member, etc.). Under certain circumstances, such information may also be released without Your Authorization for scientific research, certain audit and management functions, and as may otherwise be allowed or required by law or court order.

D. Alcohol or Drug Abuse Programs. If PHI contains information related to treatment provided in one of our alcohol or drug abuse programs (the "Program"), that information is confidential and shall not be disclosed without Your Authorization expressly releasing alcohol or drug abuse related information except in accordance with applicable law including federal regulations regarding the confidentiality of alcohol and drug patient records.

IV. Uses and Disclosures Without Your Authorization:

A. Use and/or Disclosure For Treatment, Payment and Health Care Operations. Except as noted in Sections III B, C, and D above, we may use and/or disclose PHI without Your Authorization for treatment provided to you, obtaining payment for services provided to you and for health care operations (e.g., internal administration, quality improvement, customer service, etc.) as detailed below:

- Treatment. We use and disclose your PHI to provide treatment and other services to you - for example, to diagnose and treat your injury or illness. We may also disclose your PHI for the treatment activities of another health care provider.

In addition, unless you "Opt Out" as described below, any authorized health care provider who agrees to participate with Jersey Health Connect can also electronically access and use your PHI to provide treatment to you. If you "Opt Out" as described below, your PHI will continue to be accessed, used and released as needed to provide treatment to you but will not be made electronically available through Jersey Health Connect.

- Payment. We may use and disclose your PHI to obtain payment for services that we provide to you - for example, disclosures to claim and obtain payment from your health insurer, HMO, or other company that arranges or pays the cost of some or all of your health care ("Your Payor")

to verify that Your Payor will pay for your health care. We may also disclose your PHI to another health care provider for the payment activities of that health care provider.

- Health Care Operations. We may use and disclose your PHI for our health care operations, which include internal administration and planning and various activities that improve the quality and cost effectiveness of the care that we deliver to you (including operating and troubleshooting our health information technology). For example, we may use your PHI to evaluate the quality and competence of our physicians, nurses and other health care workers. In addition, we may disclose your PHI to external licensing or accrediting bodies for purposes of hospital licensure and review. We may disclose your PHI to our patient representatives in order to resolve any complaints you may have and ensure that you have a comfortable visit with us. Under certain circumstances, we may disclose your PHI to another health care provider for the health care operations of that health care provider if they either have treated or examined you and your PHI pertains to that treatment or examination.

B. Use or Disclosure for Directory of Individuals in Atlantic. Unless you Opt Out (e.g., disagree or object), we may include your name, location in Atlantic, general health condition and religious affiliation in a patient directory. Information in the directory may be disclosed to anyone who asks for you by name or members of the clergy (provided, however, that religious affiliation will only be disclosed to members of the clergy). If you Opt Out, we cannot tell members of the public or your family and friends that you are admitted to the hospital. Please think carefully about the consequences of the decision to Opt Out.

C. Disclosure to Relatives and Close Friends. We may use or disclose your PHI to a family member, other relative, a close personal friend or any other person identified by you when you are present for, or otherwise available prior to, the disclosure, if we: (1) obtain your agreement; (2) provide you with the opportunity to object to the disclosure and you do not object; or (3) reasonably infer that you do not object to the disclosure. If you are not present, or the opportunity to agree or object to a use or disclosure cannot practicably be provided because of your incapacity or an emergency circumstance, we may exercise our professional judgment to determine whether a disclosure is in your best interests. If we disclose information to a family member, other relative, a close personal friend or other person identified by you, we would disclose only information that is directly relevant to the person's involvement with your health care or payment related to your health care or needed for notification purposes.

D. Fundraising Communications. We may contact you to request a tax-deductible contribution to support important activities of Atlantic. In connection with any fundraising without your written authorization, we may disclose to our related foundation/fundraising staff demographic information about you (e.g., your name, address and phone number) and dates on which we provided health care to you. You

have a right to Opt Out of receiving fundraising communications from us. If you do not want to receive fundraising requests, you must notify our Privacy Officer.

E. Public Health Activities. We may disclose PHI for public health activities and purposes, including, without limitation,: (1) to report health information to public health authorities for the purpose of preventing or controlling disease, injury or disability; (2) to report child abuse and neglect to public health authorities or other government authorities authorized by law to receive such reports; (3) to report information about products under the jurisdiction of the U.S. Food and Drug Administration; (4) to alert a person who may have been exposed to a communicable disease or may otherwise be at risk of contracting or spreading a disease or condition; and (5) to report information to your employer as required under laws addressing work-related illnesses and injuries or workplace medical surveillance.

F. Health Oversight Activities. We may disclose your PHI to a health oversight agency that oversees the health care system and ensures compliance with the rules of government health programs such as Medicare or Medicaid.

G. Judicial and Administrative Proceedings. We may disclose your PHI in the course of a judicial or administrative proceeding in response to a legal order or other lawful process.

H. Law Enforcement Officials. We may disclose your PHI to the police or other law enforcement officials as required by law or in compliance with a court order.

I. Decedents. We may disclose your PHI to a coroner or medical examiner as authorized by law. We may also release medical information about patients at Atlantic to a funeral director as necessary to carry out his or her duties.

J. Organ and Tissue Procurement. We may disclose your PHI to organizations that facilitate organ, eye or tissue procurement, banking or transplantation.

K. Research. We may use or disclose your PHI without your consent or authorization if our Institutional Review Board approves a waiver of authorization for disclosure.

L. Health or Safety. We may use or disclose your PHI to prevent or lessen a serious and imminent threat to a person's or the public's health or safety.

M. Specialized Government Functions. We may use or disclose your PHI to units of the government with special functions, such as the U.S. military or the U.S. Department of State under certain circumstances.

N. Workers' Compensation. We may disclose your PHI as authorized by and to the extent necessary to comply with laws relating to workers' compensation or other similar programs.

O. Victims of Abuse, Neglect or Domestic Violence. If we reasonably believe you are a victim of abuse, neglect or domestic violence, we may disclose your PHI to a government authority, including social service or protective services agencies, authorized by law to receive reports of such abuse, neglect or domestic violence.

P. Military and Veterans. We may release medical information about you as required by military command authorities if you are a member of the armed forces. We may also release medical information about foreign military personnel to the appropriate foreign military authority.

Q. National Security and Intelligence Activities. We may release medical information about you to authorized federal officials for intelligence, counter-intelligence and other national security activities authorized by law.

R. Inmates. If you are an inmate of a correctional institution or in the custody of a law enforcement official, we may release medical information about you to the correctional institution or law enforcement official. This release would be necessary:

- for Atlantic to provide you with healthcare,
- to protect your health and safety or the health and safety of others, or
- for the safety and security of the correctional institution

S. Health Information Exchange (HIE). Atlantic and other health care providers participate with Jersey Health Connect. This is a health information exchange that allows patient information to be shared electronically through a secured connected network. Jersey Health Connect gives your health care providers who participate in the Jersey Health Connect network immediate electronic access to your pertinent medical information for treatment, payment and certain health care operations. If you do not Opt-Out of Jersey Health Connect, your information will be available through the Jersey Health Connect network to your authorized participating providers in accordance with this Notice of Privacy Practices and the law. If you do Opt-Out of Jersey Health Connect, your PHI will continue to be used in accordance with this Notice of Privacy Practices and the law but will not be made electronically available through Jersey Health Connect.

T. As Required by Law. We may use and disclose your PHI when required to do so by any other law or regulation not already referenced above.

U. Other Uses of Your Health Information. Other uses and disclosures of PHI not covered by this Notice or by the laws that apply to us will be made only with Your Authorization, including certain marketing activities, sale of health information, and disclosure of psychotherapy notes with some exceptions. You have the right to revoke Your Authorization at any time, provided that the revocation is in writing, except to the extent that we have already taken action in reliance on Your Authorization.

V. Your Individual Rights:

A. For Further Information, Complaints. If you desire further information about your privacy rights, are concerned that we have violated your privacy rights, or disagree with a decision that we made about access to your PHI, you may contact our Privacy Officer. You may also file written complaints with the Director, Office of Civil Rights of the U.S. Department of Health and Human Services. Upon request, the Privacy Officer will provide you with the correct address for the Director. We will not retaliate against you if you file a complaint with us or the Director.

B. Right to Request Additional Restrictions. You may request restrictions on our use and disclosure of your PHI: (1) for treatment, payment and health care operations; (2) to individuals (such as a family member, other relative, close personal friend or any other person identified by you) involved with your care or with payment related to your care; or (3) to notify or assist in the notification of such individuals regarding your location and general condition. While we will consider all requests restrictions, we are not required to agree to a requested restriction except in the case where the intended disclosure is to a health plan for purposes of carrying out payment or health care operations, and the intended disclosure is not otherwise required by law, and the information pertains solely to a health care item or service for which you, or a person on your behalf, has paid in full. If you wish to request additional restrictions, please obtain a request form from, and submit the completed form to, our Privacy Officer. We will send you a written response.

C. Right to Receive Confidential Communications. You may request that we communicate with you about your PHI by alternative means or at alternative locations. To make such a request, you must submit your request in writing to our Privacy Officer.

D. Right to Inspect and Copy Your Health Information. You may request access to your medical record file and billing records maintained by us in order to inspect and request copies of the records. Under limited circumstances, we may deny you access to a portion of your records. If you desire access to your records, please obtain a record request form from, and submit the completed form to, our Privacy Officer.

You should take note that, if you are a parent or legal guardian of a minor, certain portions of the minor's medical record will not be accessible to you in accordance with applicable law (for example, records relating to pregnancy, abortion, sexually transmitted disease, substance use and abuse, contraception and/or family planning services).

E. Right to Amend Your Records. You have the right to request that we amend PHI maintained in your medical record file or billing records. If you desire to amend your records, please obtain an amendment request form from, and submit the completed form to, our Privacy Officer. We have the right to deny your request for amendment. If we deny your request for an amendment, we will provide you with a written explanation of why we denied the request and to explain your rights.

F. Right to Receive an Accounting of Disclosures. Upon request, you may obtain an accounting of certain disclosures of PHI made by us during any period of time prior to the date of your request, in accordance with applicable laws and regulations, provided such period does not exceed six years and does not apply to disclosures that occurred prior to April 14, 2003. If you request an accounting more than once during a twelve (12) month period, we may charge you the cost of providing the accounting statement. To request an accounting of disclosures, you must submit your request in writing to our Privacy Officer.

G. Right to Receive Notice of a Breach. You have a right to be notified by us of any breaches of unsecured PHI in accordance with the law.

H. Right to Receive Paper Copy of this Notice. Upon request, you may obtain a paper copy of this Notice, even if you agreed to receive such notice electronically. You can also access this Notice on our website at: www.atlantichealth.org.

I. Right to Opt-Out of Jersey Health Connect. With regard to Jersey Health Connect only, if you do not wish to allow otherwise authorized doctors, nurses, clinicians and other health care providers involved in your care to electronically share your PHI with each other through Jersey Health Connect, you can complete, sign and submit the Jersey Health Connect Opt-Out form and mail it as instructed on that form and any Opt-Out selection that you make will be honored. The Jersey Health Connect Opt-Out form can be obtained from us and from any participating provider. You can also download it from www.jerseyhealthconnect.org. If you Opt-Out of Jersey Health Connect, this will prevent your information from being shared electronically through the Jersey Health Connect network; however, it will not impact how your information is otherwise typically accessed, used and released in accordance with this Notice of Privacy Practices and the law.

Any exception that denies an individual from opting out of having their information transmitted through the Jersey Health Connect, shall be fully supported under federal and state law. You can obtain additional information about the Jersey Health Connect by visiting www.jerseyhealthconnect.org.

VI. Effective Date and Duration of This Notice:

A. Effective Date: This Notice is effective as of April 13, 2003.
Revision Dates: October 1, 2011, June 1, 2012, June 7, 2013.

B. Right to Change Terms of this Notice. We may change the terms of this Notice at any time. If we change this Notice, we may make the new notice terms effective for all PHI that we maintain, including any information created or received prior to issuing the new notice. If we change this Notice, we will post the new notice in waiting areas around Atlantic and on our Internet site at www.atlantichealth.org. You also may obtain any new notice by contacting our Privacy Officer.

VII. Privacy Officer:

You may contact the Privacy Officer at:

Eva J. Goldenberg, Esq.
Chief Compliance Officer
Privacy Officer
Research Integrity Officer
Atlantic Health System, Inc.
475 South Street, P.O. Box 1905
Morristown, New Jersey 07962
Telephone Number: (973) 660-3143
E-mail: eva.goldenberg@atlantichealth.org

APPENDIX N

Copy of Study Findings Form

Study title: The relationships among school nurse to student ratios, self-efficacy for type 1 diabetes management, and glyceimic control in adolescents

COPY OF STUDY FINDINGS

If you wish to receive a copy of the study findings in aggregate (grouped) form, please provide your name and mailing address below.

Name Date

Address

Address